DEN NORSKE LOS 7

SAILING DIRECTIONS
SVALBARD and JAN MAYEN

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THE NORWEGIAN PILOT

VOLUME 7

SAILING DIRECTIONS

SVALBARD and JAN MAYEN

THIRD EDITION
PDF-version 3.9

PUBLISHED BY
THE NORWEGIAN HYDROGRAPHIC SERVICE and NORWEGIAN POLAR INSTITUTE

May
2018

PREFACE

The Sailing Directions «The Norwegian Pilot» is issued as follows:

1	:	General Information
2A	:	Svenskegrensen–Langesund
2B	:	Langesund–Jærens rev
3	:	Jærens rev–Stad
4	:	Stad–Rørvik
5	:	Rørvik–Lødingen and Andenes
6	:	Lødingen and Andenes–Grense Jakobselv
7	:	Svalbard and Jan Mayen

The first sailing directions were published in 1791 and were at that time a description of each chart. In 1866, sailing directions were collected in one volume, «The Norwegian Pilot» and issued in eight booklets. Each booklet covered one part of the coast, and the firs «Idefjorden–Jomfruland» was issued in 1870–1871. In 1914 eight volumes were published but were then adapted to six volumes in 1955 when «Den norske los» were published regularly.

Volume 7 covers the area «Svalbard and Jan Mayen» and was first published in 1988. In 1990 it was reprinted with reported changes and corrections.

This book's revision is based on earlier editions and received reports. This edition, as previously, is a joint project between The Norwegian Polarinstitute (NP) and Norwegian Hydrographic Service (NHS). This English version has been largely translated by Roy Cooney who has previously translated publications for the NHS and UKHO.

As large sea areas have not been sounded due to financial reasons, the description of the north easterly and easterly areas of Svalbard in particular are essentially based on experiences. Amendments to these areas in the book will be necessary when each new survey becomes available. The reader should take special note of the content expressed in some chapters. In the newest charts of Svalbard there are source diagrams which show the areas that are covered by modern surveys.

The purpose of the Sailing Directions is mainly to provide information which cannot be found on charts, in lights lists or marks lists. «The Norwegian Lights List», «List of Norwegian Sailing Marks» and «Symbols and Abbreviations used on Norwegian charts» must be considered essential supplements to charts and Sailing Directions, and therefore should always be kept together.

In addition to the sailing directions users will find more information of general interest that can be important to navigation in these arctic regions in Chapter I. For those who wish to know more of Svalbard, there are short articles on, for example, Svalbard's history, public administration and services, information for visitors, climate, flo a and fauna, geology and fisherie . More general information for mariners can be found in «Den norske los», volume 1. Volume 1 is an essential supplement to the other volumes of «Den norske los» and should always be kept on board.

The harbour plans are based on surveys produced by NHS. Due to siltation or dredging, depths cannot always be guaranteed.

Each chapter contains an index of charts. By some of the place names there is a red mark which indicates that a harbour sketch has been included.

All directional bearings are true unless otherwise stated.

Reports of corrections to the book will be received with thanks by Norwegian Hydrographic Service, Postboks 60, N-4001 Stavanger, telephone: +47 51 85 87 00, fax: +47 51 85 87 05, e-mail: dennorskelos@kartverket.no or sjo@kartverket.no.

This PDF-version is based on the current paper edition of the «Den norske los» volume 7. All reported corrections/changes until realase date are corrected. New PDF-version with reported corrections/changes will be issued medio May and November each year. Important corrections are also reported in «Notice to Mariners».

The Norwegian Hydrographic Service and The Norwegian Polarinstitute thanks all those who have assisted with information for the book, and wishes all users good sailing.

Stavanger 2018

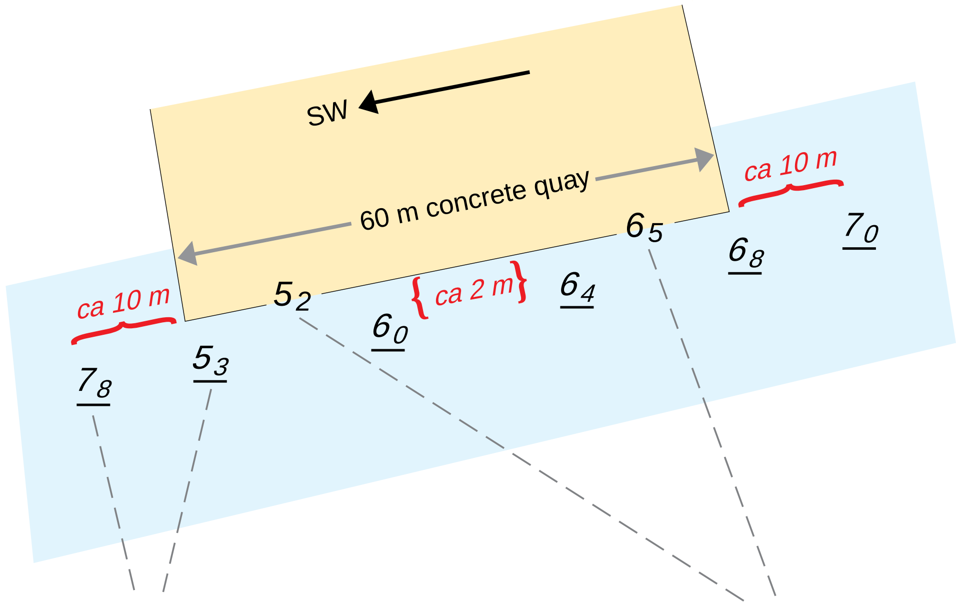
NORWEGIAN POLAR INSTITUTE
www.kartverket.no

NORWEGIAN HYDROGRAPHIC SERVICE
www.npolar.no

EXAMPLES

Quay descriptions:
Quay depths listed in the text were taken about 2 metres from the edge of the quay and in the sketches they are underlined, e.g. quay depths in the text that are set in parentheses were taken 10 metres from the comer of the quay, in the same alignment and about 2 metres off the quay-line, e.g. (7.8). The quays are measured by hand and/or echo sounder and where they deviate from the natural slope in the area between the quay/fender front and the 2 m distance, this depth will take precedence.

Due to changes in the shape of the hulls of some vessels and the wishes of some users, larger quays are now measured and registered with depths along the quay/fender front. In the sketches the depths will be in the correct position without underlining (see example). In the text it will say where the depths are measured at the quay/fender front.



1. 60 m concrete quay, depths from SW (7.8)–5.3–6.0–6.4–6.8–(7.0) m.

1. 60 m concrete quay, depths from SW (at the quay/fender front) 5.2–6.5 m.

The quay depths refer to chart datum on the charts and also on the harbour sketches and tide tables issued by NHS. In the areas covered by this book chart datum applies to «The lowest astronomical tide» (LAT).The height difference between mean water and chart datum is known as Zo and values for individual harbours are given in the table on page 78. More information can be found under the section on tides in chapter 1 and in «Tide Tables for the Norwegian Coast and Svalbard».

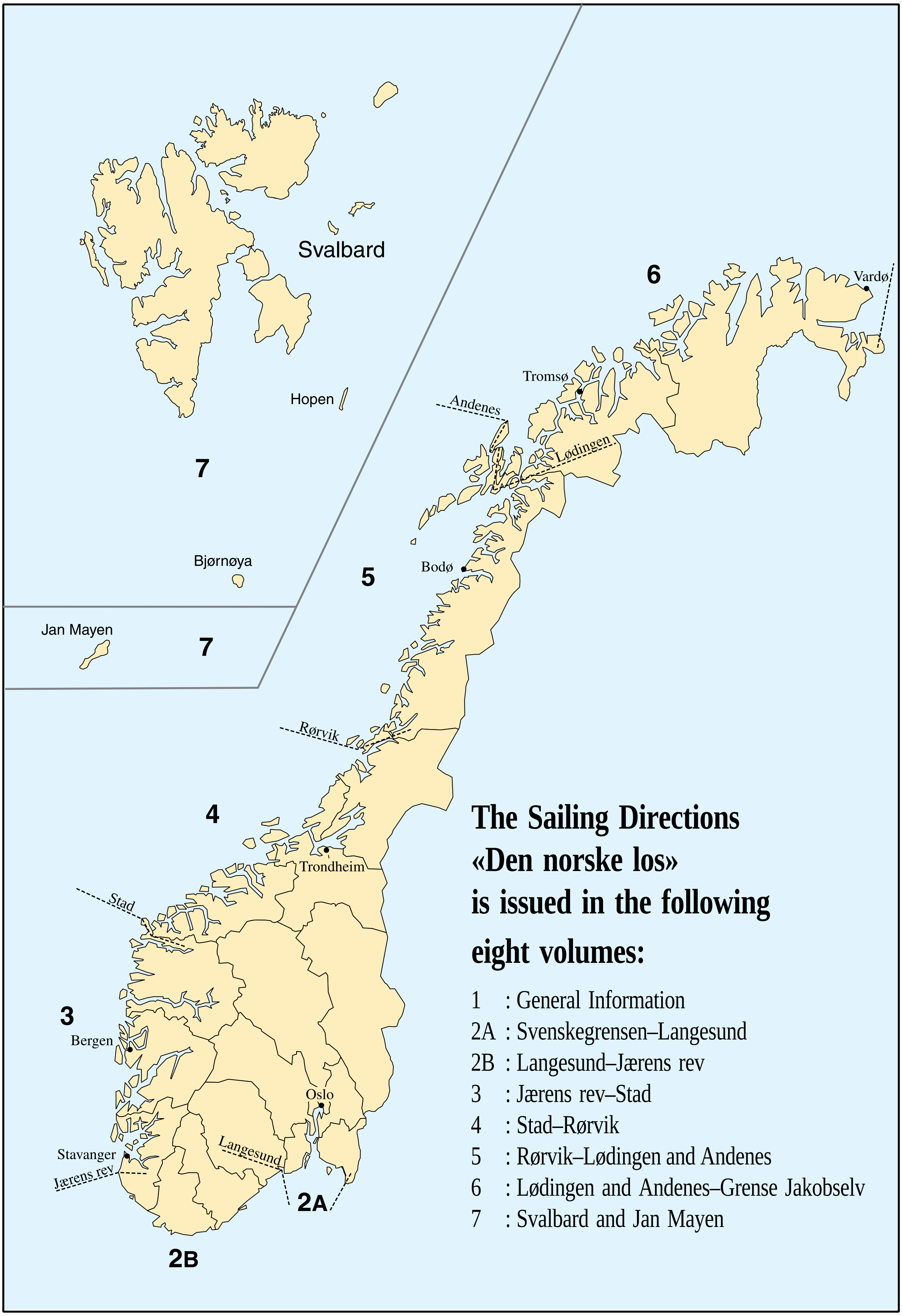
Harbour plans: chart sections are shown at scales of 1:5000, 1:10 000, 1:20 000. The symbol is a red, solid square on the chapter chart at the beginning of each chapter.

Quay sketches: chart sections shown without hydrographic information and used to show the quay's position on the ground. The symbol is a red square outline on the chapter charts.

B or R in the sketches indicate mooring bolt or ring.

Symbol indicates indirect lighting.

4/9 The figure 4 indicates which volume it appears in and the figure 9 indicates the number of the view in the book.



The Sailing Directions «Den norske los» is issued in the following eight volumes:

1 : General Information
2A : Svenskegrensen–Langesund
2B : Langesund–Jærens rev
3 : Jærens rev–Stad
4 : Stad–Rørvik
5 : Rørvik–Lødingen and Andenes
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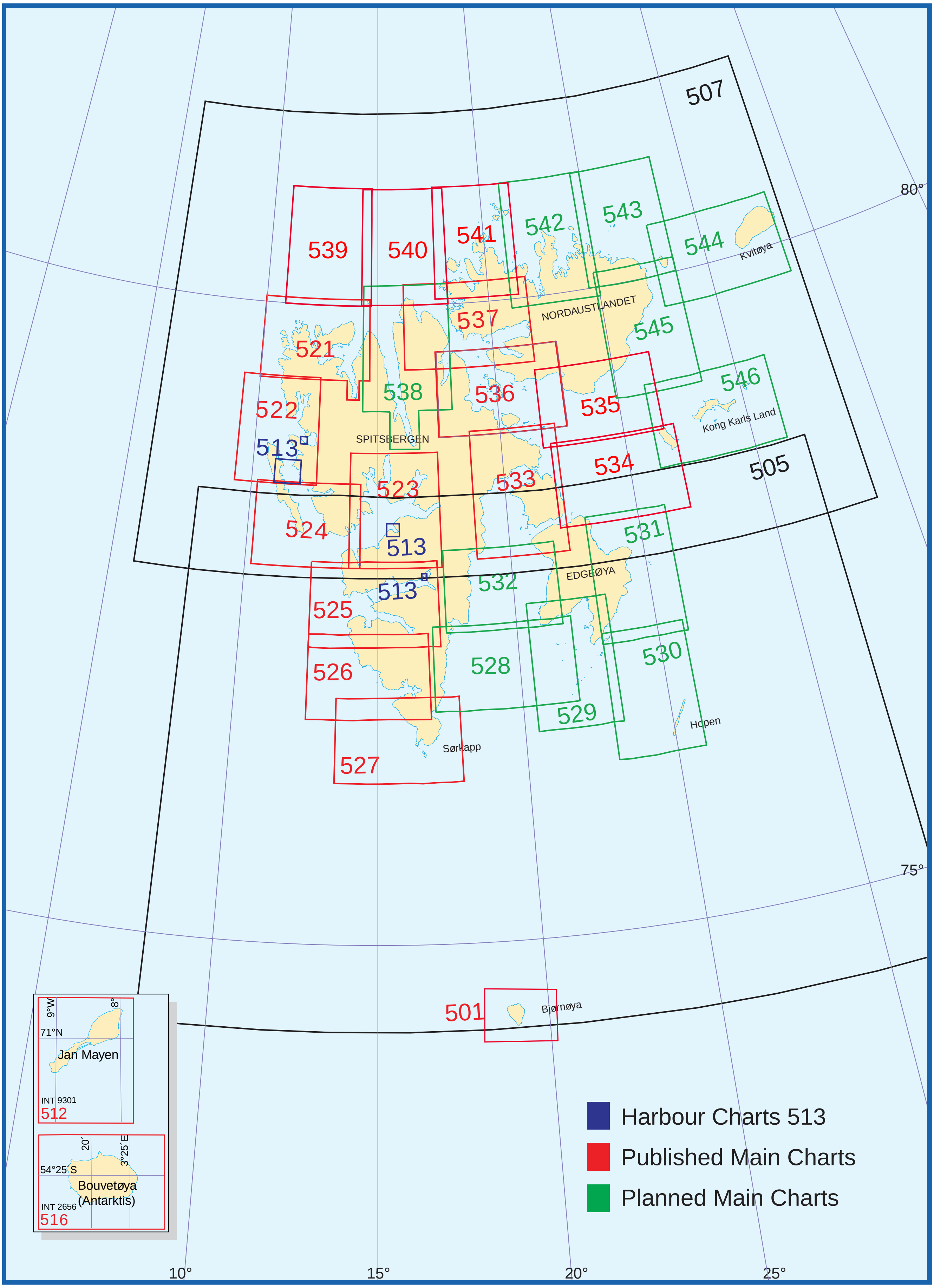
507
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539
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541
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Kvitøya
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546
Kong Karls Land
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SPITSBERGEN
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531
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EDGEØYA
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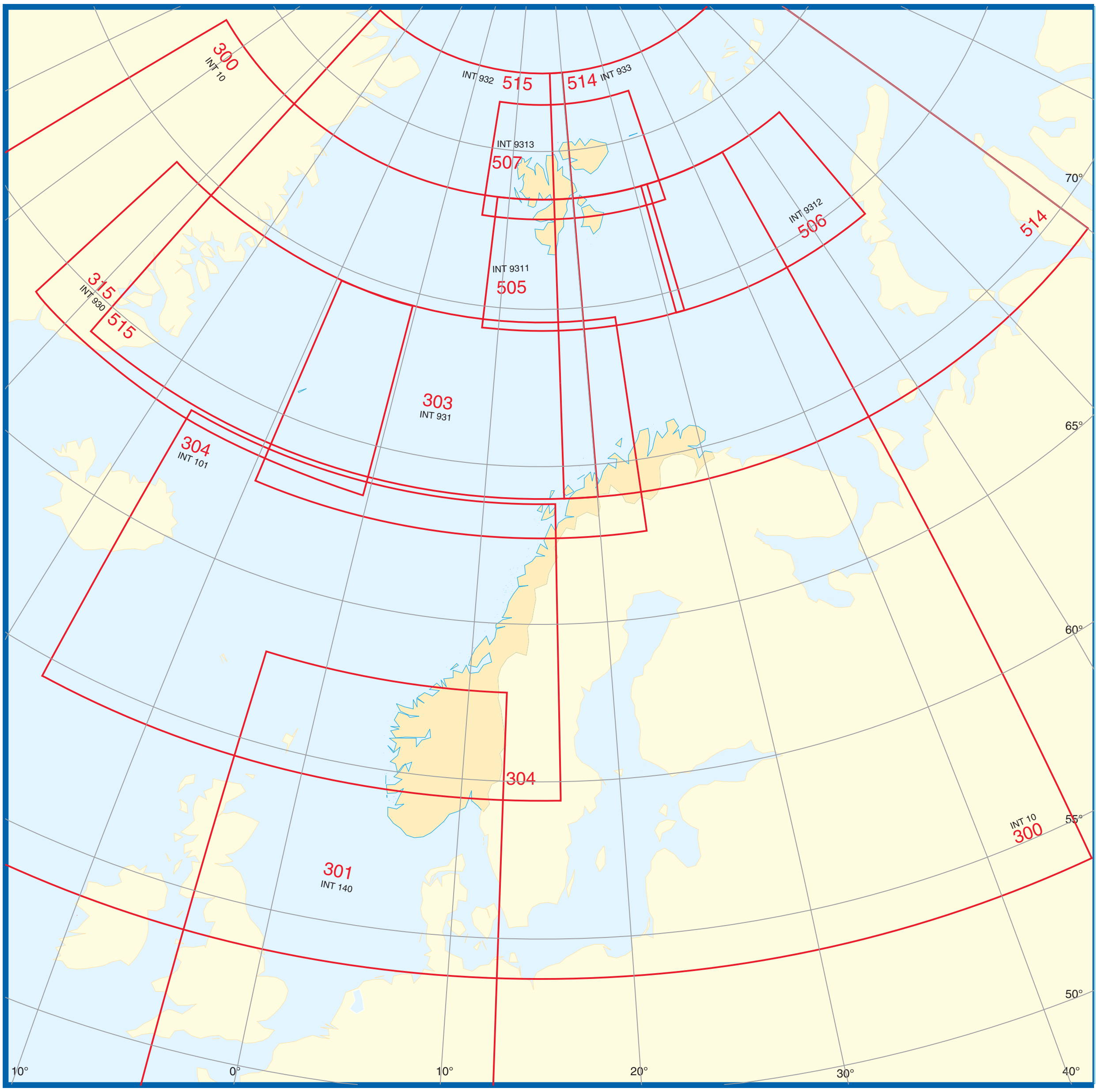
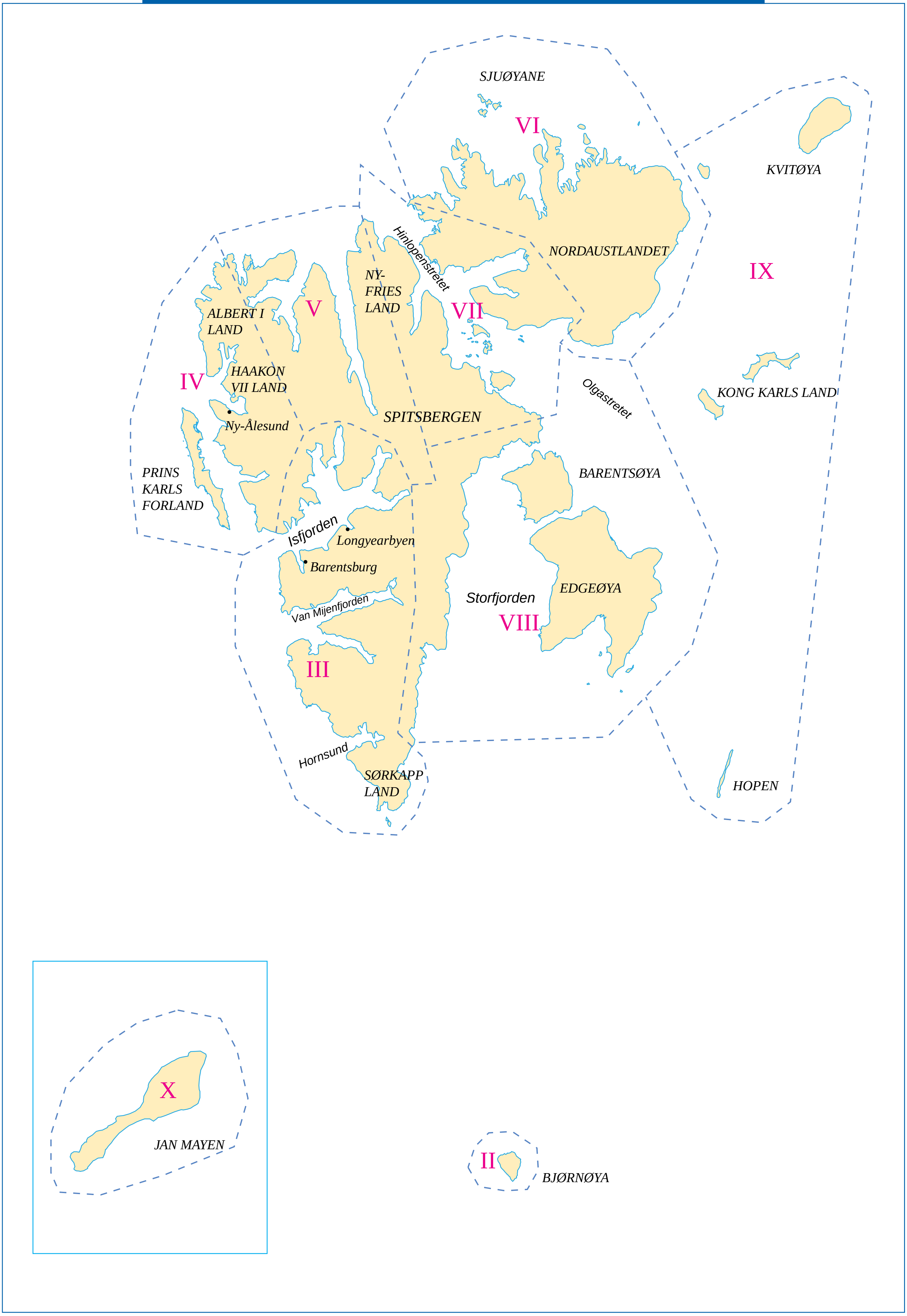
526
528
530
529
527
Sørkapp
Hopen
80°
75°
501
Bjørnøya
9°W
8°
71°N
Jan Mayen
INT 9301
512
20´
3°25´E
54°25´S
Bouvetøya
(Antarktis)
INT 2656
516
Harbour Charts 513
Published Main Charts
Planned Main Charts
10°
15°
20°
25°

General charts index

The chart series consists of charts of the North Sea, The Norwegian Sea, Svalbard, The Barents Sea, the Greenland Sea, Iceland, East Greenland and the Atlantic Ocean. All the charts in this series are on the Mercator Projection. Scales vary from 1: 600 000 to 1:10,000 000. Some of the charts are included in the international chart series within the International Hydrographic Organisation. They are marked by INT followed by the international chart number. Where these charts are concerned the chart construction parallel will often deviate from the chart central meridian. The scale at the charts central meridian in that case is given.



No	Title	Scale	Datum	Published	Bar Code
300	INT 10 / Norskehavet	1:10 000 000	WGS84	2008	7046662003006
301	INT 140 / Nordsjøen	1:1 500 000	WGS84	2009	7046662003013
303	INT 100 / Norskehavet. Norge – Jan	1:3 500 000	WGS84	2008	7046662003037
304	Mayen INT 101 / Norskehavet. Norge –	1:3 500 000	WGS84	2008	7046662003044
315	Island INT 113 / Grønlandshavet	1:3 500 000	WGS84	2008	7046662003150
505	INT 1015 / Svalbard	1:700 000	WGS84	2011	7046662005055
506	INT 1016 / Barentshavet	1:700 000	WGS84	2011	7046662005062
507	INT 1017 / Svalbard. Nordsvalbard	1:700 000	WGS84	2011	7046662005079
514	INT 174 / Barentshavet	1:2 000 000	WGS84	2011	7046662005147
515	INT 175 / Svalbard – Grønland	1:2 000 000	WGS84	2011	7046662005154
550	INT 904 / Dronning Maud Land	1:2 000 000	WGS84	2002	7046662005505


SJUØYANE
VI
KVITØYA
NORDAUSTLANDET
IX
Hinlopenstretet
NY-
FRIES
LAND
VII
ALBERT I
LAND
V
IV
HAAKON
VII LAND
SPITSBERGEN
Olgastretet
KONG KARLS LAND
Ny-Ålesund
PRINS
KARLS
FORLAND
BARENTSØYA
Isfjorden
Longyearbyen
Barentsburg
Storfjorden
EDGEØYA
Van Mijenfjorden
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III
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LAND
HOPEN
X
JAN MAYEN
II
BJØRNØYA

Contents

CHAPTER II

General information

Ordliste – Glossary – Wörterverzeichnis – Glossaire – Woordenlijst

Norsk	*English*	*Deutsch*	*Francais*	*Nederlands*
Advarsel	warning	Warnung	avis, avertissement	waarschuwing
Aktsomhetsområde	precautionary area	Achtungsgebiet	zone règlementée	voorzorgsgebied
Ankerplass	anchorage	Ankerplatz	mouillage	ankerplaats
Ankre	anchor	ankern	mouiller, jeter l'ancre	anker
Au, austre	East	Ost, östlich	est	oost, oostelijk
Badeplass	beach	Badestelle	plage, grève	strand
Bb, babord	port (side, hand)	Backbord	bâbord	BB, bakboord
Bløt	soft	weich	mou	zacht
Bratt	steep	steil	raide, pente	stijl
Bre	glacier	Gletscher	glacier	gletsjer
Bru	bridge	Brücke	pont	brug
Brygge	jetty, pier	Bootssteg, Pier	jetée, quai, appontement	kade
Bukt	bay, cove, bight	Bucht	baie, anse	baai
Bunkers	bunkering	Treibstoff	carburant	brandstof
Bunkersstasjon	bunkering	Tankstelle	station essence, station service	bunkerstation
Bunn	seabed	Grund	fond de la mer	zeebodem
Bunnbeskaffenhet	nature of the seabed	Grundbeschaffenheit	nature du fond	bodemgesteldheid
By	town	Stadt, Dorf	ville	Stad/plaats
Bøye	buoy	Boje, Tonne	bouée	boei
Båe	sunken rock, skerry	Unterwasserfelsen	rocher immergé	blinde klip
Båke	lattice beacon, landmark	Bake	balise, amer	baken, landmerk
Båtsportkart	small craft chart	Sportbootkarten	cartes pour embarcations et navires de plaisance	kaarten voor kust en binnenwateren
Båtverksted	boatyard	Bootswerft	chantier naval	scheepswerf
Delvis	partly	teilweise	partiel	gedeeltelijk
Dnl, Den norske los	Sailing Directions	Seehandbuch	Instructions nautiques	Zeemansgids/Vaargids
Dokk	dock	Dock	dock, bassin	dok
Dybde	depth	Tiefe	profondeur	diepte
Dybdeforhold	depth conditions	Tiefenverhältnisse	conditions bathymétriques	diepteverhoudingen
Dybdekurve	depth curve	Tiefenlinie	isobathe	dieptelijn
Dypgående	draught	Tiefgang	tirant d'eau	diepgang
E, øst, østlig	east, eastern	Ost, Osten, östlich	est	O, oost, oostelijk
Efs, Etterretninger for sjøfarende	Notices to Mariners	Nachrichten für Seefahrer	Avis aux navigateurs	Berichten aan Zeevarenden (BAZ)
Farlei (-led)	fairway	fahrrinne	passage, passe, chenal	vaargeul
F, fast	fixed	F, festfeuer	fixe	vast
Fartøy	vessel	Schiff	navire, vaisseau, bateau	schip
Farvann	fairway, waters	Fahrwasser	chenal	vaarwater
Farvannsbeskrivelse	Sailing Directions	Seehandbuch	Instructions nautiques	Zeemansgids
Ferje	ferry	Fähre	bac, navire transbordeur	veerboot
Fin	fine	feinkörnig, fein	fin	fijn
Fiskeoppdrett	fish farm, marine farm	Fischzucht	pêcheries, ferme marine	viskwekerij
Fiskevær	fishing station	Fischerdorf	port de pêche	vissershaven
Fjell	mountain, rock	Felsen	montagne	berg
Fjord	fjord, fiord	Förde, Fjord	fjord	fjord
Fjære	ebb tide	Ebbe	marée descendante, jusant (courant)	eb
Fl (lynblink)	flashing	Fl, Blz., Blitz	à éclats	flikkeren
Flo	flood tide	Flut	(courant) flot, marée montante	vloed
Flu	rock (submerged)	Unterwasserklippe	roche, récif, écueil	blinde klip
Flytebrygge	floating stage	Schwimmsteg	ponton	drijvende steiger
Forbudt	prohibited	verboten	interdit	verboden
Forbudt sjøområde	restricted sea area	Sperrgebiet, verbotenes Gebiet	zone interdite	verboden gebied
Fortøyningsbøye	mooring buoy	Festmachetonne	bouée d'amarrage	meerboei
Fortøyningsring	mooring ring	Vertäuungsring	anneau d'amarrage	meerring

Norsk	English	Deutsch	Francais	Nederlands
Fortøyningsbolt	mooring bolt	Vertäuungsbolzen	bollard	bolder
Foto	photo	Foto	photographie	foto
Friareal	recreational area	Erholungsgebiet	aire de loisirs	recreatiegebied
Friseilingshøyde	minimum vertical clearance	Richtlinie	tirant d'eau (vertical)	doorvaarthoogte
Friseilingsméd	clearing line	Richtmarke	limite de securité	veiligheidsgrens
Fuglereservat	bird sanctuary	Vogelschutzgebiet	réserve d'oiseaux	beschermd gebied voor vogels
Fyr	lighthouse	Leuchtfeuer	phare	vuurtoren
Fyrliste	List of Lights	Leuchtfeuerverzeichnis	livre des feux	lichtenlijst
Gjestebrygge	visitor's wharf	Gaststeg	quai reservé aux visiteurs	paasantensteiger
Gjesteplass	visitors' berth	Gastliegeplatz	poste d'amarrage pour visiteurs	passantensteiger
Gradnett	graticule	Gradnetz	graticule, réseau	gradennet
Grovkornet	coarse	grobkörnig	grossier, gros	grof, ruw
Grunne	rock, bank, shoal	Untiefe	rocher, banc, hauts fonds	ondiepte
Grunnlinje	base line	Basislinie	ligne de bases	basislijn
Grunnlinjepunkt	baseline point	Basispunkt	point d'appui d'une ligne de base droite	punt op basislijn
Grus	gravel	Kies	gravier	kiezelachtig
Grønn	green	grün	vert	groen
Halvøy	peninsula	Halbinsel	presqu'île, péninsule	schiereiland
Handel	shop	Lebensmittelgeschäft	épicerie, provisions de bouche	levensmiddelen
Hard	hard	hart	dur	hard
Hav	ocean	meer, ozean	mer, océan	zee, oceaan
Havbruk	marine farm	Fischzucht	pécheries, ferme marine	viskwekerij
Havn, hamn	harbour, haven	Hafen	port	haven
Havnedistrikt	harbour district	Hafengebiet	zone portuaire	havengebied
Havnegrense	harbour limit	Hafengrenze	limité de zone portuaire	havengebied
Havnekontor	harbour master's office	Hafenamt	capitainerie	kantoor havenmeester
Havnekart	harbour chart	Hafenkarte	carte de port	havenkaart
Havneskisse	harbour sketch, harbour plan	Hafenskizze	croquis de port	plan
Hefte	obstruction	Hindernis	obstruction	obstructie
Holme	islet	kleine Insel	îlot	klein eiland
Huk	point, headland	Landzunge	pointe, cap	landtong
Hvit, hvitt	white	weiß	blanc	wit
HW, høyvann	high water	HW, Hochwasser	pleine mer	hoogwater
Høyde	altitude, height	Höhe	altitude, hauteur	hoogte
Høydekurve	height contour line	Höhenlinie	courbe de niveau	hoogtelijn
Indre	inner	innere	intérieur	binnen
Innenfor	within	innerhalb	au-dedans	binnen
Innløp	entrance, inlet	Einfahrt	entrée	ingang
Innseiling	approach	Ansteuerung	approche, abords	aanloop
Innsiden	inside, inner side	innerhalb	au-dedans, á l'intérieur	binnen
Isbre	glacier	Gletscher	glaciers	gletsjer
Jernstang	iron perch	Stange	perche métallique	ijzeren stang
Jernbane	railway	Eisenbahn	chemin de fer	spoorweg
Kabellengde	cable, cable length	Kabellänge	encâblure	kabel, kabellengte
Kai	quay	Kai	quai	kade
Kaiskisse	quay sketc.h	Kaiskizze	croquis de quai	kadeplan
Kanal	navigation channel	Kanal	chenal	kanaal
Kapittel	chapter	Kapitel	chapitre	hoofdstuk
Kart	chart	Karte	carte	zeekaart
Kartnull	chart datum, datum for sounding reduction	Kartennull	zéro des cartes	reductievlak
Kirke	church	Kirche	église	kerk
Kjennemerke	mark sign	Landmarke	amer	kenbaar punt
Klima	climate	Klima	climat	klimaat
Klippe	reef, cliff, pinnacle rock,	Klippe	falaise, récif	klip
Knaus	crag, rock	Hügel	rocher escarpé	rots
Knop	knots	Knoten	noeud	knopen
Korall	coral and coralline algae	Koralle	corail	koraal

Norsk	*English*	*Deutsch*	*Francais*	*Nederlands*
Kran	crane	Kran	grue	hijskraan
Kystkontur	coastline	Küstenlinie	contour de la côte	kustlijn
L, lille, litle, liten	little	klein	petit	klein
LW, lavvann	low water	NW, Niedrigwasser	basse mer	laagwater
Landtoning	coastal view	Landton, Landansicht	vue côtiére	landverkenning
Landtunge	head, headland	Landzunge	cap, promontoire	landtong
Lei (led)	recommended passage	Fahrrinne, Fahrwasser	passe, passage, chenal	aanbevolen doorgang
Leire	clay	Ton	vase	klei
Leistrek, ledstrek	recommended track	empfohlener Kurs, Fahrrinne	alignement, voie (ou route)	aanbevolen route, geleidelijn
Lengde	lenght	Länge	longueur	lengte
Lenger (om tid)	more time	länger (Zeit)	plus long temps	meer tijd
Lengre (om avstand)	longer distance	länger (Entfernung)	plus long, plus loin	grotere afstand
Lengst	longest	am längsten	le plus long	grootste
Linje	line	Linie	courbe, ligne	lijn
Liten	little	klein	petit	klein
Loddskudd	sounding	Lotung	sonde	loding
Lokalkunnskap	local knowledge	Ortskenntnis	connaissance des conditions locales	plaatselijke bekendheid
Los	pilot	Lotse	station de pilotes	loods
Loskontor	pilot office	Lotsenbüro	bureau de pilotes	loodsenkantoor
Luftspenn	overhead cable	Überwasserkabel	câble aérien	bovenwaterkabel
Lydbøye	sound bouy	Heulboje, Heultonne	bouée sonore	brulboei
Lykt	light	Leuchtfeuer	feu	licht
Lykte-/fyrkarakteristikk	light characteristics	Kennung eines Leuchtfeuers	caractéristique d'un feu	lichtkarakter
Lysbøye	light buoy	Leuchttonne	bouée lumineuse	lichtboei
Lystbåt	pleasure craft	Jacht	bateau de plaisance	pleziervaartuig
Løp	channel, passage	Durchfahrt, Fahrwasser	passage, chenal	doorgang
Marina	boat harbour, marina	Bootshafen, Marina	port de plaisance	jackthaven
Méd	leading line	Richtlinie	alignement	geleidelijn
Mellomstore steiner	cobbles	mittelgroße Steine	gros galets	middelgrote stenen
Merke	mark	Markierung, Seezeichen	marque	merk
Middelvann, MW	mean sea level	mittlerer Wasserstand	niveau moyen de la mer	gemiddeld zeeniveau
Midtre	middle	mittlere	du milieu	gemiddeld
Minste dybde	least depth	geringste Tiefe	profondeur minimale, brassiage	minste diepte
Misvisning	magnetic variation	Mißweisung	déclinaison magnétique	variatie
Molo	mole, breakwater	Mole	mole	pier
Mudret	dredged	gebaggert	dragué	gebaggerd
Munning	mouth, estuary	Mündung	embouchure, estuaire	monding
Målestokk	scale	Maßstab	échelle	schaalI
Nautisk mil, n mil (M)	international nautical mile	Seemeile	mille marin international	zeemijl
N, Nord	north	N, Norden	nord	noord
N, nordre, nordlig	north, northern, northerly	nördlich	nord	noord, noordelijk
Navigering	navigation	Navigation	navigation	navigatie
Nes	point, cape, ness	Landzunge, Kap	cap, pointe	landtong
Odde	point, headland	Huk, Vorgebirge, Landspitze	pointe, cap	landtong
Olje	fuel oil	Öl	pétrole	olie
Område	area	Gebiet	zone	gebied
Omtrentlig	approximate	ungefähr	approximatif	benaderde, ongeveer
Oppmerket	marked	markiert	marqué, borné, balisé	gemarkeerd
Oppmåling	survey	Vermessung	levé, relevé	onderzoek
Os	river mouth, outlet	Mündung	embouchure	riviermonding
Overettlinje	leading line	Richtlinie, Deckpeilung	alignement	geleidelijn
Overettlykter	leading lights	Richtfeuer	feux d'alignement	geleidelichten
Overettmerker	leading marks	Richtmarken	marques d'alignement	geleidemerken
Passasje	passage	Durchfahrt	passage, passe	doorvaart
Peiling	bearing	Peilung	relèvement	peiling
Pelebukk	dolphin	Dalben	duc d'Albe	dukdalf
Pir	pier	Pier	appontement, jetée	pier
Poll	bay, fjord, cove	kleine Bucht	anse	baai
Poståpneri (-kontor)	post office	Postamt	bureau de poste	postkantoor

Norsk	English	Deutsch	Francais	Nederlands
Privat	privately maintained, private	privat	privé	privé
Proviant	provisions	Proviant	provisions	proviant
Pynt, pynten	point, headland	Landzunge, Huk, Vorgebirge	pointe	landtong
R, rød	red	R, rot	rouge	rood
Rei, red	road, roadstead	Reede	rade	rede
Renne	channel	Rinne	rigole, passe, chenal	kanaal, vaargeul
Retning	direction	Richtung	direction, relèvement	peiling
Rettvisende	true, related to true north	rechtweisend	vrai, relatif au nord vrai	rechtwijzend
Rev	reef	Riff	récif (écueil)	rif
Rutebilforbindelse	bus service, connection	Autobusverbindung	service régulier d'autobus	busverbinding
Rygg	seamount chain, spur, ridge	Bergrücken	dorsale, éperon	in zee uitlopende bergketen
S, søndre, søre	south	südlich	sud	zuid
S, sør, syd	south	S, Süden	sud	Z, zuid, zuidelijk
Sand	sand	Sand	sable	zand
Sandstrand	sand beach	Sandstrand	plage de sable	zandstrand
Seile	sail	segeln	naviguer à la voile	zeil
Side	side	Seite	côté	zidje
Sjøkabel	submarine cable	Unterwasserkabel	câble sous-marin	onderwaterkabel
Sjøkart	nautical chart	Seekarte	carte marine	zeekart
Sjømerke	beacon	Seezeichen, Bake	balise	baken
Skjær, skjer	rock above water, skerry	Schäre	rocher ne couvrant jamais	bovenwater uitstekende klip
Skjær i vannflaten uncovers	rock which covers and	Fels, trockenfallend	rocher couvrant et decouvrant droogvallende steen	gedeeltelijk
Skjærgard	archipelago, skerries	Archipel, Schärengebiet	archipel côtier, groupe d'iles	archipel
Skolt, skolten	peak	Klippe	roche	punt, spits
Skvalpeskjær	rock awash	Fels in Höhe des Kartennulls	roche à fleur d'eau	droogvallende steen
Slipp	boatslip, slipway	Trailerrampe, Schlipp	slip pour embarcations	sleephelling
Sluse	sluice	Siel, Schleuse	vanne, écluse, déversoir	sluis
Smal	narrow	schmal	étroit	smal
Småbåter	small craft	Jachten, Boote	petite embarcation	kleine scheepvaart
Småbåthavn	small craft harbour	Bootshafen, Jachthafen	port de plaisance	jackthaven
Småstein	pebbles	kleine Steine	galets	kleine stenen
St, store	large	groß	gros	groot
Stasjon	station	Station	station	station
Stb, styrbord	starboard	Steuerbord	tribord	SB, stuurboord
Stake	spar buoy	Spiere, Spierentonne	bouée espar	sparboei
Sted	place	Ort	place	plaats
Stein	stones	Stein	pierres	steen
Stein	rock, shoal	Fels	roche, rocher	rots
Steinbunn	stones	Felsgrund	pierres	stenen
Stengt	closed	geschlossen	fermée	sterk
Sterk	strong	stark	fort	gesloten
Stikke (dypgående)	draught	Tiefgang	tirant d'eau	diepgang
Strand	beach, shore	Ufer, Strand	plage	strand
Stor	large, great	groß	grand	groot
Strøm	stream, narrows	Strömung	goulet, passe	stroming
strømuttak (el)	power supply	Stromanschluz	alimentation électrique	stroomvoorziening
Sund	channel, cove, sound	Sund	bras de mer, chenal	inham, kreek
Svart	black	schwarz	noir	zwart
Søle	mud	Schlick, Schlamm	vase	modder
Tang/tare	sea weed	Seetang	herbes marines	zeewier
Tange	low point,spur, peninsula	Landzunge	cap, pointe	kaap, uitloop
Tegn	character, sign, symbol	Zeichen	caractère, signe	karakter
Tent	lighted	angezündet	lumineux, allumé	verlicht
Tegnforklaring	legend	Zeichenerklärung	légende	verklaring
Tid	time	Zeit	temps	tijd
Tidevann	tides	Gezeiten, Tide	marées	getij
Tidevannsforskjell	difference in tides	Gezeitenhub, Tidenhub	marnage	getijverschil
Tidevannsstrøm	tidal current	Gezeitenstrom	courant de marée	getijstroom
Tidevannstabell	tide tables	Gezeitentabelle	annuaire de marées	getijtafels
Tilleggsside	alongside berth	Landseite, Anlegeseite	côoté d' amarrage	aanlegzijde

Norsk	English	Deutsch	Francais	Nederlands
Tind	moutain, sharp peak	Bergspitze, Gipfel	pic, sommet d'une montagne	bergtop
Toalett	toilet	Toilette	toilettes	toilet
Topp	summit, peak	Spitze, Gipfel	pic, sommet d'une montagne	bergtop
Trafikkseparasjonssystem	traffic separation scheme	Verkehrstrennungsgebiet	dispositif de séparation du trafic	verkeerscheidingsstelsel
Trang	narrow	schmal, eng	étroit	smal
Tråling	trawling	Schleppnetzfischen	pêche au chalut, chalutage	trawlvisserij
Tvers	abeam	quer	en travers	dwarsscheeps
Tørrfall	foreshore, dries	trockenfallend, Watt	estran	droogvalling
Urent farvann	foul ground	unreiner Grund	fond malsain	vuile grond
Utenfor	off	außerhalb	au dehors	uit, buitengaats
Utløp	mouth, outlet, estuary	Auslauf, Mündung	embouchure	monding
Utstikker	jetty	Ausläufer, Verlängerung	quai avancé, môle	dam, pier, havenhoofd
Vann	water	Wasser	eau	water
Vannfylling	water tap	Wasserzapfstelle	service d'eau	watertappunt
Vannledning	waterpipe	Wasserleitung	canalisation d'eau sous-marine	waterleiding
Vannstand	sea level	Wasserstand	niveau de la mer	zeeniveau
Varde	beacon	Steinbake	cairn, tumulus	steenhoop
Verksted (mar.)	boatyard	Werft, Werkstatt	chantier naval	reparatiewerf
Vesle	little	klein	petit	klein
Vestre	west, western	westlich	ouest	westelijk
Vik	bay, cove, creek, inlet	kleine Bucht inham, baai	baie, anse, crique	inham, baai
Viltreservat	nature preserve	Wildschutzgebiet	réserve naturelle	natuurreservaat
Vind	wind	Wind	vent	wind
Vindretning	wind direction	Windrichtung	direction du vent	windrichting
Vrak	wreck	Wrack	épave	wrak
Værforhold	weather conditions	Wetterverhältnisse	état du temps	weersomstandigheden
Våg	small bay	kleine Bucht	anse, crique	kleine baai
Vårjevndøgn spring lavvann	equinoctial spring low water	äquinoktiales Springtidenniedrigwasser	basse mer de vives eaux d'équinoxe	laagwaterspring
W, hvit	white	weiß	blanc	wit
W, vest	west	Westen	ouest	west
Y, gul	yellow	Y, g, gelb	jaune	geel
Yt, ytre	outer	äussere	extérieur	buite
Ø, østre	East, eastern	östlich	est	O, oostelijk
Øy	island	Insel	île	eiland
Åpen	open	offen	ouvert	open

Svalbard's history

The name Svalbard stems from the year 1194. In the Icelandic annals it is mentioned as «Svalbar i fundinn», and in Landnámabók of the 1200's it is stated that it is four days voyage from Langenes on the north side of Iceland to Svalbard at the northern end of the ocean. We do not know if this refers to Svalbard as we know it today.

The first definite discovery of the archipelago was made by Willem Barentsz in his attempt to find a northerly sea route to Asia in 1596. He discovered then both Bjørnøya and Spitsbergen. The expedition was documented with charts and description which were published in 1598, and Spitsbergen got its name after the pointed and rugged mountain formations Barentsz had seen on the northwest of the island.

In 1607 the Englishman Henry Hudson arrived in Svalbard. He realised the hunting possibilities, and during a short time developed large scale whale hunting in the island group. The intensive hunting created conflict among the various expeditions and it became a question of who had sovereignty over Spitsbergen. There was a clear understanding that the land must be attached to Greenland and by virtue of it having a Norwegian king with rights to tax Greenland, gave Christian IV power over Spitsbergen. In the summer of 1615 the king sent a small fleet northward to establish his sovereignty. This situation was never recognised internationally.

Due to overexploitation, whale hunting around Spitsbergen disappeared but, from 1715 the Russians over-wintered to hunt for furs. This occurred more or less continuously until the middle of the 1800's. At this time the Norwegians also began that type of hunting and the number of Norwegian hunting vessels and over-wintering expeditions increased throughout the 1800's

In the last half of the 1700's there were several scientific expeditions to Spitsbergen. The first Norwegian scientist to go there was the geologist Balthazar Matthias Keilhau in 1827. During the course of the last part of the 1800's the scientific exploration increased strongly. The Swedish researchers were very active and in 1872 the Swedish Scientific Academy proposed to King Oscar that the country should be placed under Norway. The Norwegian Government, however, declined this because of the poor economy and the costs of enforcing such a claim.

When the Norwegian polar captain Søren Zachariassen returned with a cargo of coal from Spitsbergen in 1899, it gave rise to a number of expeditions from several countries with the purpose of occupying land areas with coal beds. When the regular coal mining operations were established around 1905, the question of sovereignty arose again and in connection with peace conferences after the Great War, Norway gained custody of the archipelago on 9th February 1920, under the Svalbard Treaty. Actual sovereignty was established on 14th August 1925.

Jan Mayen

Jan Mayen was made subject to Norway by legislation of 27th February 1930. All Norwegian rights are, as for Svalbard, subject to Norwegian legislation. Other legislation must have special reference to Jan Mayen to be applicable there. The island is overseen by a governor and is subject to the District Governor in Nordland from 1st January 1995. The head of the Loran station in Olonkinbyen has police authority.

Development of research and charting of Svalbard

Commencement of research and charting coincided with Svalbard's history from its discovery in 1596. In the following approximate 200 years there was some study of the importance to whaling and other hunting, but because of the desire to keep the discovery secret, little was published.

Around the year 1800 the first sporadic expeditions began with scientific research as the main objective. They continued to increase through the 19th century, most frequently British and Swedish expeditions, usually with Norwegian whaling skippers with local knowledge. The first large Norwegian expedition was lead by Captain Gunnar Isachsen. In 1906 and 1907 he persuaded Prince Albert of Monaco to send his vessel SY «Princess Alice» to Spitsbergen, with himself as leader. The geologist Adolf Hoel took part during the expedition in 1907. Isachsen also had expeditions to Spitsbergen in 1909 and 1910 with the vessel KNM «Farm» and then had economic support from the government, as well as from private individuals and industry.

After his participation in 1907, Adolf Hoel was inspired to organise his own expedition in 1908 and continued after Isachsen with the approximately annual «De Statsunderstøttede Norske Spitsbergenekspeditioner» – also with private support – up to 1928. In this year the governmental institution «Norges Svalbard- og ishavsundersøkelser» (NSIU) was established.

Norwegian Polar Institute

In 1948, «Norges Svalbard- og ishavsundersøkelser» became the Norwegian Polar Institute (NPI), as a natural successor but with extended mandate both on the technical level, and with the Norwegian Antarctic territorial claims included. In consequence of the mandate, NPI is now the central institution for Norwegian research and land mapping in both areas. Originally, sea charting was also included in the mandate, but was transferred to the Norwegian Hydrographic Service in 1984.

Professor H. U. Sverdrup was called home from USA to take over as the director of the institute. After his death in 1957, A. K. Orvin, who had led the institute in the first years after the war, took over. Tore Gjelsvik continued as director from 1960, until he reached retiring age, and was succeeded by Odd Rogne 1st November 1983. At this date, the post was also converted to an appointment for a term of 6 + 6 years.

After Odd Rogne, the institute has the following directors: Nils Are Øritsland (1991–1993), Olav Orheim (1993–2005) and Jan-Gunnar Winther (2005 to present).

The Norwegian Polar Institute was formerly under the Ministry of Trade and Industry because of the mining in Svalbard, but in 1978 it was taken over by the Ministry of the Environment.

At the end of 2011 NPI had a staff of 159, of which 111 were permanent and 48 on contracts. 16 nationalities were represented.

The institute's most important focus areas are the polar climate, the versatile nature, environmental pollution, geology and topographic mapping, in addition to environmental management and providing advice. Documentation is also an important work area, with a polar library of about 30,000 volumes. The institute's photo collection consists of a total of 90,000 photographs from the polar regions. Around 38,000 of these are digitized and are available on the institute's picture base on the internet: Http://sivert.npolar.no/fotoweb/.

There is an extensive professional cooperation externally, including a consultation service for the ministries linked with domestic and foreign universities and research institutions.

The Norwegian Hydrographic Service

The responsibility for all official charting north of 74° was transferred from Norwegian Polar Institute (NP) to Norwegian Hydrographic Service (NHS) in January 1984. The reason for such a transfer was mainly that NHS uses computer based production methods extensively, and has built up competence and equipment in this field. From the professional viewpoint a transfer of these working practices produced the benefits of rationalization and should also prove valuable in charting the polar waters.

NHS has more or less conducted systematic surveying of Svalbard since 1984 but large areas remain unsurveyed.

The surveying season of Svalbard is limited to the summer months. The areas of Westspitsbergen are the first to become free of ice and here surveying can begin in the middle of June. Near coast surveying of East Svalbard cannot normally start before the middle of July. It continues to be ice free in September but from the end of September the light conditions become too poor for surveying. The surveying season is especially short in the areas on the north and east sides of Nordaustlandet. Some years it is impossible to survey in these areas.

In addition to the short surveying season several areas require ice-going survey vessels. This is due first and foremost to safety conditions. Even with ice-going vessels it is difficult to conduct surveying in iced-up areas. This is because the ice will reduce data quality and equipment can be easily damaged by the ice.

Modern charting has developed considerably to become a specialised operation that demands much of both equipment and competence. To work effectively it is almost an assumption that this work is an all-year occupation.

M/S «H.U. Sverdrup II» is a 55 m long vessel owned by the Norwegian Defence Research Establishement. This vessel was hired from 2002 to 2006 for surveying a part of the deeper areas of West Spitsbergen. The vessel was equipped with an EM1002 multi-beam echo sounder.

In addition, NHS hired other vessels, including the coast guard ship «Malene Østervold» and «Sjøkraft». Some areas were also charted by others. This applied, among others, to the areas charted in connection with laying cables to Svalbard (SvalSat).

Survey areas

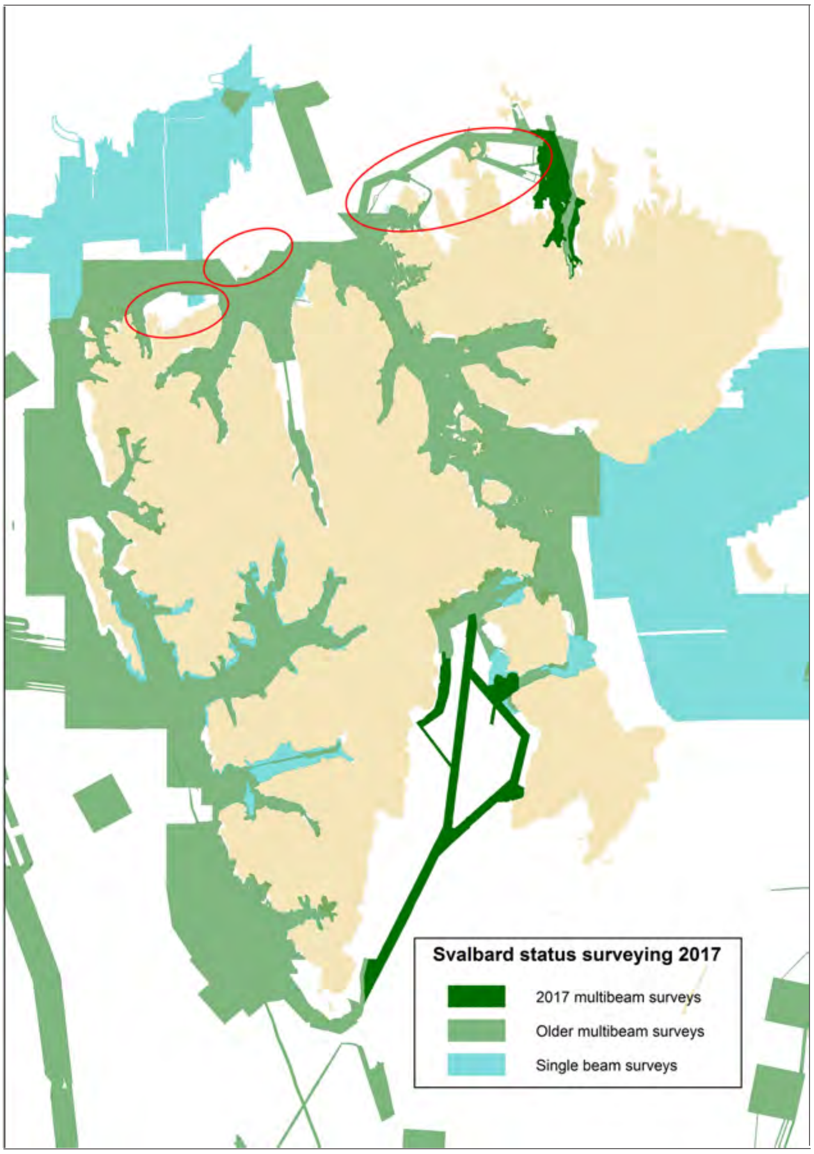
In the last half of the 1980s Van Mijenfjorden, Van Keulenfjorden, Freemansundet and some areas west of Barentsøya were charted. During this period a part of the deeper areas between Edgeøya, via Kong Karls Land to Kvitøya were also charted. Additionally, «Lance» surveyed the areas north of Nordwest-Spitsbergen. These surveys were conducted with single beam echo sounders.

Vessels used in surveying Svalbard

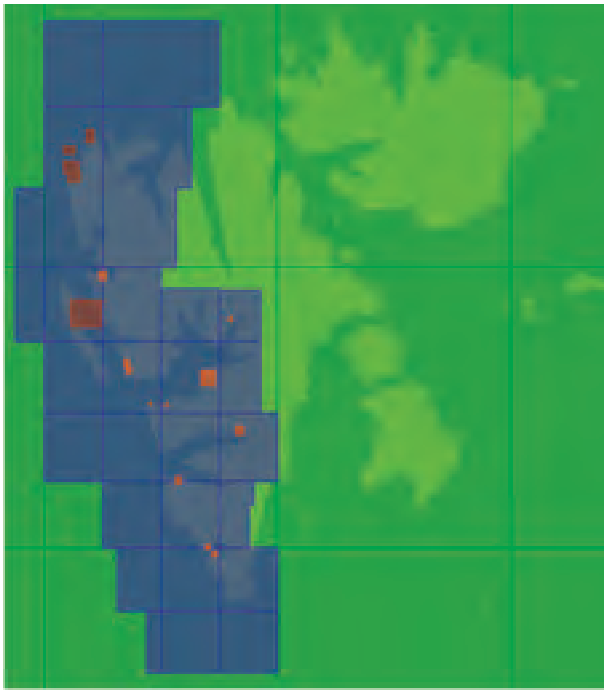
Up until 1994 M/S «Lance» was used to survey Svalbard for about one month each year. «Lance» is a 61 m long ship which originated as a fishing and seal hunting vessel. «Lance» has high ice classification and can sail in all Svalbard areas. In 1987 «Lance» was equipped with NHS' first multi-beam echo sounder (EM100). «Lance» was sold in 1994.

«Sjøfalk» (formerly «Svalis») was an 11.6 m long aluminium boat which Sjøkartverket took over from the Polar Institutt. «Sjøfalk» was used for near coast surveying of Svalbard up to the middle of the 1990s.

«Sjømåleren» was a former rescue boat with a length of 35 m. From 1995 to 2000 «Sjømåleren» was used to survey some of the fjords of Svalbard. The vessel was first equipped with EM100 but in 1999 it was replaced by an EM1002 multi-beam echo sounder. «Sjømåleren» was sold in 2001.



Areas marked in red show priority areas for future surveying.



The status of ENC coverage in 2015. See also product catalogue, Norwegian Hydrographic Service and www.kartverk.no

Most of Hinlopenstretet was charted during the 1990s when it was surveyed using a multi-beam echo sounder. Some of these surveys were carried out while the technology was in its infancy so the resulting data quality is variable.

From 2007 the surveying was intensified in that all the NHS survey vessels were deployed from the Norwegian coast to Svalbard during the summer season. The surveys of Svalbard are now conducted with approximately the same quality as of the Norwegian coast. The only difference is that the Norwegian coast is surveyed right in to the drying line while on Svalbard it is surveyed only to the 3 metre depth. From 2007 the main focus has been securing a sailing route from Sørporten, via Heleysundet and Ginevraboten to Storfjorden.

Navigation systems

Up to the beginning of the 1990s ground-based navigation systems were used for survey positioning. In areas close to the shore the micro wave system Motorola Mini ranger was used. When surveying further from land the 2MHz system Seafix was employed. Establishing and operating these systems was very time consuming. It was also almost impossible to maintain good positioning accuracy with Seafix

From 1994 Differential GPS was used for positioning. This was a revolution in effectiveness and quality of positioning. From 2004 the efficiency further improved so the land stations became obsolete as post processed positioning was introduced.

Echo sounders

When NHS took over surveying of Svalbard in 1984 all surveying was based on single beam echo sounders. In the last half of the 1980s the Simrad EM 100 was developed as the first commercial multi-beam echo sounder and NHS acquired its firs EM 100 in 1987. It was installed on «Lance». When a second corresponding echo sounder was procured it was installed on «Sjømåleren».

EM 100 was used only for deeper areas and could not be mounted in the survey boats which were used for surveying right up to the shore. In 1999 NHS acquired its first multi-beam echo sounder for shallower waters.

Charts

Charting of Svalbard

The planned general chart series that at the time should cover the whole of Svalbard, Bjørnøya and Jan Mayen would mainly be issued at a scale of 1:100 000. Provisionally 17 charts are issued, including harbour chart 513 which covers the four harbours of Sveagruva, Forlandsrevet, Adventfjorden and Ny-Ålesund. Charts of Svalbard are otherwise issued in comparatively smaller scales of 1:700 00 – 1:1.2M.

The charting of the large near-coast areas still remains. NHS has prepared a charting plan for Svalbard but when this will be completed depends on resources still to be realised.

For Status 2015, issued charting, see page 7.

The west side of Svalbard is covered by both electronic navigational charts (ENC) and paper charts produced in more recent years and ENCs at smaller scales. There is a great variation in content and accuracy regarding new and older surveys. This information is provided on individual charts with the aid of a source diagram on the paper charts and zones of confidence (ZOC) on ENCs. It is the mariner's responsibility to take notice of the information concerning the basis of the chart when navigating. See Volume 1 and EFS 1 (Notices to Mariners 1) for more information concerning quality of Norwegian charts.

Reliability

The rapid development of the shipping industry with the arrival of larger and deeper draught vessels, and newer and improved navigational methods means that there are now greater demands on the reliability of charts than at any time. The chart's reliability depends to a large degree on the technol-ogy that is available. It is therefore obvious that the chart based on older surveys will not satisfy present day demands for accuracy. Occasionally NHS receives reports of errors in the charts. These reports are dealt with as soon as possible and published in «EFS». The charts are corrected continuously.

Quality of Norwegian paper charts and digital charts of the waters around Svalbard

Charts and chart datum

All charts for the area are prepared in accordance with WGS-84. The datum for individual charts is stated on the chart.

Coastlines can be encumbered with considerable errors in the chart datum. Until density surveying of the waters takes place in several areas, the existence of shoals cannot be ruled out.

Extra special care must be exercised when sailing in the waters around Svalbard. Navigation should be conducted with established navigational traditions using all available aids (including radar), comparing the observations from aids in use, maintaining a sharp lookout and generally applying sufficient margins at all times to maintain navigational safety.

Use of the electronic chart does not exempt the navigator from the operational obligations and requirements. The same professional and critical attitude should be maintained as with those for traditional navigation when a paper chart is used.

Changes in glacier fronts and coast line – glaciers used in conjunction with leading lines

The glacier fronts seawards are continually changing. In general the glacier fronts are receding; observations exist where the glaciers have receded several hundred metres during the last decades.

It is also usual that the glaciers have shorter periods when advancing considerably («surging glaciers»). Large quantities of ice are then moving downward from the top of the glacier, and collapsing below. For this reason contour lines and terrain close to the glacier can deviate from contour lines on the chart. As an example the Fridtjovbreen in van Mijenfjorden advanced about four kilometres from autumn 1995 and the next two and a half years.

In the chart the glacier fronts seawards can be referred to a certain year, but such information does not always exist. Changes in the front of a glacier can cause a considerable difference between the existing front and the charted front. In areas where the glacier fronts have receded compared to fronts shown on the chart no depth information exist. Also the coastline can change, in particular close to great rivers. The user should bear this in mind and ensure that navigation is exercised with utmost care when navigating close to glacier fronts and river estuaries.

Glaciers are in some cases used as a reference in conjunction with leading lines. These can be old and well-known points which have been used for decades. Changes in form and outline of the glaciers might, however, cause changes in the reference point. Where glaciers are used as reference points these must be used with great care during the navigation, and always in conjunction with other navigation aids.

Place names

The place names on Svalbard and Jan Mayen reflect the history of the arctic islands. Many of the names of large landscape elements in the near coast areas are linked to the whaling period of the 1600s and possibly have Dutch or British origins. At the decline of the whale hunting there were research expeditions followed by scientific expeditions that contributed to further naming. Around the turn of the 1900s over-wintering hunting and coal mining were important factors in name material on Svalbard and at about the same time the systematic charting of the archipelago began. The topographical mapping has contributed much of the naming, particularly in more outlying areas where no names existed. On Jan Mayen hunting was pursued throughout the 1900’s, and from 1921 there has been a meteorological station on the island. Connected with the publication of topographical maps of the island in 1950, many new place names were established.

After Svalbard and Jan Mayen became Norwegian, respectively in 1925 and 1930, foreign names were translated to Norwegian. Descriptive place names were usually converted completely, while personal names were retained. Place names on Svalbard and Jan Mayen have the Nynorsk language form.

In some instances it will be found that the same place name is used in several different locations. It may not necessarily be that places are called after the same person but may have geographic links to each other. Norwegian Polarinstitute manages place names in the Norwegian polar areas and the nomenclature committee gives approval on place names on Svalbard and Jan Mayen. Updated information on place names can be found on the Polar Institute’s home page, www.npolar.no.

Sailing Directions

Sailing Directions are published as a supplement to the charts. They provide navigational directions along the coast, displaying pictures of characteristic landmarks, give information on harbours and anchorages, and other information of general interest to the mariner – which for lack of space cannot be shown on the charts.

As each new area is charted changes will be made to the sailing directions. In the same way the waters marked with lights and navigational marks, harbour conditions, etc, will be subject to changes and the sailing directions must therefore be revised at an interval of several years. Larger changes that are important to navigation will always be included on new editions of the charts which occur more frequently than new editions of sailing directions.

In cases of doubt the charts take precedence and mariners should correct charts from «Notices to Mariners» (EFS) issued by Statens kartverk sjø twice per month. These contain information of importance to the mariner to enable charts and sailing directions to be kept updated.

The third edition of the sailing Directions for Svalbard and Jan Mayen builds mainly on the two previous editions. The collection and preparation of new material is in cooperation with Norwegian Hydrographic Service and the Norwegian Polarinstitute.

Public administration and services

Svalbard treaty

The Svalbard Treaty was signed in Paris on 9 February 1920. The treaty provides for Norwegian sovereignty over Svalbard, while at the same time providing for certain rights for the other signatories.

Since the seventeenth century, people from many countries have been involved in Svalbard within fields such as whaling, fishing, research, mining and tourism. For a long time, they went about their business in a land that did not belong to any particular state. Svalbard was an international free-for-all, meaning that there were no rules, no regulations, no tribunals to solve conflict . The situation was workable as long as activities were limited to whaling and research, for the area was large and conflicts are.

In the early twentieth century, mining, not least, called for new rules. Exclusive ownership of land became an issue when mineral deposits were found. Now the need for legislation and courts to solve conflicts between miners and owners, for instance, became apparent.

After several failed efforts to satisfy such needs, a settlement was eventually reached during the Versailles negotiations after WWI. It was signed on 9 February 1920, though it only came into effect with the Svalbard Act, on 14 August 1925. The initial name of the Treaty was «Treaty between Norway, the USA, Denmark, France, Italy, Japan, the Netherlands, Great Britain and Ireland and the British Overseas Dominions and Sweden with regard to Svalbard».

Basic Principles

1. Svalbard is part of Norway
   The treaty establishes Norway's full and undivided sovereignty over Svalbard. Svalbard is part of the Kingdom of Norway, and it is Norway that ratifies and enforces the legislation that is to apply for the archipelago. Nevertheless, the treaty does include some conditions restricting the enactment of Norwegian sovereignty, and Norwegian authorities are required to see to it that Norwegian legislation and administration respect these conditions.
2. Non-Discrimination
   Citizens and companies from all treaty nations enjoy the same right of access to and residence in Svalbard. Right to fish, hunt or undertake any kind of maritime, industrial, mining or trade activity are granted to them all on equal terms. All activity is subject to the legislation adopted by Norwegian authorities, but there may be no preferential treatment on the basis of nationality.
3. Taxation
   Article 8 establishes that collected taxes, dues and fees may only benefit Svalbard. Norway may not exercise its authority to acquire any income other than that which is needed for the administration of Svalbard. In practical terms, this means that income taxes are lower in Svalbard than they are on the mainland; nor does Svalbard have any value-added-tax or any other taxes aimed to augment State revenues. Revenues and expenses from the administration of Svalbard are budgeted separately, in the Svalbard budget.
4. Military restrictions
   According to article 9, Norway is required to make sure that no fortresses or naval bases are established. Svalbard may not be used for martial purposes. Norwegian military presence in Svalbard is very slight, consisting mainly of coast guard surveillance. Foreign military presence is unwelcome.

5. Environment Conservation
   The treaty imposes the obligation, on Norway, to protect Svalbard's natural environment.

Parties to the Treaty

A total of 39 countries are registered as parties to the Svalbard treaty: Afghanistan, Albania, Argentina, Australia, Belgium, Bulgaria, Canada, Chile, Denmark, the Dominican Republic, Egypt, Estonia, Finland, France, Greece, India, Iceland, Italy, Japan, China, Monaco, the Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, Saudi Arabia, Spain, the UK, Switzerland, Sweden, South Africa, Germany, Hungary, the USA, Venezuela, Austria.

(10/03/2008 Updated: 09/04/2008)

Treaty between Norway, The United States of America, Denmark, France, Italy, Japan, the Netherlands, Great Britain and Ireland and the British overseas Dominions and Sweden concerning Spitsbergen signed in Paris 9th February 1920.

The President of The United States of America; His Majesty the King of Great Britain and Ireland and of the British Dominions beyond the Seas, Emperor of India; His Majesty the King of Denmark; the President of the French Republic; His Majesty the King of Italy; His Majesty the Emperor of Japan; His Majesty the King of Norway; Her Majesty the Queen of the Netherlands; His Majesty the King of Sweden, Desirous, while recognising the sovereignty of Norway over the Archipelago of Spitsbergen, including Bear Island, of seeing these territories provided with an equitable regime, in order to assure their development and peaceful utilisation, Have appointed as their respective Plenipotentiaries with a view to concluding a Treaty to this effect:

ARTICLE 1. The High Contracting Parties undertake to recognise, subject to the stipulations of the present Treaty, the full and absolute sovereignty of Norway over the Archipelago of Spitsbergen, comprising, with Bear Island or Beeren-Eiland, all the islands situated between 10° and 35° longitude East of Greenwich and between 74° and 81° latitude North, especially West Spitsbergen, North-East Land, Barents Island, Edge Island, Wiche Islands, Hope Island or Hopen-Eiland, and Prince Charles Foreland, together with all islands great or small and rocks appertaining thereto (see annexed map).

ARTICLE 2. Ships and nationals of all the High Contracting Parties shall enjoy equally the rights of fishing and hunting in the territories specified in Article 1 and in their territorial waters.

Norway shall be free to maintain, take or decree suitable measures to ensure the preservation and, if necessary, the reconstitution of the fauna and flo a of the said regions, and their territorial waters; it being clearly understood that these measures shall always be applicable equally to the nationals of all the High Contracting Parties without any exemption, privilege or favour whatsoever, direct or indirect to the advantage of any one of them.

Occupiers of land whose rights have been recognised in accordance with the terms of Articles 6 and 7 will enjoy the exclusive right of hunting on their own land: (1) in the neighbourhood of their habita tions, houses, stores, factories and installations, constructed for the purpose of developing their property, under conditions laid down by the local police regulations; (2) within a radius of 10 kilometres round the headquarters of their place of business or works; and in both cases, subject always to the observance of regulations made by the Norwegian Government in accordance with the conditions laid down in the present Article.

ARTICLE 3. The nationals of all the High Contracting Parties shall have equal liberty of access and entry for any reason or object whatever to the waters, fjords and ports of the territories specified in Article 1; subject to the observance of local laws and regulations, they may carry on there without impediment all maritime, industrial, mining and commercial operations on a footing of absolute equality.

They shall be admitted under the same conditions of equality to the exercice and practice of all maritime, industrial, mining or commercial enterprises both on land and in the territorial waters, and no monopoly shall be established on any account or for any enterprise whatever.

Notwithstanding any rules relating to coasting trade which may be in force in Norway, ships of the High Contracting Parties going to or coming from the territories specified in Article 1 shall have the right to put into Norwegian ports on their outward or homeward voyage for the purpose of taking on board or disembarking passengers or cargo going to or coming from the said territories, or for any other purpose.

It is agreed that in every respect and especially with regard to exports, imports and transit traffic, the nationals of all the High Contracting Parties, their ships and goods shall not be subject to any charges or restrictions whatever which are not borne by the nationals, ships or goods which enjoy in Norway the treatment of the most favoured nation; Norwegian natiolals, ships or goods being for this purpose assimilated to those of the other High Contracting Parties, and not reated more favourably in any respect.

No charge or restriction shall be imposed on the exportation of any goods to the territories of any of the Contracting Powers other or more onerous than on the exportation of similar goods to the territory of any other Contracting Power (including Norway) or to any other destination.

ARTICLE 4. All public wireless telegraphy stations established or to be established by, or with the authorisation of, the Norwegian Government within the territories referred to in Article 1 shall always be open on a footing of absolute equality to communications from ships of all fl gs and from nationals of the High Contracting Parties, under the conditions laid down in the Wireless Telegraphy Convention of July 5, 1912, or in the subsequent International Convention which may be concluded to replace it.

Subject to international obligations arising out of a state of war, owners of landed property shall always be at liberty to establish and use for their own purposes wireless telegraphy installations, which shall be free to communicate on private business with fi ed or moving wireless stations, including those on board ships and aircraft.

ARTICLE 5. The High Contracting Parties recognise the utility of establishing an international meteorological station in the territories specified in Article 1, the organisation of which shall form the subject of a subsequent Convention.

Convensions shall also be concluded laying down the conditions under which scientific investigations may be conducted in the said territories.

ARTICLE 6. Subject to the provisions of the present Article, acquired rights of nationals of the High Contracting Parties shall be recognised.

Claims arising from taking possession or from occupation of land before the signature of the present Treaty shall be dealt with in accordance with the Annex hereto, which will have the same force and effect as the present Treaty.

ARTICLE 7. With regard to methods of acquisition, enjoyment and exercise of the right of owner ship of property, including mineral rights, in the territories specified in Article 1, Norway undertakes to grant to all nationals of the High Contracting Parties treatment based on complete equality and in confi mity with the stipulations of the present Treaty.

Expropriation may be resorted to only on grounds of public utility and on payment of proper compensation.

ARTICLE 8. Norway undertakes to provide for the territories specified in Article 1 mining regulations which, especially from the point of view of imposts, taxes or charges of any kind, and of general or particular labour conditions, shall exclude all privileges, monopolies or favours for the benefit of the State or of the nationals of any one of the High Contracting Parties, including Norway, and shall guarantee to the paid staff of all categories the remuneration and protection necessary for their physical, moral and intellectual welfare.

Taxes, dues and duties levied shall be devoted exclusively to the said territories and shall not exceed what is required for the object in view.

So far, particularly, as the exportation of minerals is concerned, the Norwegian Government shall have the right to levy an export duty which shall not exceed 1 % of the maximum value of the minerals exported up to 100.000 tons, and beyond that quantity the duty will be proportionately diminished. The value shall be fi ed at the end of the navigation season by calculating the average free on board price obtained.

Three months before the date fi ed for their coming into force, the draft mining regulations shall be communicated by the Norwegian Government to the other Contracting Powers. If during this period one or more of the said Powers propose to modify these regulations before they are applied, such proposals shall be communicated by the Norwegian Government to the other Contracting Powers in order that they may be submitted to examination and the decision of a Commission composed of one representative of each of the said Powers. This Commission shall meet at the invitation of the Norwegian Government and shall come to a decision within a period of three months from the date of its first meeting. Its decisions shall be taken by a majority.

ARTICLE 9. Subject to the rights and duties resulting from the admission of Norway to the League of Nations, Norway undertakes not to create nor to allow the establishment of any naval base in the territories specified in Article 1 and not to construct any fortific tion in the said territories, which may never be used for warlike purposes.

ARTICLE 10. Until the recognition by the High Contracting Parties of a Russian Government shall permit Russia to adhere to the present Treaty, Russian nationals and companies shall enjoy the same rights as nationals of the High Contracting Parties.

Claims in the territories specified in Article 1 which they may have to put forward shall be presented under the conditions laid down in the present Treaty (Article 6 and Annex) through the intermediary of the Danish Government, who declare their willingness to lend their good offices or this purpose.

The present Treaty, of which the French and English texts are both authentic, shall be ratified

Ratific tions shall be deposited at Paris as soon as possible.

Powers of which the seat of the Government is outside Europe may confine their action to informing the Government of the French Republic, through their diplomatic representative at Paris, that their ratific tion has been given, and in this case, they shall transmit the instrument as soon as possible.

The present Treaty will come into force, in so far as the stipulations of Article 8 are concerned, from the date of its ratific - tion by all the signatory Powers; and in all other respects on the same date as the mining regulations provided for in that article.

Third Powers will be invited by the Government of the French Republic to adhere to the present Treaty duly ratified This adhesion shall be effected by a communication addressed to the French Government, which will undertake to notify the other Contracting Parties.

In witness whereof the abovenamed Plenipotentiaires have signed the present Treaty.

Done at Paris, the ninth day of February, 1920, in duplicate, one copy to be transmitted to the Government of His Majesty the King of Norway, and one deposited in the archives of the French Republic; authenticated copies will be transmitted to the other Signatory Powers.

Administration

The administration of Svalbard is subject to the relevant ministries. For reasons of coordination they may obtain statements from the Inter Ministerial Committee on Polar Affairs, where the justice minister is chairman.

The State's main representative on Svalbard is the District Governor who is approximately equivalent to a County Governor on the mainland, is administratively attached to the Justice Ministry from 1st July 1953. He represents the police authorities and as the judicial authority the District Governor is subject to Tromsø municipal court.

The Superintendent of Mines ensures that the Royal Resolution on Mines is followed. Other State representatives are the priest, the telegraph manager and the airport controller.

Rescue Service

The District Governor of Svalbard leads all rescue operations in the archipelago.

The District Governor of Svalbard has responsibility for planning, leading and coordinating the rescue service on Svalbard under the overall management of the Rescue Coordination Centre of Northern Norway. The police force personnel perform staff services in the local rescue centre (LRS Svalbard) and run the operational management and coordination of the actions in the field

The rescue service on Svalbard is part of the Norwegian rescue service and is organised in the same way as on mainland Norway. It relies on volunteer efforts and Longyearbyen Red Cross provides a significant part of this. Public agencies and private companies also have material and personnel resources of great importance for the rescue service. In essence LRS Svalbard has at its disposal excellent materials, equipment and skilled crews.

The Governor also oversees the ambulance service with helicopters on the archipelago and the surrounding sea areas.

The District Governor's emergency resources

The District Governor of Svalbard has entered into a contract with Airlift AS for the operation of two rescue helicopters. The helicopters are of the Eurocopter Super Puma AWSAR – AS 332 Ll and Eurocopter Dauphin AS365N2. Both helicopters are among the best equipped rescue helicopters. They are adapted to fly in severe cold, have a long-range, auto-hover, heat-seeking cameras and are also equipped for night flying Super Puma also has de-icing equipment.

The Governor also has at his disposal the service vessel MS «Nord Syssel» during the period May–December each year. Rana Ship Service owns the boat which is 71 m long, has high ice class; helicopter deck and operations room for action operational management.

In addition the District Governor has the following equipment:

- two tracked vehicles
- snowmobiles
- smaller inspection craft
- Service cabins and fuel depots for helicopter
- Communications equipment, including base stations that cover large parts of the busiest areas within the Svalbard
- rescue equipment and personal equipment for operations in the fiel
- preparedness equipment, oil spill protection equipment

Information for visitors to Svalbard and Jan Mayen

Text obtained from sysselmannen.no

Introduction

It is the duty of all persons visiting Svalbard to make themselves thoroughly familiar with the rules which apply to a stay on the island and to travel in the archipelago.

For further information see «Svalbardloven» and «Svalbardmiljøloven» and «Forskrift som gjelder for Svalbard» on sysselmanen.no.

Admittance of visitors

Neither a passport nor a visa is required for a visit to Svalbard1. Nor is it necessary to obtain a special permit. All persons visiting Svalbard must bring with them adequate equipment to be able to manage without help. Persons without the necessary equipment risk being denied entry. Svalbard is a customs and duty-free area.

1. The Norwegian Authorities do not require a visa for travel in Svalbard itself but where there is a visa requirement to Norge/Schengen, a visa is required if travelling via Norge/Schengen to or from Svalbard.

For further information see «Regulations on Expulsion, deportation of Persons from Svalbard» on sysselmannen.no

Registration

The District Governor of Svalbard is in charge of the rescue service and keeps a check on tourists and other visitors. All persons travelling outside the settlements should register at the District Governor's offic , and declare the route they intend to take and the estimated date of return. It is important to notify the District Governor upon return from a tour. The District Governor has a special registration form for visitors. The form may be obtained from the District Governor's office or from one of his officials t the airport.

For further information see «Turistforskriften» on sysselmanen.no

Reporting and insurance obligations

Administration area 10 (chart s. 28) is an area of central Spitsbergen where visitors can travel unaccompanied without reporting to the District Governor of Svalbard. When travelling outside the area contact must be made with the District Governor. It must be noted that the north side of Isfjorden and the south side of van Mijenfjorden are outside of Administration area 10 and therefore carries a reporting obligation.

The reporting obligation implies that intention of the tour must be submitted to the District Governor. Contact should be made well in advance of the proposed trip for information and applications to be exchanged. The forms should be completed and returned. The application shall contain the names of all participants, the type of equipment to be taken and also the route description. Only one form is required for a group travelling together.

For those planning a longer private trip or expedition on Svalbard/sailing to Svaqlbard:

If either planning a personal tour on the one hand outside Administration Area 10 or sailing to Svalbard there is a reporting and insurance obligation (see chart of administration areas on page 28). See also local regulations, special environmental regulations and safety conditions.

Svalbard's rules

The local travel company and the District Governor have prepared a set of «Svalbard Rules of Conduct». These describe how the authorities and travel the company require visitors to Svalbard should travel:

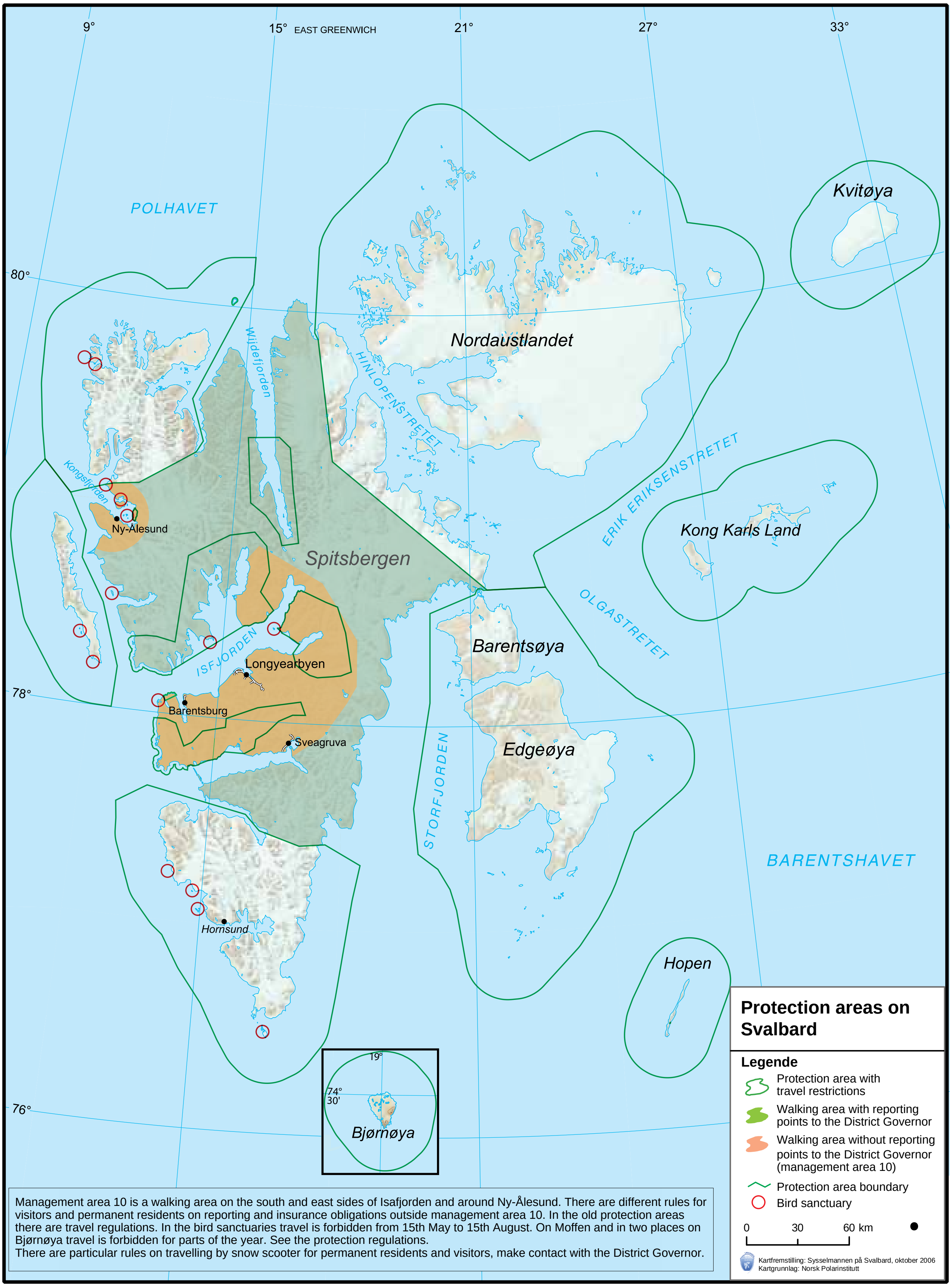
1. No rubbish to be disposed of or left in the environment.
2. No disturbance of animals or birds. Remember that you are here as guests
3. Pick no fl wers. Take care of everything
4. Do not destroy or remove cultural monuments. All traces of human activity from before 1946 are protected cultural monuments.
5. It is forbidden to seek out or attract polar bears. This can be extremely dangerous to life.
6. Do not leave settlements without a weapon and make sure that you know how to use it.
7. Show consideration to others.
8. Make contact with District Governor when you go on unaccompanied long walks. There is an obligation to report travel over large parts of Svalbard.
9. Familiarise yourself on the regulations on travel and activities on Svalbard.
10. In your and the environment's interest we recommend that the local travel company and the District Governor undertake the organisation of tours.

The tourist cannot be invisible but we would like you to try to be.

The cultural heritage

Cultural monuments in Svalbard belong to three main categories: relics of whaling in the 17th century, remains from Russian and Norwegian winter hunting and relics of the oldest mining activity in Svalbard. There are also traces of the hostilities connected with World War II. The regulations concerning the protection of cultural monuments are found in the booklet «Environmental Regulations for Svalbard and Jan Mayen». Violation of these regulations is a punishable offence. The most important regulations are as follows:

1. Certain permanent cultural monuments are protected, irrespective of age. This applies, for example, to graves, burial monuments, inscriptions in stone, etc.
2. Other permanent cultural monuments are protected if they predate 1900. These include buildings, trypots and house grounds from sites of earlier whaling activity, and buildings connected with hunting and mining with the fi ed technical equipment for such activities. Annexation signs from before 1926 are also protected.



Management area 10 is a walking area on the south and east sides of Isafjorden and around Ny-Ålesund. There are different rules for visitors and permanent residents on reporting and insurance obligations outside management area 10. In the old protection areas there are travel regulations. In the bird sanctuaries travel is forbidden from 15th May to 15th August. On Moffen and in two places on Bjørnøya travel is forbidden for parts of the year. See the protection regulations.
There are particular rules on travelling by snow scooter for permanent residents and visitors, make contact with the District Governor.

3. It is forbidden to damage or remove cultural monuments such as hunting devices, weapons, coins, household articles etc, when these may be assumed to predate 1900. Any find must be reported to the Governor. The Ministry of the Environment may protect all kinds of cultural monuments, irrespective of age. No one is allowed to carry out independent excavations or change the position of a cultural monument.
4. Numerous burial sites are to be found along the coast of the archipelago, as well as individual graves. These sites must be treated with respect.

Nature conservation

The natural environment on Svalbard is vulnerable. Plant and animal species alike are specially adapted to the arctic climate. Even small changes and encroachments may have a major impact on the delicate ecological balance. It is therefore important that visitors are thoroughly acquainted with the current regulations for travel and comply with them. A complete set of these rules is printed in the booklet «Environmental Regulations for Svalbard and Jan Mayen».

Seven national parks and six nature reserves, fifteen bird sanctuaries and one plant reserve have been established in Svalbard. No waste may be emptied or left behind in any of the protected areas. The flo a and fauna must be protected against injury and unnecessary disturbance. The use of cross-country vehicles is prohibited in the national parks and reserves. Nor are aircraft permitted to land in these areas without the permission of the Governor.

From 15 May to 15 August it is not permitted to move within a distance of 300 meters from the edge of the bird sanctuaries. All traffic is prohibited in the Moffen Nature Reserve from 15 May to 15 September, both dates inclusive. The ban also includes flying ver the reserve at a height of less than 500 metres.

All travel on Svalbard must take place in a manner which does not damage or unnecessarily disturb the natural environment. Special care should be exercised in the vicinity of lairs, breeding grounds and nesting sites. The use of motor vehicles is forbidden on thawed ground, and on ground covered by vegetation.

There are special regulations for economic and industrial activity on Svalbard. These regulations are printed in the «Regulations concerning Conservation of the Natural Environment of Svalbard» adopted by Royal Decree of 16 December 1983.

Hunting, trapping and fishing on Svalbard

Svalbard's animal life is totally protected but some species are open to hunting and fishing. It should be noted that visitors have more limitations regarding hunting and fishing than permanent dwellers. Hunting and fishing follow the annual calendar.

The purpose of management of Svalbard's fauna is to preserve as far as possible the natural animal stock. This implies that hunting and fishing shall not influence the stock in a negative manner. Hunting and fishing on Svalbard are regulated through Svalbardmiljøloven, Høstingforskriften and Røyeforskriften.

GENERAL

The hunter must have taken a hunting test to hunt in Svalbard. Persons from abroad who are permanent residents do not need to have taken the test where there is documentation that fulfil the conditions to undertake the corresponding hunting test in his own country. In addition, he must have a hunting license to hunt, which is obtainable from the District Governor.

BIG GAME HUNTING

To hunt for seal and reindeer the hunter must have valid and current test documentation in addition to passing the hunting test. Reindeer hunting is reserved for permanent residents but both visitors and permanent dwellers can hunt bearded seal and ring seal.

SMALL GAME HUNTING

Where it applies to grouse hunting, permanent dwellers can shoot up to ten grouse per day but visitors can only shoot a total of fi e per season. Both visitors and permanent residents can hunt guillemot, black guillemot, fulmar and short-billed goose without limit.

FOX HUNTING

Fox hunting is reserved for permanent residents.

FISHING

HUNTABLE SPECIES

Mammals	**Hunting period**
Ring seal (*Phoca hispida*)	01.02–20.03 20.05–30.11
Bearded seal (*Erignathus barbatus*)	01.02–27.04 05.06–30.11
Polar fox (*Alopex lagopus*)	01.11–15.03*
Svalbard reindeer (*Rangifer tarandus*)	15.08–20.09*
Birds	**Hunting period**
Fulmar (*Fulmarus glacialis*)	21.09–31.10
Short billed goose (*Anser brachyhynchus*)	28.08–31.10
Guillemot (*Uria lomvia*)	01.09–31.10
Svalbard ptarmigan (*Lagopus mutus*)	10.09–23.12
Black guillemot (*Cepphus grylle*)	01.09–31.10

*Applies to permanent residents

Permanent residents can fish with nets for Svalbard char in the sea and in water courses, in accordance with the char regulations. Both permanent residents and visitors can fish for char with rod or spoon-hook in freshwater outside nature reserves where the char regulations allow it and until the season's quota is full.

Fees for hunting and fishing, etc.

All hunters must pay fees for hunting and fishing on Svalbard. The price for a hunting license is the same for permanent residents and visitors. The income goes to Svalbard's environmental fund. Trappers can obtain a license without charge. Hunting seal is also permitted without charge.

Fishing license	
Net license season	NOK 150
Hand gear license season	Free
Hunting and trapping	
Small animals:	
Season license for persons under 18	Free
Season license for others	NOK 200
Fox hunting	
Season license for persons under 18	Free
Season license for others	NOK 200
Reindeer hunting	
Yearling	NOK 100*
Female reindeer/young animal	NOK 300*
Wild animals	NOK 300*

* Each animal

The fees are paid to Svalbard's Environmental Fund

Related documents:

Shooting and hunting restrictions near Longyearbyen (revised 2010)(PDF/Adobe Reader - file -1.8MB)

Hunting areas for reindeer on Svalbard (PDF/Adobe Reader - file – 2.4MB).

Map – Hunting areas for mountain fox on Nordenskiold Land (PDF/Adobe Reader - file –3.7 MB.

Hunting area on Svalbard (PDF/Adobe Reader - file – 533.8kB).

Char Regulations 2010 (PDF/Adobe Reader - file – 97.4).

Hunting licence for small wild animals – form 2010 (PDF/Adobe Reader - file – 25.0kB).

Touring

Since large parts of Svalbard are covered by glaciers, the possibilities of walking tours in the summer are limited. The most accessible area is Nordenskiöld Land, between Isfjorden and Van Mijenfjorden where there are few glaciers. Nevertheless, rivers gouged by water from the thaw may be wide and difficul to cross.

There are many good tracks for skiers in the late winter when the days are longer and there is enough snow. Care must always be taken on glaciers and also on the inland ice because there may be large crevices. For this reason glaciers should never be crossed alone. Ropes and other safety devices should always be deployed.

The mountains in northwest-Spitsbergen are generally steep and consist of hard gneiss and granite, and because of this the area is popular for mountain climbing. Similar mountains reaching up to more than 1700 metres are also found innermost in Wijdefjorden. In the central parts of Spitsbergen many of the mountains have horizontal layers of shales, sandstone and chalk and are consequently not suited for mountaineering.

Equipment

Svalbard is an arctic region even if the climate is milder there than in other places of the same latitude. Bivouac equipment must be of a quality which stands up to sudden changes in the weather. Warm windproof clothing is essential in summer as well as in winter.

Paraffin, methylated spirit, oil and other kinds of fuel can usually be obtained from Store Norske Spitsbergen Kulkompani. Inquiries should be made to the company in advance.

The equipment must include first aid kit and distress signal fl res. Survival suits are strongly recommended for sea voyages. The seawater temperature seldom rises above + 5 °C.

Weapons of self defence against aggressive polar bears may be brought to Svalbard, provided that the owner has a valid licence from his home country.

Polar bears

Polar bears exist in large numbers over the whole of Svalbard but particularly along the eastern and northern coasts. The bears are inquisitive and are attracted, for example, to tents. For this reason food should be placed well away from the campsite (100 m), and be visible from the door or opening of the tent. Trip ropes placed around the tent are a good way to detect the presence of polar bears in good time.

Hungry bears can be aggressive and a danger to humans and therefore a gun should always be carried in areas where there might be bears. The polar bear is totally protected and may be shot only in self-defence. Weapons are allowed as a main rule but not necessarily for protection against polar bears. Weapons of self defence against aggressive polar bears may be brought to Svalbard, provided that the owner has a valid licence from his home country. If a polar bear is shot the Governor should be notified as soon as is possible. The skin and carcass of shot polar bears are the property of the State.

Boat trips

For safety of individuals the District Governor recommends that the boat is equipped with AIS transmitter-receiver, VHF radio (initial velocity > 25 W), iridium telephone, a sufficien number of survival suits and a life raft.

Time

Svalbard keeps Norwegian time, i.e., Alpha-time (one hour ahead of UT(GMT)). Summer time begins and ends as on the mainland. The Soviet settlements keep Moscow time (3 hours ahead of UT (GMT)).

State owned cabins

Private and state-owned cabins exist throughout Svalbard. The state owned cabins serve as emergency quarters and shall be used only in emergency situations. These cabins are only for use by those permanently resident in Svalbard and, in special cases by visiting researchers. See table and chartlets on pages 31–35.

Rabies

Svalbard is a rabies-infected area. Dogs, foxes, polar bears, reindeer and seal may be infected. The disease can be spread to humans through a bite or saliva from an infected animal. Be especially cautious of wild animals that behave abnormally.

For further information, see «Innførsel og utførsel (imports and exports)» on sysselmanen.no

Customs

In accordance with the Svalbard Treaty, goods are customs free on Svalbard but dues must be paid when importing goods to the mainland.

No	Name	Chart No	Position N	Position E	Listed	Remarks	Type

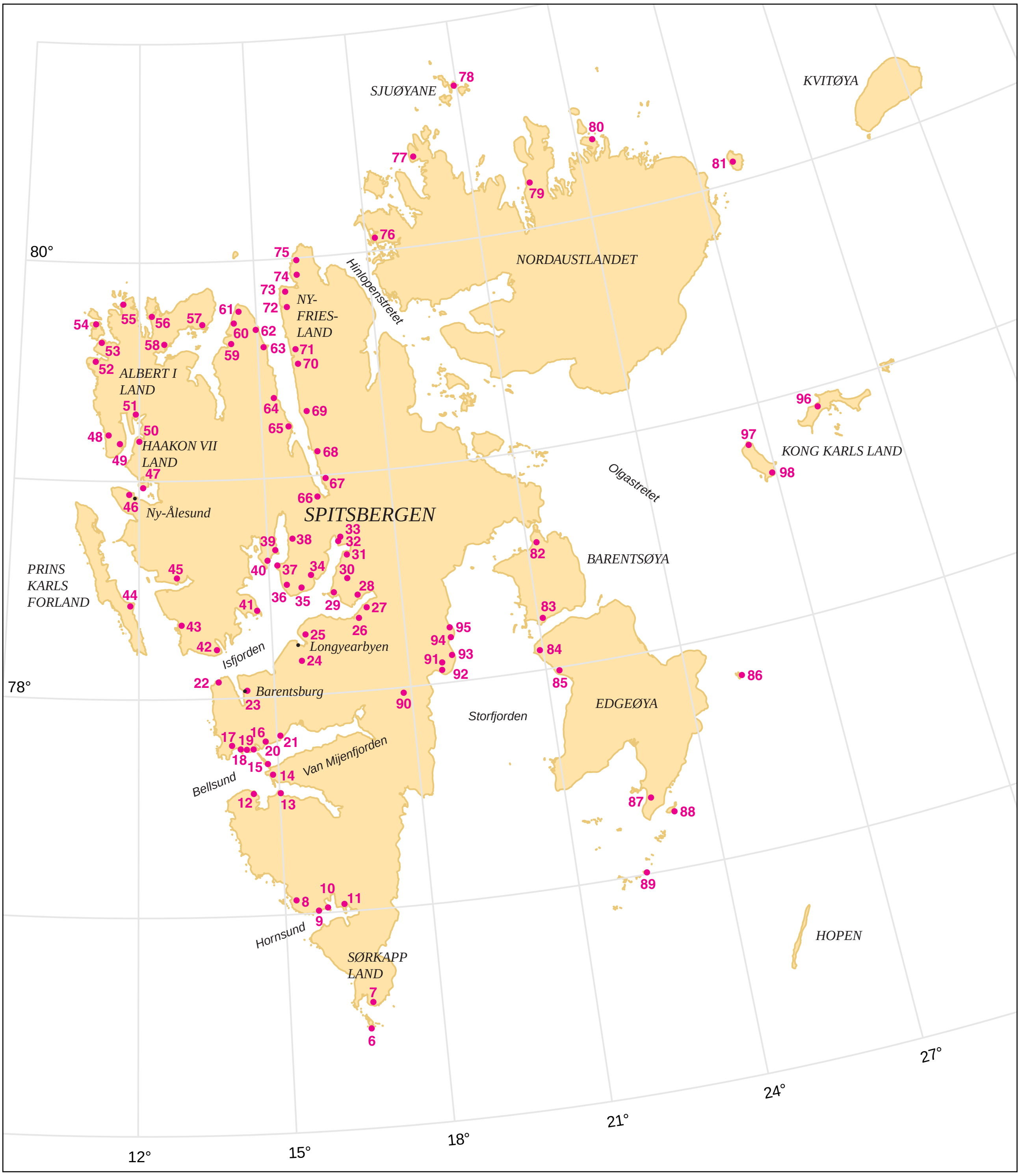
The list shows cabin positions with remarks and cabin type
WGS84

Bjørnøya

No	Name	Chart No	N	E	Listed	Remarks	Type
01	Teltvika	501	74°28,23’	18°45,69’		Kapp Dunér	
02	Tunheim	501	74°28,70’	19°12,65’		Kapp Bergesen	
03	Sagatun	501	74°27,02’	19°15,19’		Kapp Levin	
04	Russehamna	501	74°23,17’	19°10,33’		Lognvika	
05	Revdalen	501	74°21,07’	19°05,83’		Evjebukta	

Spitsbergen

No	Name	Chart No	N	E	Listed	Remarks	Type
06	Sørkappøya	527	76°28,71’	16°32,11’		Sørkappøya west	refuge cabin
07	Sørkapphytta	527	76°33,94’	16°35,11’		Sørkappland, Skjemmeneset	service cabin
08	Hyttevika	526	77°02,97’	15°08,61’	x	Hornsund, north off	refuge cabin
09	Konstantinovka	526	76°59,90’	15°32,45’		Isbjørnhamna, Hornsund, built 1965	refuge cabin
10	Gnålodden	526	77°01,00’	15°52,90’	x	Hornsund	refuge cabin
11	Treskelen	526	77°01,29’	16°11,13’		Adriabukta	refuge cabin
12	Calypsobyen 2	525	77°33,53’	14°30,85’	x	Recherchefjorden, residential hut	refuge cabin
13	Fleur de Lys	525	77°33,70’	15°00,23’		Van Keulenfjorden	service cabin
14	Midterhuken	525	77°38,70’	14°46,33’	x	Bellsund	refuge cabin
15	Slettbakkhytta	525	77°41,35’	14°47,25’		Akseløya, Louis Nielsen («Hiawatha»), trapping station (under liquidation)	refuge cabin
16	Hagruphuset, Steinuren	525	77°41,35’	14°47,17’	x	Russeltvedtodden	refuge cabin
17	Vårsolhytta	525	77°45,22’	14°23,32’	x	Vårsolbukta, LJFF	rented cabin
18	Camp Bell	525	77°45,52’	14°21,42’	x	Vårsolbukta	service cabin
19	Camp Millar (2)	525	77°45,38’	14°23,70’		Vårsolbukta	service cabin
			77°45,40’	14°23,44’		Vårsolbukta, disponeres av LJFF	rented cabin
20	Kapp Schollin	525	77°45,91’	14°39,54’		Louis Nielsen, user	trapping station
21	Clara Ville	525	77°47,39’	14°53,87’	x	Camp Morton, To-takter'n	rented cabin
	Michelsenhuset		77°47,43’	14°53,84’	x	Camp Morton	
22	Russekeila	524	78°04,80’	13°44,61’	x	Russekeila, Kapp Linné, LJFF	rented cabin
23	Finneset	523	78°02,65’	14°14,14’		Barentsburg	service cabin
24	Nordenskiöldhytta	523	78°09,44’	15°24,33’	x	Nordenskiöldfjellet, LRKH	rented cabin
25	Justitsen	523	78°14,98’	15°42,11’		Hiorthhamn	service cabin
26	Fredheim	523	78°21,20’	16°55,08’	x	Tempelfjorden, main house	service cabin
27	Selbu	523	78°23,44’	17°05,47’	x	Tempelfjorden, LJFF	rented cabin
28	Bjonahytta	523	78°23,75’	16°49,98’	x	Tempelfjorden, To-takter'n	rented cabin
29	Gipshuken	523	78°26,37’	16°23,61’	x	Gipshukodden	refuge cabin
30	Gipsdalen	523	78°31,97’	16°58,92’	x	Gipsdalen, To-takter'n	rented cabin
31	Brucebyen SMS	523	78°38,32’	16°43,98’	x	Nordenskiöldbukta	service cabin
32	Skottehytta	523	78°41,55’	16°37,06’	x	Petuniabukta, LJFF	rented cabin
33	Ebbahytta	523	78°42,33’	16°37,62’	x	Petuniabukta	refuge cabin
34	Skansbukta	523	78°31,56’	16°02,92’	x	Skansbukta, LJFF	rented cabin
35	Svenskhuset	523	78°28,74’	15°41,74’	x	Kapp Thordsen	refuge cabin
36	Hagahytta	523	78°29,35’	15°19,98’	x	Harald Soleim,	trapping station
37	Oxaashytta	523	78°34,57’	15°14,24’	x	Kapp Wijk, next Harald Solheim’s trapping station	
38	Tåkefjellhytta	523	78°42,86’	15°28,44’	x	Harald Soleim,	trapping station
39	Kapp Smith	523	78°39,18’	15°13,07’	x	Harald Soleim,	trapping station
40	Kapp Wærn	523	78°37,10’	14°57,89’	x	Harald Soleim,	trapping station



Cabins on Svalbard. The cabins stay open and are seldom supervised. Their condition is not known and they may fall into disrepair. Visitors are not permitted to use the cabins for overnight accommodation but they may be used for short stays only when there is an emergency requirement. The service cabins are always equipped with gas and firewood and are an important part of preparedness against hostilities. These cabins are locked. See also the table on pages 31–34 for the positions of cabins.

No	Name	Chart No	Position N	Position E	Listed	Remarks	Type
			The list shows cabin positions with remarks and cabin type WGS84				
41	Bohemanneset	523	78°22,92’	14°39,51’	x	Bohemanflya	refuge cabin
42	Trygghamna	524	78°13,34’	13°50,19’		Trygghamna	service cabin
43	Farmhamna	524	78°19,74’	12°50,05’		Trapping station	
44	Poolepynten	524	78°26,71’	11°53,43’		Poolepynten	service cabin
45	Gjertsenhytta	524	78°31,52’	12°51,46’		St. Jonsfjorden	refuge cabin
46	Ny-Ålesund hytte nr 7	522	78°56,42’	11°51,86’	x	SMS rent by Kings Bay	service cabin
47	Camp Mansfield	522	78°57.80’	12°02,80’	x	Blomstrandhalvøya, Velf. Ny-Ålesund	rented cabin
48	Laksebu	522	79°11,21’	11°10,06’	x	Mitrahalvøya,Velferden Ny-Ålesund	rented cabin
49	Haugenhytta	522	79°11.06’	11°38,95’	x	Krossfjorden, Velferden Ny-Ålesund	rented cabin
50	Camp Zoe	522	79°11,76’	11°54.90’	x	Krossfjorden, Velferden Ny-Ålesund	rented cabin
51	Lloyds Hotell	522	79°16,64’	11°55,24’	x	Möllerfjorden, Velferden Ny-Ålesund	rented cabin
52	Trinityhamna	521	79°33,52’	11°01.12’		Magdalenefjorden	service cabin
53	Bjørnhamna	521	79°38,45’	10°58,79’	x	Sørgattet	service cabin
54	Æøya	521	79°43,23’	10°55,47’	x	Danskegattet, Æøya	service cabin
55	Sallyhamn	521	79°49,00’	11°35,54’	x	Kapp William	service cabin
56	Raudfjordhytta	521	79°44,59’	12°11,94’	x	Raudfjorden, Bruceneset	refuge cabin
57	Villa Oxford	521	79°41,32’	13°36,12’	x	Worsleyhamna, Reinsdyrflya	refuge cabin
58	Texas Bar	521	79°36,89’	12°41,80’	x	Woodfjorden	refuge cabin
59	Mushamna	521	79°40,74’	14°12,13’		Woodfjorden	service cabin
60	Vårfluesjøen	521	79°43,49’	14°20,77’		Woodfjorden	refuge cabin
61	Gråhuken	521	79°47,27’	14°27,81’	x	Woodfjorden	refuge cabin
62	Lille Krypinn	507	79°43,20’	14°55,66’		Wijdefjorden west, Haavelsrud	refuge cabin
63	Elvetangen	507	79°36,45’	15°11,33’	x	Wijdefjorden west, not russehytta	refuge cabin
64	Villa Purpur	507	79°20,28’	15°28,16’	x	Wijdefjorden	refuge cabin
65	Krosspynthytta	507	79°12,34’	15°43,18’	x	Wijdefjorden	refuge cabin
66	Overgangshytta	507	78°54,32’	16°20,81’	x	Austfjorden, To-takter'n	rented cabin
67	Austbotnhytta	507	78°59,39’	16°22,61’	x	Austfjorden south	refuge cabin
68	Austfjordneset	507	79°07,15’	16°11,56’	x	Trapping station	service cabin
69	Flatøyrhytta	507	79°16,94’	15°58,21’	x	Wijdefjorden	refuge cabin
70	Villa Møen	507	79°28,92’	15°53,07’	x	Wijdefjorden	refuge cabin
71	Gletcherhytta	507	79°33,38’	15°51,27’	x	Wijdefjorden, Midtbreen	refuge cabin
72	Laksevågen	507	79°46,50’	15°39,46’	x	Vassfarbukta, Wijdefjorden northeast	refuge cabin
73	Bangenhukhytta	507	79°52,40’	15°42,28’	x	Bangenhuk	refuge cabin
74	Polheim	507	79°53,82’	16°01,03’		Mosselbukta	refuge cabin
75	Rekvika	507	79°59,56’	16°01,93’	x	Mosselhalvøya	refuge cabin

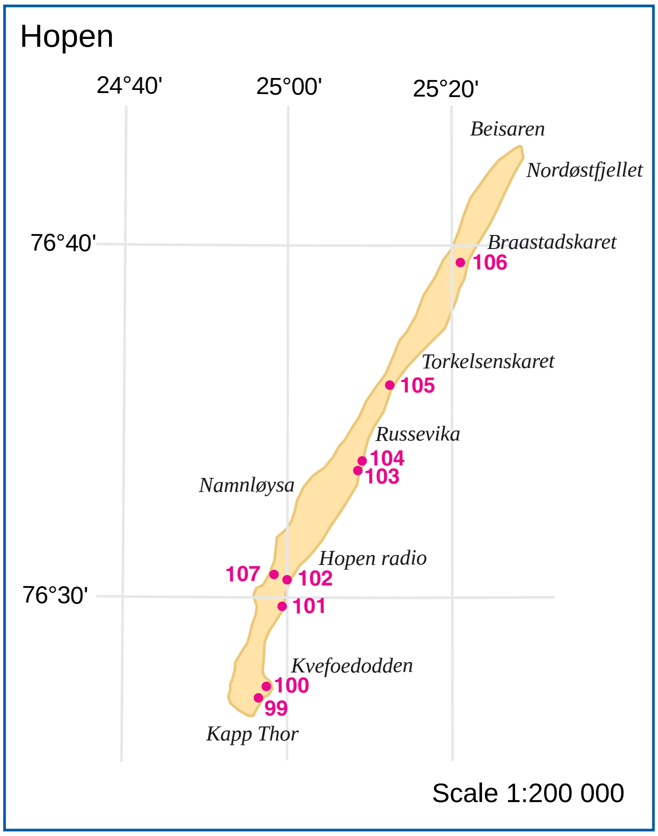
Nordaustlandet

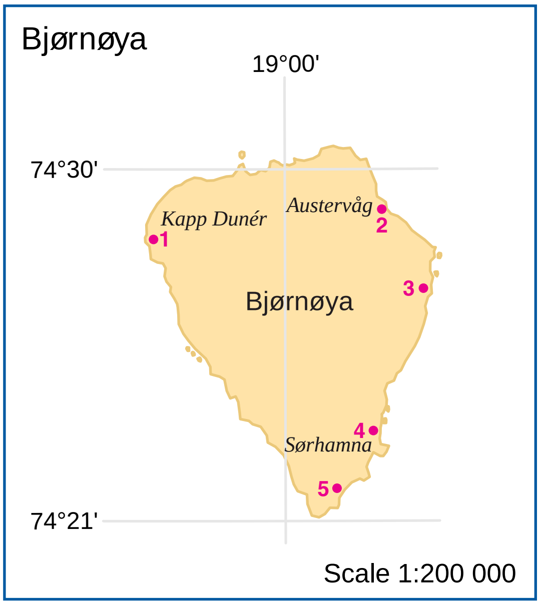
76	Kinnvika 2	537	80°03,02’	18°13,11’	x	Murchisonfjorden	service cabin
77	Oxfordhuset	507	80°23,24’	19°28,70’	x	Depotodden	refuge cabin
78	Isflakbukta	507	80°41,44’	20°51,54’	x	Phippsøya, Isflakbukta. NP	refuge cabin
79	Bluffvarden	507	80°13,09’	22°28,37’		Rijpfjorden	refuge cabin
80	Glenhalvøya	507	80°20,87’	24°26,66’	x	Glenhalvøya NE	refuge cabin
81	Storøya	507	80°05.38’	27°53,94’		Storøya W	refuge cabin

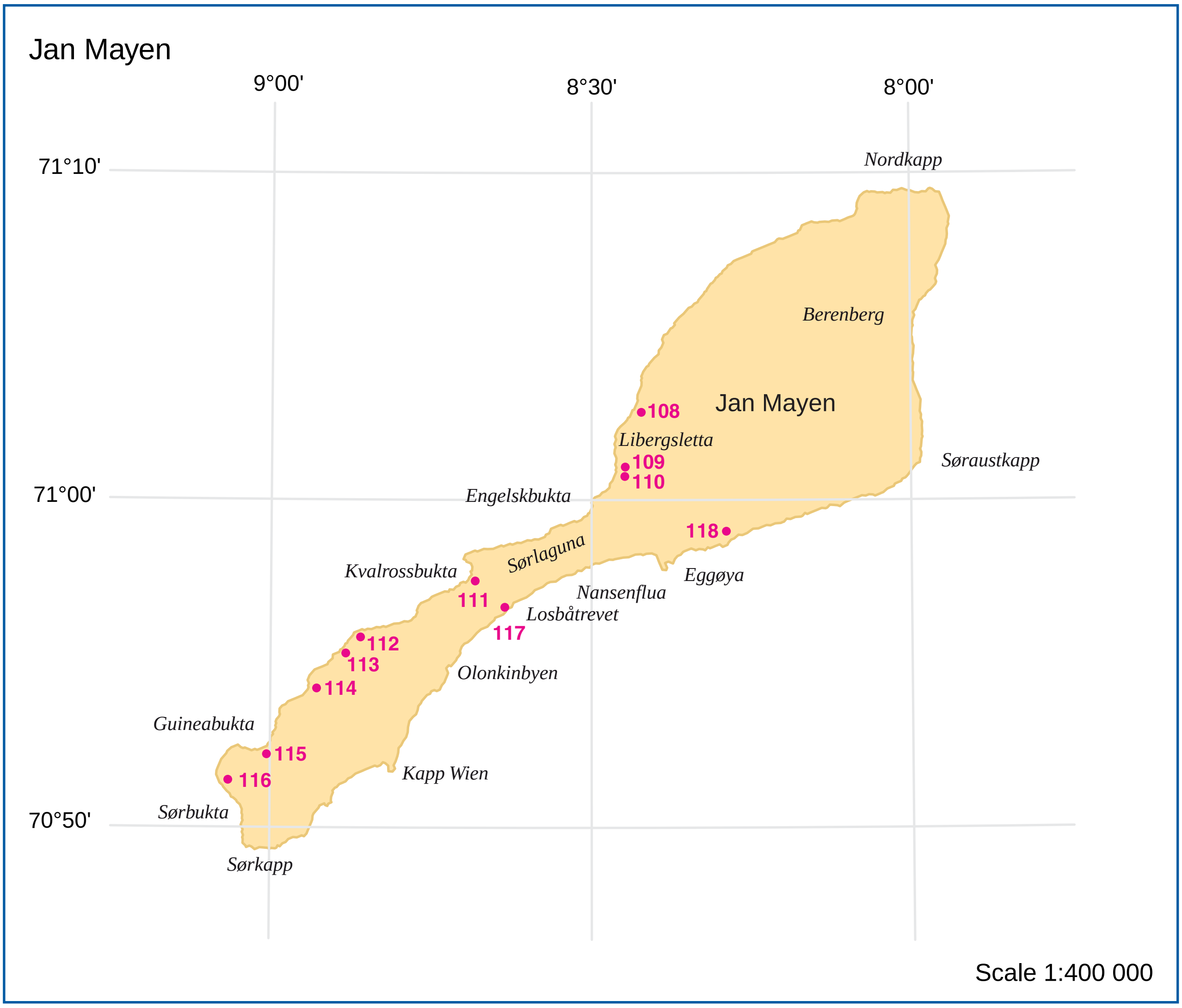
The list shows cabin positions with remarks and cabin type

WGS84

No	Name	Chart No	Position N	Position E	Listed	Remarks	Type
Barentsøya, Edgeøya med Storfjorden							
82	Heimland	533	78°35,13’	21°06,83’	x	Frankenhalvøya	refuge cabin
83	Würzburgerhytta	533	78°12,36’	21°03,81’		Freemansundet, Sundneset	service cabin
84	Kapp Lee, Gammelhytta	533	78°04,94’	20°49,10’	x	Dolerittneset	refuge cabin
85	Villa Disco (2)	505	77°57,84’	21°18,64’	x	Diskobukta, S, Villa Disco, N, Caltexhytta, NP	Refuge cabin
86	Ryke Yse	505	77°47,95’	25°06,63’		Ryke Yse	refuge cabin
87	Andréetangen	505	77°23,16’	22°34,50’	x	Edgeøya south	refuge cabin
88	Bjørneborg	505	77°16,62’	23°10,05’	x	Halvmåneøya	service cabin
89	Lurøya	505	76°59,69’	21°56,61’		Lurøya	refuge cabin
90	Utgår	505					
91	Myklagard	505	78°03,03’	18°40,23’		Agardhbukta	service cabin
92	Agardh	505	78°03,20’	18°42,02’		Agardhbukta, LJFF	rented cabin
93	Agardhfjellet	533	78°04,51	18°59,55’		Agardhfjellet	refuge cabin
94	Dunérhytta	533	78°09,78’	18°56,07’	x	Dunérbukta South, To-takter'n	rented cabin
95	Mohnbukta	505	78°15,15’	18°59,21’	x	Mohnbukta south, LJFF	rented cabin
Kong Karls Land							
96	Kapp Koburg	507	78°54,94’	28°07,76’	x	Kongsøya	service cabin
97	Kapp Petersen	534	78°49,45’	26°37,84’	x	Svenskøya	refuge cabin
98	Svenskøya	534	78°39,34’	26°46,59’		Svenskøya South	refuge cabin
Hopen							
99	Kofoedhytta	505	76°27,18’	24°58,16’	x	Koefoedodden, Hopen, DNMI	refuge cabin
100	Rudihytta/Sørhytta	505	76°27,43’	24°58,43’	x	Koefoedodden	refuge cabin
101	Camp Skakk	505	76°29,59’	24°59,38’	x	Egsetstranda	
102	Nilsebu	505	76°30,35’	25°00,20’	x	Husdalen	
103	Russehytta/Nordhytta	505	76°33,90’	25°09,25’	x	Hermansenskaret	refuge cabin
104	Bjørnebo	505	76°33,95’	25°09,30’	x	Hermansenskaret	refuge cabin
105	Nilubua	505	76°36,11’	25°13,05’		Thorkelsenskaret	refuge cabin
106	Beisarhytta	505	76°39,83’	25°23,10		Braastadskaret	refuge cabin
107	Johshytta	505	76°30,76’	24°58,94’		Bjørnstranda	refuge cabin
Jan Mayen			N	W			
108	Polheim	512	71°02,85’	08°25,60’	x	Vestbukta	
109	Gammelmetten	512	71°00,78’	08°27,59’		Stasjonsbukta	
110	Susabu	512	71°00,83’	08°27,55’		Stasjonsbukta, gapahuk	
111	Puppebu	512	70°58,14’	08°40,71’		Kvalrossbukta	
112	Olsbu	512	70°56,37’	08°48,29’	x	Tømmerbukta	
113	Vera	512	70°55,36’	08°53,94’		Sjuhollendarbukta	
114	Camp Margareth	512	70°54,27’	08°56,23’		Titeltbukta	
115	Guinea huken	512	70°53,12’	08°59,35’		Guineabukta, gapahuk	
116	Jørns hule	512	70°51,63’	09°04,41’		Sørbukta, Hybergodden	
117	Nikkebu	512	70°56,32’	08°40,47’		Helenesanden	
118	Ulla	512	70°59,52’	08°15,35’		Ullringsanden	


Hopen
24°40'
25°00'
25°20'
Beisaren
Nordøstfjellet
76°40'
Braastadskaret
106
Torkelsenskaret
105
Russevika
104
103
Namnløysa
Hopen radio
107
102
76°30'
101
Kvefoedodden
100
99
Kapp Thor
Scale 1:200 000


Bjørnøya
19°00'
74°30'
Kapp Dunér
Austervåg
2
1
3
Bjørnøya
4
Sørhamna
5
74°21'
Scale 1:200 000


Jan Mayen
9°00'
8°30'
8°00'
71°10'
Nordkapp
Berenberg
108
Jan Mayen
Libergsletta
109
110
Søraustkapp
71°00'
Engelskbukta
118
Sørlaguna
Kvalrossbukta
Eggøya
111
Nansenflua
Losbåtrevet
117
112
113
Olonkinbyen
114
Guineabukta
115
116
Kapp Wien
Sørbukta
70°50'
Sørkapp
Scale 1:400 000

Definition o Norway's areas

The Kingdom of Norway

The Kingdom of Norway consists of all the Norwegian land areas in the northern hemisphere out to the base lines along the individual land areas, plus the sea area within the baselines out to the outer limit at sea where the boundaries are laid down in accordance with Norwegian legislation based on the United Nations Sea Rights Convention 1982, and agreement with neighbouring States. The Norwegian land areas in the northern hemisphere are: Norway's mainland including Svalbard and Jan Mayen.

Norway's mainland

Norway's mainland covers the mainland which borders Sweden, Finland and Russia, together with the near coast islands, islets and skerries within the baseline. The baseline consists of straight line segments (geodetic lines) between 103 baseline points from the last point of the land boundary Norway/Russia to the outermost point on the land boundary Norway/Sweden. The baseline off Norway's mainland was determined by Royal Resolution 14th June 2002.

Svalbard

Svalbard is composed of the islands of Spitsbergen, Nordaustlanet, Barentsøya, Prins Karls Forland, Kvitsøya, Hopen, Bjørnøya and all other islands, islets and skerries between 10°E and 35°E east from Greenwich, and between 74°N and 81°N (the boundary of the so-called Svalbard case). In the Svalbard Treaty of 9th February 1920, Norway was awarded full custody and absolute sovereignty over Svalbard, with the boundaries as laid down according to the treaty. Svalbard is, in accordance with the legislation of 17th July 1925, a part of the Kingdom of Norway. The baselines around Svalbard were determined by Royal Resolution of 1st June 2001. They consist of straight line segments (geodetic lines) between 196 baseline points that encircle Hopen, Bjørnøya, Kong Karls Land, Kvitsøya and collectively Spitsbergen/Nordaustland/Edgeøya respectively.

Jan Mayen

Jan Mayen is an island in the northern Atlantic Ocean. It came under Norwegian State Authority on the 8th May 1929 and, in accordance with the legislation of the 27th February 1930 No. 2, became a part of the Kingdom of Norway. Jan Mayen is absolute Norwegian territory and belongs as such to the actual Norwegian mainland. In discussions occurs which include Jan Mayen as in the mainland, the following term can be used: Norway's mainland includes Jan Mayen. The baseline of Jan Mayen is formed by 42 points and was determined by Royal Resolution of 30th August 2002. It is composed mainly of straight line segments (geodetic lines) but along three stretches it coincides with the low water line.

Norway's Dependencies

Norway's Dependencies lie in Antarctica and consist of Bouvetøya, Droning Maud Land and Peter I Øy. Of these Bouvetøya is not included in the Antarctic Convention (The main Antarctic Treaty) that came into force 23rd June 1962 because the island is situated at about 54° south. The Antarctic Convention is limited to the areas south of 60° south. The dependencies were included under Norwegian Authority in accordance with the legislation of 27th February 1930 No. 3 Parliamentary Resolution of 23rd April 1931 and Royal Proclamation of 14th January 1939. The Dependencies are under Norwegian sovereignty but are not part of the Norwegian Kingdom.

The legislation of 27th June 2003 No. 57 on Norway's Territorial Waters and adjacent zones came into force for Bouvetøya on 1st April 2005. At the same time Bouvetøya's baseline was defined and follows the low water line in accordance with Article 5 in the treaty of the United Nations Sea Rights Convention of 1982. Statens kartverk Geodesy has extracted from the Foreign Office the coordinates of 31 marked points along Bouvetøya's coast line and on islets and skerries which are important in the calculation of the boundary of the sea territories. The starting point for this work has been the Norsk Polarinstitutt's chart at a scale of 1:20 000, printed at Statens kartverk in 1986.

Definition of boundaries

Norway's sea boundaries are calculated from the UNs Sea Rights Convention which was adopted on the 10th December 1982, and which came into force after ratific tion by 60 nations. The date of the implementation was 16th November 1994. Norway ratified the Sea Rights Co vention on 24 June 1996.

The sea boundaries that the Sea Rights Convention dealt with are based on the baseline along a nation's coast(s). It provides for two types of baseline:

- Straight baseline segments drawn between marked points on the coastal low water line, if the coast is irregular such as the Norwegian coast.
- Or a normal baseline if the coast does not have pronounced irregularities, a normal baseline follows the coast's low water line.

Norway has drawn straight lines off Norway's mainland and off the islands of Svalbard. Jan Mayen has mostly straight baseline segments but on three stretches there are normal baselines. Normal baselines are drawn off Bouvetøya but they are described by coordinates for the most projecting headlands and rocks.

The Sea rights Convention permits coastal states to draw a territorial boundary up to 12 nautical miles off the baseline. At present Norway has, as have approximately all coastal states, used a 12 nautical miles territorial boundary. A nation's legislative system applies absolutely to the full extent of the territorial boundary. Norway has proclaimed a so-called «adjacent zone». The Sea Rights Convention defines the area between territorial boundaries and a boundary marked by a distance of 24 nautical miles off the baseline as an «adjacent zone». In this zone the coastal state has limited authority, such as for the suppression of smuggling, wreck plundering and similar activities. Peaceful travel by other nation's vessels is permitted within a nation's economic zone. Within the set boundaries the rights of the coastal states are approximately limited to the exploitation of fisheries and mine al/petroleum deposits.

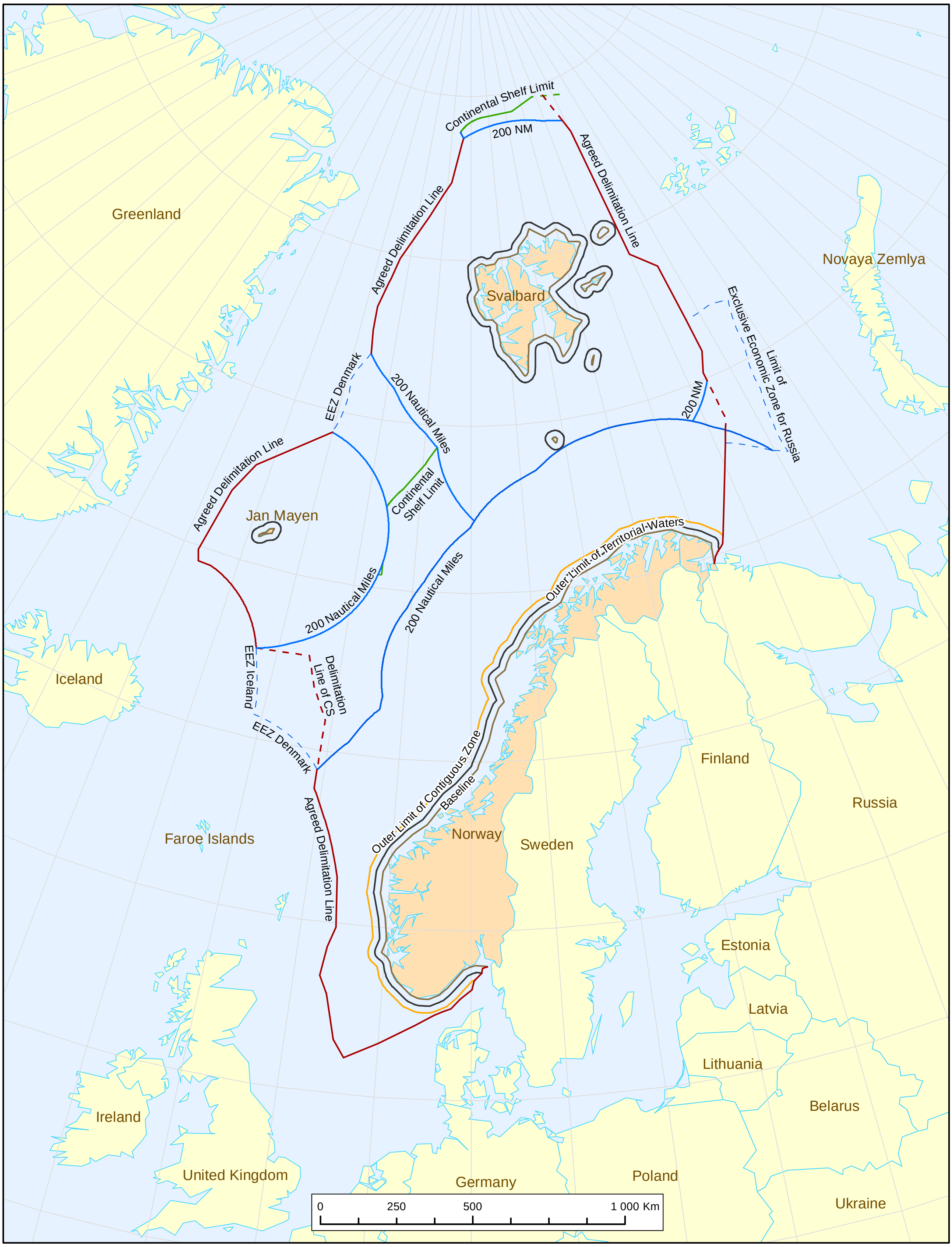


Chart showing the various boundary lines

200 n miles	Economic zone	Peaceful traffic by other nations' vessels is allowed within a nation's economic zone. The coastal State's rights in the economic zone are roughly limited to the exploitation of fisheries and mineral/petroleum deposits.
24 n miles	contiguous zone	In this zone the coastal state has limited authority, such as for the suppression of smuggling, wreck plundering and similar activities.
12 n miles	Territorial boundary	The nation's laws apply absolutely within the nations territorial boundaries.

Regulations for Norway's sea territory

Norwegian Sea territory, fishery limits and economic zon

Introduction

The starting point for calculating most national maritime boundaries is the baseline. This is a line that consists of straight lines between baseline points. These points mark the outermost positions of the mainland which fall dry at low water and which lie on the longest perpendicular to the main direction of the coast in the area.

The sea boundary with Sweden and its corresponding boundary with Russia are described in detail in «Norway's Treaties» Volume 1 from and including pages 306 to and including page 311 and in Volume III from and including page 199 to and including 201.

Norway's inner waters are the areas within the baseline. Norway's sea territory is the area between the baseline and the territorial boundary, and a line drawn parallel to the baseline at a distance of 12 nautical miles to seaward.

From 2003 the territorial boundary and the fishing limits coincide. The outer boundary of the economic zone are lines that lie at a distance of 200 nautical miles where the distance from neighbouring states is more than 400 nautical miles. Where the distance to the neighbouring state is less than 400 nautical miles, the boundary of the economic zone is an agreed medium line.

The baseline is drawn through baseline points listed below.

Treaty between the Kingdom of Norway and the Russian Federation concerning Maritime Delimitation and Cooperation in the Barents Sea and the Arctic Ocean

The Kingdom of Norway and the Russian Federation (hereinafter «The Parties»),

Desiring to maintain and strengthen the good neighbourly relations,

Bearing in mind the developments in the Arctic Ocean and the role of the Parties in this region,

Desiring to contribute to securing stability and strengthen the cooperation in the Barents Sea and the Arctic Ocean,

Referring to the provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 (hereinafter «the Convention»),

Referring to the Agreement between the Kingdom of Norway and the Russian Federation on the Maritime Delimitation in the Varangerfjord area of 11 July 2007 (hereinafter «the 2007 Agreement») and desiring to complete the maritime delimitation between the Parties,

Aware of the special economic significance of the living resources of the Barents Sea to Norway and the Russian Federation and to their coastal fishing communities and of the need to avoid economic dislocation in coastal regions whose inhabitants have habitually fished in the a ea,

Aware of the traditional Norwegian and Russian fisheries in the Barents Sea,

Recalling their primary interest and responsibility as coastal States for the conservation and rational management of the living resources of the Barents Sea and in the Arctic Ocean, in accordance with international law,

Underlining the importance of efficient and responsible management of their hydrocarbon resources,

Have agreed as follows:

Article 1

1. The maritime delimitation line between the Parties in the Barents Sea and the Arctic Ocean shall be defined as geodetic lines connecting points defined by the following coordinates:
   1. 70°16'28.95"N 32°04'23.00"E
      (This point corresponds to point 6 of the delimitation line as defined in the 2007 Ag eement.)
   2. 73°41'10.85"N 37°00'00.00"E
   3. 75°11'41.00"N 37°00'00.00"E
   4. 75°48'00.74"N 38°00'00.00"E
   5. 78°37'29.50"N 38°00'00.00"E
   6. 79°17'04.77"N 34°59'56.00"E
   7. 83°21'07.00"N 35°00'00.29"E
   8. 84°41'40.67"N 32°03'51.36"E

   The terminal point of the delimitation line is defined as the point of intersection of a geodetic line drawn through the points 7 and 8 and the geodetic line connecting the easternmost point of the outer limit of the continental shelf of Norway and the westernmost point of the outer limit of the continental shelf of the Russian Federation, as established in accordance with Article 76 and Annex II of the Convention.
2. The geographical coordinates of the points listed in paragraph 1 of this Article are defined in World Geodetic System 1984 (WGS84 (G1150, at epoch 2001.0)).
3. By way of illustration, the delimitation line and the points listed in paragraph 1 of this Article have been drawn on the schematic chart annexed to the present Treaty. In case of difference between the description of the line as provided for in this Article and the drawing of the line on the schematic chart, the description of the line in this Article shall prevail.

Article 2

Each Party shall abide by the maritime delimitation line as defined in Article 1 and shall not claim or exercise any sovereign rights or coastal State jurisdiction in maritime areas beyond this line.

Article 3

1. In the area east of the maritime delimitation line that lies within 200 nautical miles of the baselines from which the breadth of the territorial sea of mainland Norway is measured but beyond 200 nautical miles of the baselines from which the breadth of the territorial sea of the Russian Federation is measured (hereinafter «the Special Area»), the Russian Federation shall, from the day of the entry into force of the present Treaty, be entitled to exercise such sovereign rights and jurisdiction derived from exclusive economic zone jurisdiction that Norway would otherwise be entitled to exercise under international law.
2. To the extent that the Russian Federation exercises the sovereign rights or jurisdiction in the Special Area as provided for in this Article, such exercise of sovereign rights or jurisdiction derives from the agreement of the Parties and does not constitute an extension of its exclusive economic zone. To this end, the Russian Federation shall take the necessary steps to ensure that any exercise on its part of such sovereign rights or jurisdiction in the Special Area shall be so characterized in its relevant laws, regulations and charts.

Article 4

1. The fishing opportunities of either Party shall not be adversely affected by the conclusion of the present Treaty.
2. To this end, the Parties shall pursue close cooperation in the sphere of fisherie , with a view to maintain their existing respective shares of total allowable catch volumes and to ensure relative stability of their fishing activities for each of the stocks concerned.

3. The Parties shall apply the precautionary approach widely to conservation, management and exploitation of shared fish stocks, including straddling fish stocks, in order to protect the living marine resources and preserve the marine environment.
4. Except as provided for in this Article and in Annex I, nothing in this Treaty shall affect the application of agreements on fisheries coope ation between the Parties.

Article 5

1. If a hydrocarbon deposit extends across the delimitation line, the Parties shall apply the provisions in Annex II.
2. If the existence of a hydrocarbon deposit on the continental shelf of one of the Parties is established and the other Party is of the opinion that the said deposit extends to its continental shelf, the latter Party may notify the former Party and shall submit the data on which it bases its opinion.

If such an opinion is submitted, the Parties shall initiate discussions on the extent of the hydrocarbon deposit and the possibility for exploitation of the deposit as a unit. In the course of these discussions, the Party initiating them shall support its opinion with evidence from geophysical data and/or geological data, including any existing drilling data and both Parties shall make their best efforts to ensure that all relevant information is made available for the purposes of these discussions. If the hydrocarbon deposit extends to the continental shelf of each of the Parties and the deposit on the continental shelf of one Party can be exploited wholly or in part from the continental shelf of the other Party, or the exploitation of the hydrocarbon deposit on the continental shelf of one Party would affect the possibility of exploitation of the hydrocarbon deposit on the continental shelf of the other Party, agreement on the exploitation of the hydrocarbon deposit as a unit, including its apportionment between the Parties, shall be reached at the request of one of the Parties (hereinafter «the Unitisation Agreement») in accordance with Annex II.

3. Exploitation of any hydrocarbon deposit which extends to the continental shelf of the other Party may only begin as provided for in the Unitisation Agreement.
4. Any disagreement between the Parties concerning such deposits shall be resolved in accordance with Articles 2–4 of Annex II.

Article 6

The present Treaty shall not prejudice rights and obligations under other international treaties to which both the Kingdom of Norway and the Russian Federation are Parties, and which are in force at the date of the entry into force of the present Treaty.

Article 7

1. The Annexes to the present Treaty form an integral part of it. Unless expressly provided otherwise, a reference to this Treaty includes a reference to the Annexes.
2. Any amendments to the Annexes shall enter into force in the order and on the date provided for in the agreements introducing these amendments.

Article 8

This Treaty shall be subject to ratific tion and shall enter into force on the 30th day after the exchange of instruments of rati-fiction.

Done in duplicate in Murmansk on 15 September 2010, each in Norwegian and Russian languages, both texts being equally authentic.

Regulations on the baselines of the territorial sea around Svalbard

Decreed by Royal Resolution 1st June 2001, the Act of 17 May 1814 on The Kingdom of Norway's Constitution § 1 and Royal Resolution of 22nd February 1812 (reproduced in Cancelli-Promemoria of 25th February 1812). Amended 5th December 2003 No. 1425. (among other titles)

§ 1. The limit for the sea territory of Svalbard is drawn off and parallel to the straight line between the following points. Lines should not be drawn between the various islands that are named separately in the list.

Changed by Regulation of 5th December 2003 No. 1425

§ 2. The regulations apply from 1st July 2001. At the same time the Decree of 25th September 1970 No. 3390 on the border of the Norwegian sea territory of Svalbard is rescinded.

The translations are unofficial and only updated at the time of the translation. Should any doubt arise, the Norwegian text of the Act is valid and binding

Hopen

No.	North-coordinates deg. min. sec.	East-coordinates deg. min. sec.	Name
SV001	76° 27' 04,90″	24° 59' 17,10″	Skumskjer
SV002	76° 26' 35,59″	24° 56' 05,19″	Kapp Thor 1
SV003	76° 26' 35,73″	24° 55' 57,47″	Kapp Thor 2
SV004	76° 26' 37,33″	24° 55' 33,14″	Kapp Thor 3
SV005	76° 26' 49,71″	24° 54' 17,76″	Vesterodden 1
SV006	76° 26' 56,14"	24° 53' 43,35"	Vesterodden 2
SV007	76° 27' 00,55"	24° 53' 33,82"	Vesterodden 3
SV008	76° 27' 09,28"	24° 53' 36,20"	Vesterodden 4
SV009	76° 27' 31,48"	24° 53' 49,22"	Kvasstoppen SW
SV010	76° 30' 07,54"	24° 56' 20,46"	Askheimodden
SV011	76° 31' 30,71"	24° 59' 02,53"	Point N Bjørnstranda
SV012	76° 33' 03,09"	25° 02' 10,36"	Namnløysa
SV013	76° 41' 28,83"	25° 23' 23,42"	Lyngfjellet W
SV014	76° 42' 19,85"	25° 26' 05,78"	W of Flatsalen 1
SV015	76° 42' 21,46"	25° 26' 13,73"	W of Flatsalen 2
SV016	76° 42' 36,29"	25° 27' 40,58"	W of Nørdstefjellet
SV017	76° 42' 53,60"	25° 29' 26,17"	Beisaren 1
SV018	76° 42' 54,51"	25° 29' 40,98"	Beisaren 2
SV019	76° 42' 50,45"	25° 29' 51,02"	Beisaren 3
SV020	76° 42' 44,32"	25° 29' 56,09"	E of Nørdstefjellet 1
SV021	76° 42' 29,24"	25° 29' 58,93"	E of Nørdstefjellet 2
SV022	76° 42' 22,72"	25° 29' 52,18"	Easternmost point

Bjørnøya

SV023	74° 27' 57,14"	19° 16' 10,80"	Framnes S
SV024	74° 27' 31,47"	19° 16' 16,81"	Kapp Nordenskiöld
SV025	74° 26' 59,67"	19° 16' 06,18"	Kapp Levin
SV026	74° 26' 01,24"	19° 15' 22,93"	Brettingsdalen SE
SV027	74° 21' 30,57"	19° 10' 48,95"	Kapp Roalkvam
SV028	74° 20' 30,73"	19° 06' 12,73"	Kapp Kolthoff
SV029	74° 20' 04,37"	19° 03' 17,54"	Keilhauøya E
SV030	74° 20' 06,26"	19° 03' 09,29"	Keilhauøya W
SV031	74° 25' 37,28"	18° 48' 47,40"	Kapp Hanna
SV032	74° 28' 10,35"	18° 44' 21,11"	Utstein
SV033	74° 28' 50,90"	18° 45' 33,60"	Drangane
SV034	74° 29' 34,44"	18° 47' 06,18"	Snyta
SV035	74° 29' 46,15"	18° 48' 08,08"	Flisa
SV036	74° 29' 59,91"	18° 50' 10,49"	Taggen
SV037	74° 30' 31,77"	18° 55' 11,41"	Emmaholmane N
SV038	74° 30' 55,76"	19° 05' 11,70"	Nordkapp
SV039	74° 30' 50,54"	19° 06' 36,02"	Kapp Olsen W
SV040	74° 30' 47,02"	19° 07' 13,36"	Kapp Olsen E/Hav-hestholmen

No.	North-coordinates deg. min. sec.	East-coordinates deg. min. sec.	Name
SV041	74° 30' 29,80"	19° 09' 02,28"	Måkestauren
SV042	74° 30' 21,12"	19° 09' 33,24"	Kapp Forsberg
SV043	74° 27' 57,73"	19° 16' 10,24"	Framnes N

Kong Karls Land

SV044	78° 42' 44,06"	27° 03' 55,75"	Kapp Weissenfels
SV045	78° 40' 19,14"	26° 58' 40,41"	Kükenthalfjellet 1
SV046	78° 39' 40,25"	26° 56' 29,33"	Kükenthalfjellet 2
SV047	78° 38' 20,12"	26° 44' 53,05"	Kapp Hammerfest 1
SV048	78° 38' 18,39"	26° 44' 33,24"	Kapp Hammerfest 2
SV049	78° 38' 18,23"	26° 44' 19,06"	Kapp Hammerfest 3
SV050	78° 38' 19,67"	26° 44' 05,29"	Kapp Hammerfest 4
SV051	78° 40' 06,17"	26° 37' 52,49"	Antarcticøya
SV052	78° 43' 11,33"	26° 29' 16,33"	Kapp Walter
SV053	78° 47' 11,16"	26° 22' 11,06"	Malmgrenodden 1
SV054	78° 47' 48,47"	26° 21' 38,93"	Malmgrenodden 2
SV055	78° 48' 20,49"	26° 21' 35,59"	Malmgrenodden 3
SV056	78° 48' 32,05"	26° 21' 56,80"	Malmgrenodden 4
SV057	78° 48' 38,69"	26° 22' 24,21"	Malmgrenodden 5
SV058	78° 50' 15,73"	26° 30' 42,76"	Arnesenodden 1
SV059	78° 50' 17,73"	26° 31' 12,06"	Arnesenodden 2
SV060	78° 50' 18,77"	26° 31' 29,69"	Arnesenodden 3
SV061	78° 52' 31,25"	27° 49' 45,55"	Kennedyneset
SV062	78° 57' 57,28"	28° 22' 09,44"	Nordneset
SV063	78° 58' 03,18"	28° 23' 27,18"	Teistpynten
SV064	79° 01' 14,40"	30° 22' 12,43"	Kapp Brühl
SV065	79° 00' 48,45"	30° 24' 35,24"	Lågtunga 1
SV066	79° 00' 46,94"	30° 24' 41,41"	Lågtunga 2
SV067	79° 00' 20,33"	30° 25' 10,48"	Point S of Lågtunga 1
SV068	79° 00' 17,29"	30° 25' 08,08"	Point S of Lågtunga 2
SV069	78° 58' 08,06"	30° 14' 50,17"	Berrøya
SV070	78° 53' 34,26"	29° 38' 09,78"	Bremodden
SV071	78° 43' 26,37"	28° 39' 49,94"	Skerry S of Tirpitzøya
SV072	78° 48' 07,54"	28° 03' 54,92"	Skerry S of Kapp Altmann

Kvitøya

SV073	80° 07' 03,81"	31° 28' 24,59"	Satellitthøgda N
SV074	80° 08' 40,36"	31° 29' 39,61"	Kvitøya NW 1
SV075	80° 10' 07,36"	31° 33' 42,13"	Kvitøya NW 2
SV076	80° 11' 04,01"	31° 38' 10,28"	Kvitøya NW 3
SV077	80° 12' 59,71"	31° 52' 49,77"	Kvitøya NW 4
SV078	80° 13' 10,50"	31° 54' 34,20"	Kvitøya NW 5
SV079	80° 15' 23,34"	32° 04' 55,93"	Kvitøya NW 6 (on glacier)
SV080	80° 16' 56,68"	32° 18' 32,65"	Kvitøya NW 7 (on glacier)
SV081	80° 19' 00,00"	32° 51' 25,14"	Kvitøya N (on glacier)
SV082	80° 17' 55,79"	33° 07' 40,98"	Kvitøya NE 1 (on glacier)
SV083	80° 14' 29,44"	33° 26' 56,37"	Kvitøya NE 2 (on glacier)
SV084	80° 13' 45,28"	33° 30' 58,74"	Kræmerpynten
SV085	80° 11' 07,81"	33° 28' 56,89"	Kvitøya SE 1
SV086	80° 10' 26,80"	33° 27' 31,33"	Kvitøya SE 2
SV087	80° 08' 33,45"	33° 23' 05,41"	Hornodden 1
SV088	80° 08' 28,89"	33° 22' 48,88"	Hornodden 2
SV089	80° 01' 49,44"	31° 40' 00,05"	Lundquistskjera
SV090	80° 03' 17,03"	31° 30' 45,07"	W av Vindrabbane
SV091	80° 04' 50,89"	31° 25' 26,61"	NW Kvalross-beach
SV092	80° 05' 02,36"	31° 25' 20,31"	Andréeneset S
SV093	80° 05' 30,73"	31° 25' 26,22"	Andréeneset N
SV094	80° 06' 34,21"	31° 26' 13,13"	Satellitthøgda W
SV095	80° 06' 59,14"	31° 27' 27,13"	Satellitthøgda NW

Spitsbergen/Nordaustlandet/Edgeøya mv.

No.	North-coordinates deg. min. sec.	East-coordinates deg. min. sec.	Name
SV096	76° 26' 31,25"	16° 36' 52,36"	Sørkappfallet
SV097	76° 28' 08,57"	16° 29' 36,13"	Brattholmen
SV098	76° 32' 21,52"	16° 18' 16,08"	Svartskjeret
SV099	76° 43' 04,82"	15° 53' 31,34"	Brimingen
SV100	76° 52' 58,55"	15° 21' 02,76"	Utskjeret (S of Suf-folkpynten)
SV101	77° 03' 25,94"	14° 53' 48,24"	Dunøyane
SV102	77° 06' 54,92"	14° 35' 01,32"	Svartesteinane (SW of Krohgryggen)
SV103	77° 12' 35,22"	14° 13' 13,56"	Skerry SW av Olsholmen
SV104	77° 24' 59,44"	13° 51' 57,61"	Middagsskjera
SV105	77° 28' 59,19"	13° 51' 06,53"	Dunderholmen
SV106	77° 44' 11,87"	13° 42' 55,97"	Lågneset W
SV107	77° 53' 21,92"	13° 31' 11,87"	Islet NW of St. Hansholmane
SV108	78° 03' 04,06"	13° 33' 03,52"	Kapp Linné, Revleodden
SV109	78° 11' 50,38"	12° 58' 44,67"	Agskjera SV (Daud-mannsodden)
SV110	78° 12' 03,62"	12° 05' 35,20"	Salskjera S
SV111	78° 12' 12,75"	11° 57' 13,63"	Plankeholmane S
SV112	78° 13' 35,36"	11° 50' 44,50"	Skerry W of Gibsonpynten
SV113	78° 27' 02,72"	11° 02' 51,90"	Skerry by Kvervodden
SV114	78° 42' 23,52"	10° 36' 13,54"	Fidrasteinen
SV115	78° 46' 43,61"	10° 29' 54,69"	N off point Kapp Sietoe
SV116	78° 47' 07,67"	10° 29' 26,95"	Niggbukta S
SV117	78° 53' 37,31"	10° 27' 14,33"	Skerry W of Fuglehuken 2
SV118	78° 53' 48,29"	10° 27' 40,17"	Skerry W of Fuglehuken 1
SV119	79° 06' 41,33"	11° 08' 00,13"	Mitraskjeret
SV120	79° 20' 36,28"	10° 50' 21,70"	Skerry W of Tredjebreen
SV121	79° 31' 58,91"	10° 39' 00,99"	Skerry W of Hamburg-bukta 2
SV122	79° 32' 44,85"	10° 38' 38,64"	Skerry W of Hamburg-bukta 1
SV123	79° 46' 05,38"	10° 33' 48,74"	Ytterholmane N
SV124	79° 52' 18,48"	11° 15' 37,02"	Örnenøya
SV125	79° 54' 28,15"	11° 38' 47,11"	Kobbskjera N
SV126	79° 50' 30,59"	12° 23' 28,64"	Biskayarhuken
SV127	79° 52' 50,07"	13° 46' 14,14"	Velkomstpynten
SV128	80° 02' 08,97"	14° 28' 28,91"	Moffen 5
SV129	80° 02' 11,05"	14° 28' 40,49"	Moffen 4
SV130	80° 02' 14,96"	14° 29' 09,33"	Moffen 3
SV131	80° 02' 17,61"	14° 29' 50,47"	Moffen 2
SV132	80° 02' 18,90"	14° 30' 40,00"	Moffen 1
SV133	80° 03' 44,93"	16° 14' 23,64"	Verlegenhuken
SV134	80° 07' 43,40"	17° 42' 43,93"	Langgrunnodden2
SV135	80° 09' 33,79"	17° 47' 07,19"	Langgrunnodden 1
SV136	80° 18' 24,54"	18° 00' 16,08"	Skerry W of Parryfjellet
SV137	80° 20' 57,75"	18° 08' 17,10"	Skerry W of Purchasneset
SV138	80° 37' 42,14"	19° 44' 37,86"	Waldenøya
SV139	80° 49' 42,96"	20° 20' 12,96"	Rossøya 4
SV140	80° 49' 44,41"	20° 20' 32,29"	Rossøya 3 (northern-most point in Norway)
SV141	80° 49' 44,37"	20° 21' 01,29"	Rossøya 2
SV142	80° 49' 43,69"	20° 21' 08,14"	Rossøya 1
SV143	80° 42' 08,60"	21° 18' 02,86"	Posseneset, Martensøya
SV144	80° 30' 28,61"	22° 49' 31,29"	Skjær ved Kapp Platen
SV145	80° 39' 46,52"	24° 59' 53,08"	KarlXII-øya3
SV146	80° 39' 47,09"	25° 00' 03,09"	Karl XII-øya 2

No.	North-coordinates deg. min. sec.	East-coordinates deg. min. sec.	Name
SV147	80° 39' 47,17"	25° 00' 23,40"	Karl XII-øya 1
SV148	80° 27' 31,19"	26° 11' 46,73"	Foynøya
SV149	80° 12' 39,83"	26° 27' 16,55"	Austholmen
SV150	80° 08' 41,08"	27° 58' 44,45"	Norvargodden
SV151	80° 08' 22,64"	28° 02' 24,17"	Polarstarodden
SV152	80° 07' 01,12"	28° 13' 05,15"	Storøya SE 3
SV153	80° 06' 39,64"	28° 14' 58,72"	Storøya SE 2
SV154	80° 06' 32,50"	28° 15' 29,65"	Storøya SE 1
SV155	80° 04' 47,81"	28° 17' 29,21"	Diorittodden
SV156	79° 55' 12,12"	27° 34' 59,49"	Håkjerringa
SV157	79° 47' 26,54"	27° 09' 54,82"	Einstøingen
SV158	79° 42' 00,10"	26° 41' 08,23"	Isispynten
SV159	79° 27' 33,90"	25° 46' 49,25"	Bråsvellbreen 7 (on glacier)
SV160	79° 22' 06,21"	25° 22' 57,61"	Bråsvellbreen 6 (on glacier)
SV161	79° 12' 00,35"	24° 00' 05,89"	Bråsvellbreen 5 (on glacier)
SV162	78° 58' 39,58"	21° 48' 32,80"	Kiepertøya 1
SV163	78° 56' 23,12"	21° 44' 33,40"	Tobiesenøya
SV164	78° 50' 00,50"	21° 29' 41,96"	Kapp Payer
SV165	78° 34' 46,40"	21° 56' 31,64"	Kapp Ziehen
SV166	78° 12' 40,55"	23° 06' 04,66"	Kapp Brehm 2
SV167	78° 12' 31,75"	23° 06' 27,08"	Kapp Brehm 1
SV168	78° 09' 49,71"	23° 10' 15,00"	Kapp Pechuel Lösche
SV169	77° 56' 40,36"	24° 15' 43,16"	Stonebreen (on glacier)
SV170	77° 49' 23,68"	25° 09' 26,47"	Ryke Yseøyane 5
SV171	77° 48' 36,27"	25° 09' 20,02"	Ryke Yseøyane 4
SV172	77° 47' 33,32"	25° 08' 49,62"	Ryke Yseøyane 3
SV173	77° 47' 24,40"	25° 08' 41,36"	Ryke Yseøyane 2
SV174	77° 47' 08,67"	25° 07' 39,64"	Ryke Yseøyane 1
SV175	77° 34' 37,42"	23° 50' 01,70"	Boulder S of Kong Johans Bre
SV176	77° 17' 24,15"	23° 15' 53,42"	Halvmåneøya
SV177	77° 15' 09,26"	23° 10' 47,64"	Tennholmane E
SV178	77° 09' 17,85"	22° 55' 10,78"	Skerry S of Teisten
SV179	77° 02' 28,88"	22° 32' 41,05"	Vindholmen
SV180	76° 52' 04,57"	21° 47' 19,36"	Håøya 4
SV181	76° 51' 58,02"	21° 39' 54,80"	Håøya 3
SV182	76° 52' 03,37"	21° 39' 08,05"	Håøya 2
SV183	76° 52' 13,14"	21° 38' 17,33"	Håøya 1
SV184	77° 08' 56,80"	21° 27' 08,73"	Utsira
SV185	77° 17' 14,65"	21° 16' 17,47"	Kong Ludvigøyane W
SV186	77° 26' 32,89"	20° 51' 43,53"	Kvalpynten
SV187	77° 28' 31,50"	20° 39' 30,44"	Skerry NW of Kvalpynten
SV188	77° 35' 40,78"	19° 56' 03,81"	Storfloskjeret
SV189	77° 29' 50,61"	18° 13' 35,94"	Sporodden
SV190	77° 22' 07,27"	17° 33' 50,98"	Schönrockfjellet
SV191	77° 10' 49,62"	17° 24' 30,74"	Stepanovfjellet
SV192	76° 58' 06,11"	17° 17' 18,34"	Davislaguna
SV193	76° 42' 22,97"	17° 08' 45,86"	Skolthuken
SV194	76° 32' 51,61"	17° 02' 39,35"	Tresteinane SE
SV195	76° 27' 57,94"	16° 47' 37,76"	Flakskjeret
SV196	76° 27' 51,20"	16° 47' 08,67"	Flakskjeret S

The coordinates in the list refer to geodetic datum EUREF89. A straight line is understood to mean the shortest distance between two points (the geodetic line).

Regulations on the Norwegian sea territory of Jan Mayen

Established by Royal Resolution 30th August 2002 with legality in the King-dom of Norway's Constitution of 17th May 1814 and Royal Resolution of 22nd February 1812 (reproduced in Cancelli-Promemoria of 25th February 1812, submitted by the Ministry of Foreign Affairs

§ 1. The boundary for the Norwegian sea territory of Jan Mayen shall be calculated seaward from the following points:

§ 2. The boundary of the sea territory is drawn off and parallel to the low water line between the points JM4 and JM5, the points JM11 and JM12 and the points from and including JM26 to and including JM29.

The boundary of the sea territory shall then be drawn parallel to and off straight lines between the points from and including JM1, to and including JM4, the points from and including JM5, to and including JM11, the points from and including JM12, to and including JM26, the points from and including JM29 to and including JM41 and between the points JM41 and JM1.

The boundary of the sea territory shall also be calculated outwards from point JM42.

A straight is understood to mean the shortest distance between two points (the geodetic line).

§ 3. This regulation came into force 1st October 2002. At the same time the regulation on the implementation of legislation and the Norwegian fishing area, Jan Mayen, were repealed by Crown Prince Resolution of 30th June 1955, No. 3471.

The translations are unofficial and only updated at the time of the translation. Should any doubt arise, the Norwegian text of the Act is valid and binding

No.	North-coordinates deg. min. sec.	West-coordinates deg. min. sec.	Name
JM01	71° 09' 35,26"	07° 57' 09,83"	Nordkapp East
JM02	71° 09' 25,10"	07° 56' 45,62"	Fulmarfloget North
JM03	71° 08' 44,89"	07° 55' 43,00"	Austkapp
JM04	71° 06' 35,00"	07° 57' 23,00"	Taggodden
JM05	71° 01' 16,67"	07° 59' 10,18"	Søraustkapp North
JM06	71° 01' 08,70"	07° 59' 24,37"	Søraustkapp South
JM07	71° 00' 58,89"	07° 59' 55,12"	Vesle Sandbukta
JM08	71° 00' 47,58"	08° 00' 34,32"	Langlistupa South
JM09	71° 00' 17,96"	08° 02' 49,84"	Kapp Wohlgemuth
JM10	70° 59' 28,00"	08° 10' 37,00"	Presidentsteinen
JM11	70° 58' 00,00"	08° 23' 04,00"	Eggøya
JM12	70° 55' 43,00"	08° 41' 57,00"	Helenesanden
JM13	70° 55' 24,00"	08° 42' 17,00"	Olonkinbyen East
JM14	70° 51' 58,00"	08° 48' 00,00"	Måkeskjera East
JM15	70° 51' 34,23"	08° 49' 00,47"	Fyrtårnet
JM16	70° 49' 55,22"	08° 56' 34,66"	Kjeglene
JM17	70° 49' 31,04"	08° 59' 37,07"	Sørkapp
JM18	70° 49' 39,82"	09° 03' 45,98"	Sjuskjera
JM19	70° 51' 49,05"	09° 04' 38,86"	Hoybergodden
JM20	70° 51' 51,96"	09° 04' 38,63"	Hoybergskjeret
JM21	70° 52' 20,95"	09° 04' 07,37"	Trekantskjeret
JM22	70° 52' 34,71"	09° 03' 45,17"	Punktskjeret
JM23	70° 52' 41,70"	09° 03' 25,91"	Ytsteskjeret
JM24	70° 54' 47,59"	08° 56' 53,88"	Fugleskjera
JM25	70° 56' 03,00"	08° 52' 38,00"	KappRudsen
JM26	70° 56' 32,00"	08° 51' 53,00"	Lavastraumskjeret
JM27	70° 58' 41,00"	08° 41' 03,00"	Brielletårnet
JM28	71° 00' 11,00"	08° 29' 44,00"	Fugleberget
JM29	71° 02' 25,00"	08° 27' 01,00"	Krosspyntsletta North
JM30	71° 03' 53,00"	08° 25' 10,00"	Hudsonodden South

No.	North-coordinates deg. min. sec.	West-coordinates deg. min. sec.	Name
JM31	71° 04' 08,00"	08° 24' 49,00"	Hudsonodden North
JM32	71° 05' 08,00"	08° 22' 59,00"	Kapp Muyen
JM33	71° 06' 51,00"	08° 18' 23,00"	Vakta South
JM34	71° 07' 18,01"	08° 17' 19,14"	Vakta West
JM35	71° 07' 20,33"	08° 17' 10,10"	Vakta
JM36	71° 08' 36,83"	08° 09' 44,65"	Isneset
JM37	71° 09' 29,69"	08° 04' 19,18"	Koksneset West
JM38	71° 09' 31,23"	08° 04' 05,89"	Koksneset
JM39	71° 09' 32,15"	08° 03' 54,45"	Koksneset East
JM40	71° 09' 38,32"	07° 58' 08,42"	Nordskjeret
JM41	71° 09' 37,46"	07° 57' 47,29"	Nordkapp
JM42	70° 55' 31,00"	08° 39' 15,00"	Losbåten

The coordinates in the list refer to geodetic datum EUREF89.

The boundary line between Jan Mayen and Greenland

The boundary line points are described by the Expert Committee, which computes the coordinates, of The Hague Court on 13th July 1993. The Expert Committee report is dated 14th January 1994 and the given coordinates were accepted by Norway and Denmark.

(Trig point Norway/Denmark) (Greenland/Iceland) (the point from which the median between Norway and Iceland follows the 200 nautical miles boundary further 200 nautical miles eastwards up to a point that marks 200 nautical miles out from Jan Mayen's and Iceland's baselines).

The Norwegian boundary of the Jan Mayen triangle was concluded during negotiations in Reykjavik 6th and 7th October 1997.

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No.	North-coordinates deg. min. sec.	West-coordinates deg. min. sec.
1	74° 21' 46,9"	05° 00' 27,7"
2	72° 49' 22,2"	11° 28' 28,7"
3	71° 52' 50,8"	12° 46' 01,3"
4	69° 54' 34,4"	13° 37' 46,4"
5	69° 35' 00,0"	13° 16' 00,0"

isted coordinates refer to S84 geodetic datum

Land areas of Svalbard and Jan Mayen

The areas are calculated from chart data S250, scale 1:250 000. Datum EUREF 89 with geographic coordinates.

Glacier fronts are updated by satellite images 2002–2008. The area of Svalbard is changed every year by changes to the glacier fronts.

	Name	Km²	Glacier total
1	Spitsbergen	37 503	21 160
2	Nordaustlandet	14 320	10 897
3	Edgeøya	5 009	2 054
4	Barentsøya	1 279	558
5	Kvitøya	700	695
6	Prins Karls Forland	612	76
7	Kongsøya	191	9
8	Bjørnøya	178	
9	Svenskøya	137	4
10	Wilhelmøya	120	41
11	Lågøya	86	
12	Storøya	50	29
13	Hopen	46	
14	Wahlbergøya	46	2
15	Danskøya	41	
16	Søre Repøya	23	
17	Phippsøya	22	
18	Chermsideøya	20	1
19	Amsterdamøya	19	1
20	Parryøya	17	
21	Blomstrandhalvøya	16	
22	Von Otterøya	16	
23	Martensøya	15	
24	Abeløya	13	
25	Søre Russøya	8	
26	Sørkappøya	8	
27	Halvmåneøya	8	
28	Scoresbyøya	6	
29	Kükenthaløya	5	
30	Moffen	5	
	Smaller islands	148	1
	Total	60 667	35 528
	Jan Mayen	377	

Harbours and waterways legislation

The translations are unofficial and on y updated at the time of the translation. Should any doubt arise, the Norwegian text of the Act is valid and binding.

General

The Harbour Act of 17.04.2009 No. 19 applies to Svalbard through the regulation of 30.12. 2009 No.1846 on the use of harbours and fairways of Svalbard (Svalbard Regulations) as amended.

Svalbard regulations provide legislation on the use of the harbours and fairways of Svalbard, with adjustments arising from Regulations §§ 3 and 4, cf. Svalbard Regulations § 1, section1. Additionally, the regulations provide the harbour and fairways legislation, with any adjustments, cf. Svalbard Regulations § 1, section 2. This also embraces harbour and fairways regulations which do not apply to Svalbard. In Svalbard Regulations § 2, adjustments made in some of the regulations are on the basis of the special local conditions that prevail on Svalbard.

Responsibility and authority emanating from the Harbour Act is divided between Longyearbyen and the Norwegian State, cf. Svalbard Regulations §§ 3 and 4. Longyearbyen Local Com-munity Council has management responsibility and authority «within Longyearbyen planning area» corresponding to that of local authorities on the Norwegian mainland under the har-bours and fairways legislation. The Longyearbyen planning area extends 100 m out to sea, cf. Regulation of 28.06.2002 No. 650 on the impact assessment and appraisal of the plan areas on Svalbard § 1 with annex. The Norwegian State together with the Norwegian Coastal Administration (NCA) has in practice therefore, responsibility and authority for the harbours and waterways for approximately the whole of Svalbard, including the territorial waters and inner waters.

Activities that require authorisation under The Harbour Act

All activities that affect safety or accessibility of the fairways, require permission from Longyearbyen Local Authority or NCA, depending on where they should be implemented, cf. Harbours and Waterways legislation § 27, cf. Svalbard Regulations § § 3 and 4. This also includes measures on the land that may affect safety or accessibility to the adjacent waters. Measures that may be of importance to the Coast Administration installations, equipment or operations require permission from the NCA, regardless of location, cf. harbours and fairways legislation, § 28. In addition, it follows from the regulations of 03.12.2009 No. 1449 on the measures that require permission from the NCA for the application of specific measures, that applications always shall be handled by the NCA, regardless of where they will be implemented.

Examples on measures that require permission under the harbours and fairways legislation are (the list is not exhaustive):

- Construction of quays, jetties and breakwaters
- Mooring installations
- Laying-up of vessels
- Laying cables, pipes, etc, at sea
- Installation of overhead cables
- Dredging and dumping
- Other measures that may hinder or create difficulties to other users or essential traffic

Regulations

Longyearbyen Local Authority has determined the order of regulation of Longyearbyen in the regulation 28.07. 2009 No. 1031 on the use of and order in harbours, Longyearbyen, Svalbard. The Regulations include details on the use of the local authority's sea and land areas, mooring and berthing in the harbour, etc.

Maritime Security

International regulations

To prevent and stop acts of terrorism against international shipping, the United Nations Maritime Organisation, (IMO), adopted new international regulations on safety measures on board ships in international traffic and port facilities serving such ships, in December 2002. The regulations are included as a new chapter XI-2 of «The International Convention for the Safety of Life at Sea» (SOLAS Convention), and a corresponding code for the safety of ships and port terminals, «the International Ship & Port Facility Security Code» (ISPS Code).

The EU followed this retrospectively with a regulation on the strict security of ships and port facilities (Regulation 725/2004), a directive on strict protection of ports (Directive 2005/65), and its own inspection Regulation (884/2005, now changed to 324/2008) to secure the proper implementation of regulations in the member states.

The EU's Regulation 725/2004 is based on the IMO regulations. The purpose of the regulation has been to improve protection against terrorism, as well as a secure enforcement of IMO regulations within the EU member states. The purpose of the directive is to contribute to increased safety and terrorism preparedness in the parts of the port that are not covered by the ISPS Code and Regulation 725/2004.

Norway's implementation of the regulations

In Norway the responsibility for the implementation of the above regulations is shared by the Ministry of Fisheries and Coastal Affairs (MFCA) and the Ministry of Trade and Industry (MTI).

MFCA has delegated authority and responsibility in connection with the implementation of the regulations that apply to ports and port terminals to the NCA. MTI has delegated authority and responsibility in connection with the implementation of the regulations that apply on board ship to the Norwegian Maritime Directorate.

The above-mentioned international rules are effective in Norwegian legislation through the following regulations:

1. Regulation of the 3.7.2007 No. 825 on the protection of ports and port terminals against terrorist acts, etc.
2. Regulation of the 22.6.2004 No. 972 on safety and terrorist preparedness on board ships and mobile offshore drilling units, etc.

These regulations contain a number of regulatory requirements and concrete safety measures to be taken on board the following vessels on international voyages and in port facilities or ports serving such vessels:

- Passenger ships, including express passenger vessels
- Cargo ships, including express cargo vessels with gross tonnage of 500 and over, and
- Mobile offshore drilling units which are moved by their own propulsion machinery.

Implementation of the regulations on Svalbard

Chapter 2 in the Svalbard Regulations (see above) is concerned with harbour security, and in this chapter Regulation 725/2004, and therefore the ISPS Code, made applicable to Svalbard.

Unlike the mainland, however, Directive 2005/65 does not apply, and it is therefore only the port facilities that are covered by the port security regulations on Svalbard and not the entire harbour area. An assessment, however, will be made of whether the directive will also be implemented in Svalbard's regulations.

Sea traffic around Svalbard

The general sea traffic regulations arising from Chapter 1 of the regulation of 15th December 2009 on maritime traffic in certain waters apply also to Svalbard, cf. Svalbard Regulations § 21. Furthermore, in Chapter 9, sea traffic regulations include special rules on the use of the waters of Bellsund-Akselsun-det/Mariasundet-Van Mijenfjorden. There are requirements to obtain permission from the NCA – Troms and Finnmark regional office to use Akselsundet and Mariasundet. Additio-nally the regulations limit the passage of Akselsundet, where there are precautionary measures for meeting and passing. There is also a requirement relating to seabed clearance.

Position reporting

All vessels that carry passengers and vessels with a length on 24 m or more are subject to the requirements of position reporting to the NCA. Positions shall be reported when entering or leaving the waters around Svalbard, on arriving at or leaving the harbour, arrival or departure from an anchorage and every twelve hours when the vessel is underway. This does not apply to military vessels, including vessels under military command and vessels that have compulsory automatic tracking every 6 hour or more.

Vardø Vessel Traffic Centre (VTS) covers traffic control in the northern areas, from the Barents Sea to Lofoten with the aid of radar surveillance, ship reporting and the automatic ships identific tion system, AIS. The NCA's most northerly traffi centre is also responsible for monitoring all tankers and other risk traffic along the coast and sea area around Svalbard, with the exception of the NCA's four other traffic control centres in Southern Norway. Reporting is made to Vardø VTS which receives and processes reports.

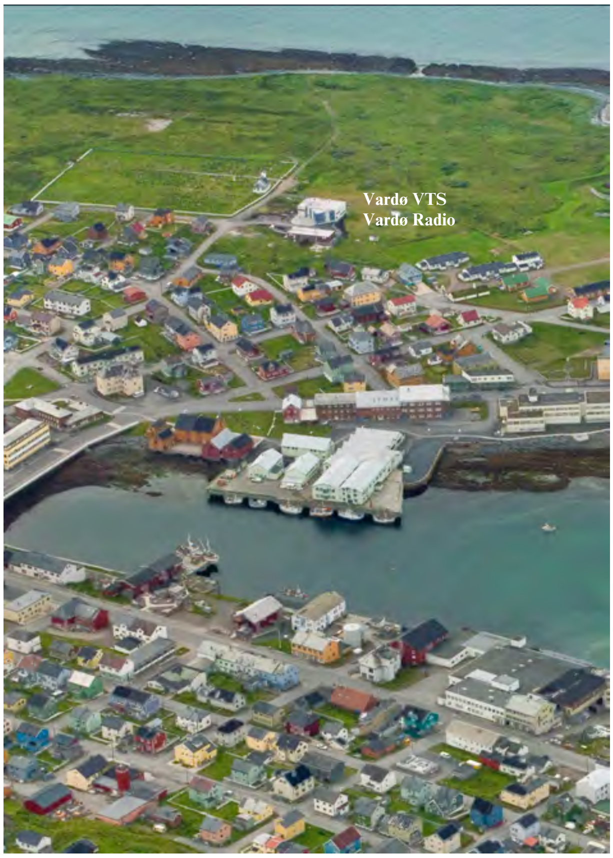


PHOTO: Eiliv Leren

Vardø VTS became operational on 1 January 2007. The VTS Centre, which has NOR VTS as it call name, covers traffic monitoring in the northern areas, from the Barents Sea to Lofoten by means of radar monitoring, ship reporting and AIS.

Vardø VTS also administers the state tugboat emergency preparedness scheme in Northern Norway. From 1 July 2008 the Vardø VTS Centre was made responsible for monitoring all tankers and other hazardous traffic along the entire coast and the sea area around Svalbard, with the exception of the areas of operation for the Norwegian Coastal Administration's other four VTS centres.

Assignments

- Provides sailing permit for vessels prior to entering the shipping control service and prior to departure from port.
- Informs and regulates vessel traffic
- Intervene to enforce Maritime Traffic as required
- Monitors vessel will immediately take contact for suspected engine problems, the wrong course or other abnormal conditions
- Summon, imposes and provide assistance to vessels if necessary
- Part of the NCA 1st line preparedness for acute pollution

Telephone:	+47 78 98 98
VHF:	Channel 71 (Melkøya)
Other coastal areas:	Other coastal areas: VHF Channel 16, or channels administered by Vardø or Bodø Radio. MMSI no: 002573550
Fax:	+47 78 98 98 99
Telephone no. Iridium:	881621419009
Email:	vts.nor@kystverket.no

Regulations relating to use of vessel traffic service areas and use of specific waters (Maritime Traffic Regulations)

Statutory authority: Laid down by the Ministry of Transport and Communications on 23 September 2015 pursuant to sections 13, 17 and 18, of Act no. 19 of 17 April 2009 relating to harbours and fairways, etc. (the Harbour Act), cf. Royal Decree of 17 December 2010 no. 1607.

Please note that this document is an English translation of the Norwegian regulation. Should there be any conflict between the Norwegian regulation and this translation, the wording in the Norwegian regulation will have precedence.

Chapter 1. Introductory provisions

1 (***Definitions***)

For the purposes of these regulations, the following definitions shall apply:

a) particularly hazardous or noxious cargo:
   - cargo as mentioned in chapter 19 of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)
   - cargo in pollution category X, cf. the International Convention for the Prevention of Pollution from Ships, 1973, as modified by Annex II of the Protocol of 1978 relating thereto (MARPOL). This also applies to cargoes that are provisionally categorised as such substances.
   - cargo that requires vessel type 1 or vessel type 2, cf. chapter 17 of the International Chemical Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) or the Code of Safe Practice for Solid Bulk Cargoes (BC Code)

b) hazardous or noxious cargo:
   - cargo defined as particularly hazardous or noxious in letter a), provided stricter rules have not been stipulated for these cargoes
   - oil cargoes as mentioned in MARPOL, Annex I. This also applies to cargoes that are provisionally categorised as such substances.
   - cargo that requires vessel type 3, cf. the IBC Code or BC Code
   - liquids with a flash point below 23 degrees Celsius

c) regular service: a series of voyages between the same two or more ports, either in accordance with a published timetable or with such regularity and frequency that the voyages are perceived as a systematic series of voyages

d) transit: that the vessel does not call to port, moor or anchor in the waters

e) position coordinates: position coordinates are given in accordance with the World Geodetic System 1984 (WGS-84)

f) daylight: when the centre of the sun is higher than 6 degrees below the horizon

g) escort vessel: a tugboat that is classified as an escort vessel

h) traffic separation scheme: a geographically defined area in the sea consisting of traffic lanes for traffic flows in opposite directions, separated by a separation zone

i) two-way fairway: a geographically defined area in the sea established for two-way traffic.

§ 2. (*Dispensations*)

The Norwegian Coastal Administration may, on application from the master of the vessel, grant dispensation from the provisions laid down in chapter 3 of these regulations when it is safe and there are special grounds for doing so.

§ 3. (*Exceptions from the Public Administration Act*)

Section 24 of the Public Administration Act relating to grounds and section 28 relating to appeals do not apply to individual decisions made by the vessel traffic service centres, provided the individual decision is not particularly burdensome or intrusive. This exception does not apply to individual decisions that vessels must use a tugboat.

§ 4. (*National coordinator for navigational warnings*)

The Norwegian Coastal Administration is the national coordinator for navigational warnings and must be notified of any hazards of significance to safe navigation or passage.

Chapter 2. Use of the waters in vessel traffic service areas (VTS areas)

§ 5. (*Vessel traffic service areas – VTS areas*)

The geographical areas regulated by the vessel traffic service centres – vessel traffic service (VTS) areas – are defined in the Norwegian Coastal Administration's electronic navigational charts, which are available online at "Kystinfo" and are part of these regulations:

a) Horten VTS area
b) Brevik VTS area
c) Kvitsøy VTS area
d) Fedje VTS area
e) Vardø VTS area

§ 6. (*Substantive scope*)

The provisions in this chapter apply to the following vessels:

a) vessels with a maximum length of 24 metres or more
b) vessels that push a vessel and vessels that are pushed, with a total combined length of 24 metres or more
c) vessels that tow an object with a length of 24 metres or more
d) vessels that tow one or more objects with a total combined length of the vessel and the objects of 35 metres or more
e) vessels that tow one or more objects with a total combined width of the vessel and the objects of 24 metres or more
f) vessels carrying particularly hazardous or noxious cargo.

The provisions in sections 7 and 11 also apply to fishing and hunting vessels when they are engaged in commercial fishing, hunting or seaweed and kelp trawling. Similarly, the provisions in section 8 apply when such vessels are engaged in commercial fishing, hunting or seaweed and kelp trawling in a traffic separation scheme.

§ 7. (*Communication in the VTS area*)

Communication between a vessel traffic service centre and a vessel must take place over the VTS centre's VHF working channels.

Communication between vessels concerning passing or other coordination of voyages must take place over the VTS centres' VHF working channels.

The master of the vessel or whoever is in command in his place must be able to communicate in a Scandinavian language or English if the vessel is not using a pilot.

Vessels under military command may communicate with the VTS centre via mobile telephone when necessary.

§ 8. (*Requirement for clearance*)

Use of the VTS area requires clearance from the vessel traffic service centre. Vessels pushing or towing a vessel that has clearance to use the VTS area do not need separate clearance.

For use of the Vardø VTS area, clearance is only required for vessels carrying hazardous or noxious cargo and vessels with a length greater than 150 metres.

For use of the Kvitsøy VTS area, clearance is not required for vessels with a length less than 100 metres if the vessel is only using the waters east of a line from the Toftøy beacon–Storholmen lantern–Plentinggrunnen lantern directly south to shore at Ryfylkekaien. This exception does not apply to vessels that are going to use the waters inside a straight line between Vardneset lantern and Holeneset (59° 20,28′ N 006°01,31′ E).

§ 9. (*Requests for clearance*)
Clearance must be requested via the VTS centre's VHF working channels before entrance into the VTS area or when leaving a dock or anchorage site and must include the vessel's international call sign, name and intended sailing route.

Requests for clearance from vessels with a length greater than 100 metres or vessels carrying hazardous or noxious cargo must be made at least one hour before expected departure from the port, mooring site or anchorage site.

The second paragraph does not apply to passenger vessels in regular service.

§ 10. (*Conditions for clearance*)
When necessary to ensure safe passage and safe use of the waters, conditions may be set for clearance, including:

a) that the voyage takes place at a specified time
b) that a specific route must be followed
c) that other vessels must be passed in a specified order
d) that a specified distance must be kept from other vessels
e) that a tugboat must be used
f) that machinery must be ready when anchoring
g) that the anchorage site must be left if strong winds are forecast.

§ 11. (*Duty to listen and duty of disclosure*)
Vessels that use a VTS area have a duty to listen to the VTS centre's VHF working channels.

Vessels that use a VTS area must inform the VTS centre about any matters that may be of significance to safe passage and efficient traffic flow, including that the vessel is departing from the dock or anchorage site or is making changes to its cleared sailing route.

Chapter 3. Navigation rules in specific waters

§ 12. (*Geographic scope*)
The provisions in chapter 3 apply in those specific waters indicated in the chapter.

VII Navigation rules in Svalbard

This is an excerpt from «Sea Traffic Regulations» which deal with Svalbard. Chapter's 3-8 which deal with the mainland, are omitted. For the regulation in its entirety, see https://lovdata.no:

§ 151. (*Requirements for vessels that use Akselsundet*)
Vessels that use Akselsundet must have their anchors ready for immediate use. Crew must be in position by the anchor.

§ 152. (*Ban on use of Akselsundet*)
Vessels with a length greater than 160 metres must not use the waters in Akselsundet east of Millarodden (77°44,05′ N 014°23,76′ E) when the speed of the current through the sound is greater than 1.5 knots or the wind speed is in excess of 14 metres per second.

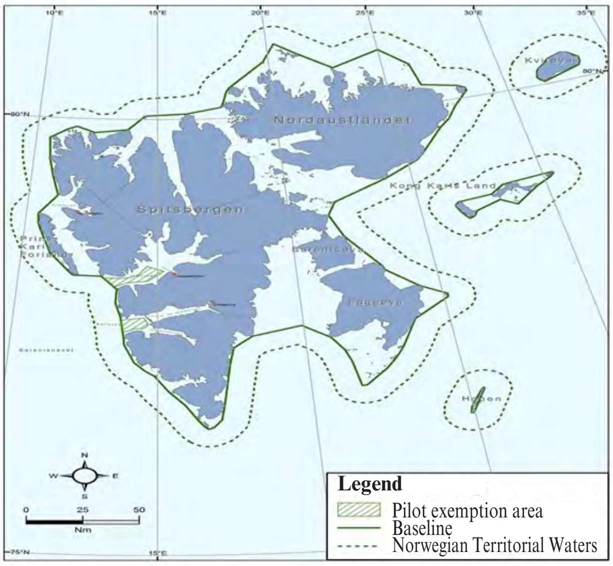
The waters mentioned in the first paragraph must not be used by vessels with a length greater than 250 metres or a draught greater than 15 metres.

§153. (*Visibility requirements in Akselsundet*)
Vessels with a length greater than 160 metres must not use the waters in Akselsundet east of Millarodden (77°44,05′ N 014°23,76′ E) when visibility is less than 1 nautical mile.

§154. (*Ban on passing in Akselsundet*)
Vessels with a length greater than 50 metres and vessels carrying hazardous or noxious cargo must not pass other vessels in Akselsundet.

In the instances mentioned in the first paragraph, vessels must maintain a distance of at least 0.5 nautical mile from other vessels sailing in the same direction.

§155. (*Obligation to use tugboats in Akselsundet*)
Vessels with a length greater than 160 metres must be assisted by two tugboats when passing Akselsundet, one of which must be attached before the vessel passes Akselsundet and throughout the entire passage through the sound. Vessels must not commence their approach before confirmation has been obtained that the position of the light buoys in the waters has been checked.



Pilotage service and compulsory pilotage in Svalbard

As of 1st July 2012 the Pilotage Act and regulations issued pursuant to the act were made applicable to Svalbard, thus introducing the state pilotage service, compulsory pilotage and PEC on Svalbard.

This follows from the regulations 25th June 2012 relating to the pilotage service on Svalbard.

Who are subject to compulsory pilotage

The same rules apply on Svalbard as for mainland Norway. I.e. vessels with at length of 70 meters or more and passenger vessels with a length of 50 meters or more are subject to compulsory pilotage when sailing in Svalbard internal waters. For vessels carrying dangerous cargo the length limits are shorter. See the Regulations on compulsory pilotage § 3 for the complete list of vessels subject to compulsory pilotage and exempt vessels.

The vessels listed in the compulsory pilotage regulations § 3 are subject to compulsory pilotage when navigating in Svalbard internal waters, i.e. on the landward side of the baselines (see map for illustration). However, specific areas in Bellsund and Isfjorden leading in to the pilot embarkations points off Akselsundet, Barentsburg and Longyearbyen are exempt, allowing vessels in transit to and from the pilot boarding are to approach the boarding are without having a pilot on board (see link to the right). The pilot boarding areas and exempt areas are set out in the regulations relating to the pilotage service on Svalbard § 2 first indent a) and defined geographically in annex 1 to the regulations.

The regulations on compulsory pilotage do not apply to Bjørnøya. The Norwegian Coastal Administration (NCA) is, however, empowered to require a vessel to use a pilot for a specific voyage, by individual decision.

Transitional measures are set out in the regulations relating to the pilotage service on Svalbard § 3. The requirement to use a pilot or to hold a pilot exemption certificate (PEC) has been introduced step by step:

1. Large vessels (150m<) to Svea from 1. July 2012
2. Large cruise vessels (150m<) from sailing season 2013
3. All vessels listed in the regulations on compulsory pilotage § 3 from sailing season 2014, except expedition cruise vessels
4. From 2015 no exemptions, i.e. all vessels listed in § 3 must use pilot or hold PEC

Vessels subject to compulsory pilotage as described above must, in accordance with the compulsory pilotage regulations § 4 either use a pilot or hold a PEC when navigating in Svalbard internal waters. A PEC may only be used by vessels with an all over length less than 150 meters.

A PEC is issued to captains/navigators that have experience from sailing in the fairways or areas covered by the PEC, after concluding a PEC examination. For more information about PEC and cadet PEC, see www.kystverket.no.

Practical information

The NCA is responsible for the pilotage service on Svalbard, in the same way as on the mainland. The pilotage service on Svalbard is organized under the Troms and Finnmark pilot master administration.

The NCA will have pilots in both Longyearbyen and on Svea, subject to need. The pilots of Longyearbyen cover vessel traffic to both Barentsburg, Longyearbyen and Ny-Ålesund, including the long distance cruise ships. Vessels arriving in and leaving Svalbard must embark/disembark the pilot at one of the pilot embarkation points. Vessels already in port and vessels with a pilot already on board can embark/disembark the pilot in port.

Ordering a pilot/pilot dispatch services

Pilot dispatch services are carried out from the dispatch service in Lødingen. As on the mainland, the vessel or agent must register in Safe Sea Net, notify the voyage and book pilots electronically. For more information on how to book a pilot, user manual for Safe Sea Net and contact information for the pilot dispatch service, se links to the left. To book a pilot there is a 24h prenotification requirement. However, due to the extra logistical challenges of Svalbard we kindly ask for prenotifications to be made as early as possible.

Pilot boarding areas on Svalbard

1. Isfjorden off Barentsburg:	N 78° 08′	Ø 014° 00′
2. Isfjorden off Longyearbyen:	N 78° 16′	Ø 015° 14′
3. Bellsund:	N 77° 41′	Ø 014° 25′

Areas within the baselines on Svalbard exempt from compulsory pilotage in accordance with § 2 first indent a) shall be determined by drawing straight lines between the geographical coordinates specified below:

Isfjorden

1. N 78° 06′ Ø 013° 22′
2. N 78° 08′ Ø 014° 00′
3. N 78° 16′ Ø 015° 14′
4. N 78° 18′ Ø 015° 10′
5. N 78° 12′ Ø 014° 10′
6. N 78° 08′ Ø 013° 14′
7. Tilbake til posisjon nr. 1.

Bellsund

1. N 77° 41′ Ø 014° 25′
2. N 77° 40′ Ø 014° 27′
3. N 77° 42′ Ø 014° 24′
4. N 77° 40′ Ø 013° 45′
5. Tilbake til posisjon nr. 1.

Norwegian preparedness against acute pollution

GENERAL PREPAREDNESS AND ACTIONS AGAINST ACUTE POLLUTION

What is acute pollution?

The legislation defines *acute pollution* as pollution of *significance*, which *occurs suddenly* and *is not permitted* under the provisions in or pursuant to the Pollution Control Legislation. What is considered pollution of significance must be assessed based on the potential for damage resulting from pollution in each case. Acute pollution is often caused accidentally but can also be caused deliberately.

Handling of acute pollution

When acute pollution occurs or an emergency situation arises with a danger of such pollution, it is often necessary to take action to prevent or limit damage that follows pollution. How quickly action is taken may be critical to the performance of these measures and thus the extent of the damages. For this reason, rules for notific tion of acute pollution have been adopted (see below). Moreover, a nationwide operational emergency of readiness has been established, consisting of private, municipal and state resources, to handle dangerous situations and sustained acute pollution. On Svalbard emergency preparedness is organised as a partnership between state and private enterprise.

When acute pollution threatens the environment, the Norwegian Coastal Administration (NCA) has a supervisory and operational responsibility to prevent and limit damage. This responsibility is safeguarded by ensuring that the polluter responsible or municipality takes appropriate measures when acute pollution occurs, or the NCA itself take steps to prevent damages while major pollution occurs. The NCA has a twenty-four hour service for receiving and monitoring reports about the danger of accrued pollution.

The NCA is also responsible for the prevention of accidents with shipping and take action where danger of acute pollution from ships has occurred, and in this manner may prevent pollution recurring.

Notification of acute pollution

Provisions for notific tion of acute pollution are given in the regulation of 9.7.1992 regarding notific tion of acute pollution or danger of acute pollution (Notific tion Requirements). Everyone has a duty to warn of acute pollution, and also about situations with a risk of acute pollution.

Organisations to be notified a e as follows:

- The fi e department shall be notified of acute pollution or danger of acute pollution from land-based activities. (See special regulations for Svalbard below.)
- The Joint Rescue Coordination Centre or nearest coast radio station shall be notified of acute pollution or danger of acute pollution from vessels.

When acute pollution or danger of acute pollution arises from operations on the continental shelf, The Petroleum Safety Authority shall be notified in accordance with specific regulations for this industry.

Private preparedness

Those responsible for operations which can lead to acute pollution have the main obligation to be prepared for action. The private response shall be conducted in accordance with the environmental risks associated with its own operations, and shall cover emergency incidents caused by its actions. The Climate and Pollution Agency has set special emergency requirements for operations that represent a significant risk of acute pollution, including petroleum activities, large tank farms, refinerie , and other large land-based industrial companies who handle substances dangerous to the environment. At Svalbard some private concerns have established an operational readiness as a result of demands from the Climate and Pollution Agency, namely Store Norske Spitsbergen Kullkompani (coal company) for Norwegian coal mining in Sveagruva, and tank installations with a capacity above 10 m^3.

For the petroleum activities on the Norwegian continental shelf, the operating companies have established a special response organization, The Norwegian Clean Seas Association For Operating Companies (NOFO). It is, on the operator's behalf, in charge for the operational readiness and implementation of damage limitation measures if an acute pollution situation arises.

Where shipping is involved, the government has not set specific requirements for this industry to have an operational emergency against acute pollution.

Local authority preparedness

According to the Pollution Control Act, the local authority has a duty to ensure the necessary preparedness for minor cases of acute pollution that may occur or cause damage within the municipality, and which not covered by private preparedness. The Climate and Pollution Agency has set special requirements for municipalities regarding planning and inter-municipal cooperation on preparedness.

State preparedness

The NCA is responsible for the operation and development of the State's preparedness against acute pollution, including the State action organisation. The government response is designed and dimensioned to take care of the bigger instances of acute pollution not covered by private or municipal capability. These events are usually where the responsible polluter is unknown or not capable of dealing with the pollution which in addition is more extensive than the local government preparedness is capable of dealing with. As a result of the shipping companies is not entitled to have their own operational readiness, the State's emergency response is designed to take care of acute pollution caused by shipping. The NCA has agreements with other authorities and organisations for cooperation and assistance in the event of acute pollution, including international agreements.

If the private or municipal emergency organisations cannot deal with the situation, the Norwegian Coastal Administration can, completely or partly, assume management of the operation. Private concerns and local authorities have an obligation to assist the State with their own emergency response resources at larger incidents where NCA is in charge.

The NCA is responsible for coordinating private, municipal and state emergency preparedness within a national system.

The Norwegian Coastal Administration's supervision of action against acute pollution

The Norwegian Coastal Administration has delegated authority under the Pollution Control Act and Svalbard Environmental Protection Act where there is acute pollution or danger of acute pollution. The Norwegian Coastal Administration's responsibility and authority also includes acute pollution on land. If an accidental spill can be treated by the responsible polluter or local authority, The NCA will supervise the management of the incident and the implementation of the attempts to limit environmental damage. If necessary The NCA can impose the implementation of specific, concrete measures, including monitoring and environmental investigations. Such authority can be delegated to the County Governor and the Governor of Svalbard in certain instances.

Refuge harbours' role in preparedness against acute pollution

The NCA's task in these detrimental incidents involving ships is in supervising, monitoring and providing advice to the master and owner, as well as initiating action to prevent and limit acute pollution. If the situation not handled in a secure and appropriate manner, the NCA may take necessary measures on behalf of the owner.

An important measure to avoid or limit damage resulting from any acute pollution is to move the ship to a refuge harbour. A refuge harbour is usually understood to consist of a place where a ship in distress may take action to stabilize the ship's condition, to ensure the safety of the ship and to protect life, health and the environment. In extreme situations it also allows a vessel to be controlled on the grounds of reducing the extent of pollution.

When the NCA should intervene, where the distressed vessel threatens maritime safety or represents a risk to the environment in Norwegian waters, is regulated through a national procedure developed in accordance with the requirements of the International Maritime Organization (IMO). The purpose of this procedure is to ensure that the decisions made and actions taken by the NCA in cooperation with other authorities regarding a possible use of a refuge harbour or beaching a vessel is the best suited to the current situation. The NCA's decisions in such situations will be taken in consultation with a range of local, regional and central authorities in accordance with the procedure. For the best possible preparation for situations in which a ship needs to be directed to refuge harbour, it is important that appropriate refuge harbour localities are identified in advance, assessed and closely evaluated on suitability for the purpose. Nautical and navigation conditions should be assessed, together with exposure to wind and current, environment vulnerability, and a number of other interests and possible conflicts of interest related to the area. Localities that on the basis of these assessments are regarded as suitable places of refuge are to be included in the NCA's work plan. This does not imply any form of restrictions on the use of the localities for other purposes.

The advantages of using a pre-evaluated locality when a ship in distress are obvious. If other localities must be used, for example, if the distance to nearest available harbour is too great, assessments must be made while the situation is acute. This can be very demanding because of time pressures, resulting in an increase in the extent of damage.

Preparedness and actions against acute pollution in Svalbard

Notification

The Governor of Svalbard should be warned if there is acute pollution or the danger of acute pollution on Svalbard, via one of the following telephone numbers:

- Watch telephone +47 79 02 1222
- Emergency number 112
- Emergency number 110 (only in Longyearbyen)

Responsibility and organization

The operational preparedness against acute pollution on Svalbard addressed by the Committee against acute pollution on Svalbard (UA Svalbard) and agreements are made between the partners. The Committee is chaired by the Governor. All the preparedness participants on Svalbard contribute to the overall readiness through this committee.

The District Governor has the operational responsibility for implementing action if those responsible for acute pollution cannot deal with it.

Agreement has been made between The Governor of Svalbard and the Norwegian Coastal Administration concerning coordination of action where acute oil pollution on Svalbard occurs. Under the agreement The Governor has an obligation to take action when there is a danger of or an occurrence of acute oil pollution within the territorial waters of Svalbard, with the exception of Bjørnøya. When oil pollution is of an extent that exceeds what The Governors could reasonably be expected to deal with, The District Governor shall ask the Norwegian Coastal Administration for assistance or to take over management of the action. Outside the territorial boundary and in the protection zone, except Bjørnøya, The Governor has a duty to act on behalf of the Norwegian Coastal Administration until it has assumed leadership. The Governor has a duty to assist the Norwegian Coastal Administration during operations on Bjørnøya and in the protection zone during operations.

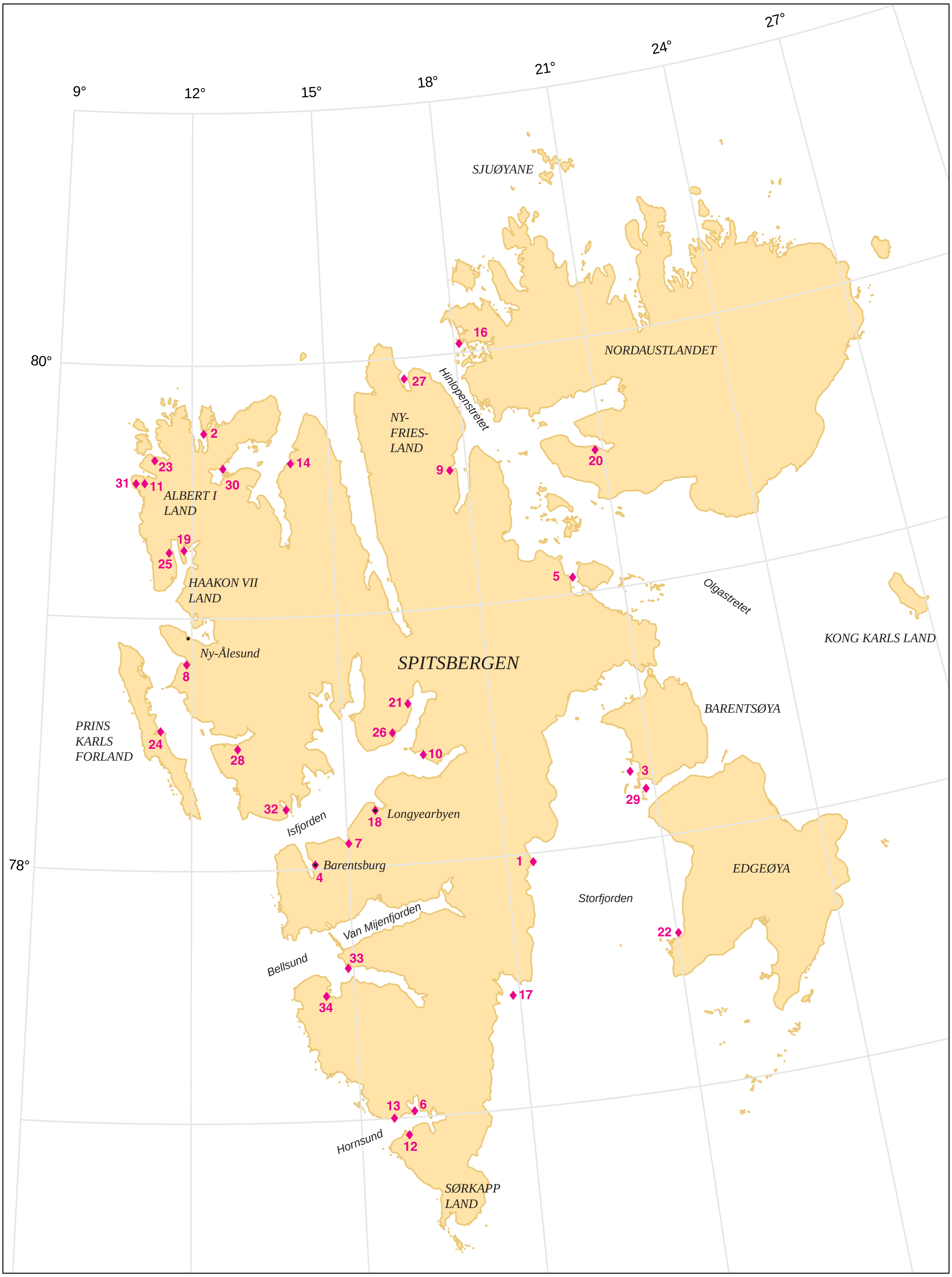
Equipment

Emergency equipment depots containing public and private equipment for recovering oil at sea, such as oil booms and skimming gear are placed in various locations on Svalbard. The largest depots are in Longyearbyen, Barentsburg, Ny-Ålesund and Sveagruva. In addition, this type of equipment can be found on board The Governor's vessel «Nord Syssel» as well as on the coastguard vessels operating in the area which are KV «Svalbard», KV «Harstad» KV «Barentshav» and KV «Sortland». Additional resources can be supplied from the mainland. Heavier equipment can be transported by sea, and at least 48 hours response time must be expected.

The Norwegian Coastal Administration is responsible for maintenance and upgrading of government equipment and the supply of any extra required personnel.

Places of refuge on Svalbard

Place of refuge locations that are selected on Svalbard (see chart on page 53 and table on page 54) is the result of an interdisciplinary work lead by the NCA, with assistance from The Governor on Svalbard, the Coast Guard, the Norwegian Polar Institute and the Norwegian Directorate For Nature Manage-



The chart shows selected places of refuge on Svalbard.

ment. The locations will, after a consultation process, be file in the Norwegian Coastal Administrations plan for preparedness against acute pollution. The Norwegian Coastal Administration reserves the right, to implement changes where places of refuge, for various reasons, are removed from the readiness plan or new locations inserted.

Refuge harbours on Svalbard

No	Name	Chart no	Position N	Position E	Maximum size LOA	Maximum size Draught
01	Agardhbukta, Storfjorden	505	78°01,38'	18°32,23' *	350 m	15 m
02	Alicehamna, Raudfjorden	521	79°45,11'	12°06,35'	350 m	15 m
03	Anderssonbukta, Storfjorden	533	78°16,52'	20°31,43'	350 m	15 m
04	Ankerhamna, Grønfjorden,	524	78°01,01'	14°15,02'	350 m	15 m
05	Binnebukta, Bjørnsundet	536	79°02,85'	20°06,15'	200 m	10 m
06	Burgerbukta, Hornsund	526	77°02,05'	15°57,38'	350 m	15 m
07	Colesbukta, Isfjorden	523	78°06,54'	14°56,59'	350 m	15 m
08	Engelskbukta, Forlandsundet	522	78°49,34'	11°52,50'	350 m	15 m
09	Faksevågen, Lomfjorden	536	79°33,00'	17°42,02'	350 m	15 m
10	Gipsvika, Sassenfjorden	523	78°25,40'	16°31,59'	350 m	15 m
11	Gullybukta, Magdalenefjorden	521	79°33,00'	10°56,41'	100 m	5 m
12	Gåshamna, Hornsund	526	76°56,49'	15°49,26'	350 m	15 m
13	Isbjørnhamna, Hornsund	526	76°59,56'	15°34,38'	150 m	7,5 m
14	Jakobsenbukta, Woodfjorden	521	79°36,54'	14°10,28'	350 m	15 m
15	Kaldbukta, Van Mijenfjorden	525	77°50,48'	15°23,51'	250 m	15 m
16	Kinnvika, Murchisonfjorden	537	80°02,29'	18°13,57'	120 m	6,5 m
17	Kvalvågen, Storfjorden	505	77°28,13'	18°10,20' *	350 m	15 m
18	Longyearbyen, Adventfjorden	523	78°14,29'	15°38,12'	350 m	15 m
19	Möllerhamna, Möllerfjorden	522	79°16,46'	11°50,59'	350 m	15 m
20	Palanderbukta, Nordaustlandet	537	79°33,35'	21°01,11'	350 m	15 m
21	Pyramiden, Mimerbukta, Billefjorden	523	78°38,42'	16°25,03'	350 m	15 m
22	Russebukta, Edgeøya	505	77°37,38'	20°59,41' *	150 m	7,5 m
23	Scheibukta, Bjørnfjorden	521	79°38,06'	11°09,20'	350 m	15 m
24	Selvågen, Forlandsundet	524	78°33,05'	11°17,29'	350 m	15 m
25	Signehamna, Lilliehöökfjorden	522	79°16,19'	11°33,01'	100 m	6,5 m
26	Skansbukta, Billefjorden	523	78°31,33'	16°01,29'	350 m	15 m
27	Sorgfjorden	537	79°54,02'	16°48,44'	350 m	15 m
28	St. Jonsfjorden, Forlandsundet	524	78°31,29'	12°59,59'	350 m	15 m
29	Sundbukta, Freemansundet	533	78°12,35'	20°51,00'	350 m	15 m
30	Texas Bar, Liefdefjorden	521	79°36,17'	12°44,14'	120 m	7,5 m
31	Trinityhamna, Magdalenefjorden	521	79°33,32'	11°03,04'	350 m	15 m
32	Trygghamna, Isfjorden	524	78°15,09'	13°47,34'	150 m	15 m
33	Van Keulenhamna	525	77°37,01'	14°55,03'	350 m	15 m
34	Vestervågen, Recherchefjorden	525	77°30,09'	14°33,36'	350 m	15 m

* ED 50

The table shows proposed places of refuge localities with positions and maximum vessel size

Territorial sea, fisheries protection zone, fisheries zone and economic zones

Legislation 27-06-2003 No. 57, «Legislation on Norway's territorial waters and adjacent zones (territorial waters legislation) »
The translations are unofficial and on y updated at the time of the translation. Should any doubt arise, the Norwegian text of the Act is valid and binding.

§ 2, the territorial sea.
The territorial sea includes the sea area from the baselines to 12 nautical miles seawards.

With an extension of the territorial sea to 12 nautical miles, the geographical area of the 12 nautical miles fishing limit will be absorbed by the territorial sea.

§ 5 The legislations geographical operation area.
The law also applies to Svalbard, Jan Mayen, Bouvetøya, Peter Øy and Queen Maud Land.

The former fishing limit of four nautical miles around Jan Mayen is rescinded.

The outer limit of the Norwegian economic zone, the fishe - ies zone around Jan Mayen and the fisheries protection zone around Svalbard will not be affected by an extension of the territorial sea. An extension of the territorial sea to 12 nautical miles will, however, imply that the width of the named zones will be reduced from 196 to188 nautical miles.

The Fisheries Question

Appendix I to the Convention between the Kingdom of Norway and the Russian Federation on maritime delimitation and cooperation in the Barents Sea and Arctic Ocean.

ARTICLE 1
The agreement of 11th April 1975 between the Government of the Kingdom of Norway and the Government of the Union of Soviet Socialist Republics on cooperation in the fishin business, and the Agreement of 15th October 1976 between the Government of the Kingdom of Norway and the Government of the Union of Soviet Socialist Republics on Mutual Fisheries alliance will remain in force for fifteen years after the agreement is implemented. On the expiration of this period, each of the agreements remain in force for further periods of six years at a time, unless one party notifies the other party, at least six months before the six-period expires, that the agreement is to be terminated.

ARTICLE 2
In the previously disputed area within 200 nautical miles from the Norwegian orRussian mainland, the technical regulations stipulate a transitional period of two years from the date the agreement is implemented. This applies especially to mesh size and minimum size of fish which each of the parties has decided for their fishing essels.

ARTICLE 3
Total allowable catch, mutual catch quotas and other measures for regulating fishing will continue, subject to negotiation by the Joint Norwegian-Russian Fisheries Commission in accordance with the agreements referred to in article 1 of this annex.

ARTICLE 4
The Joint Norwegian-Russian Fisheries Commission will continue a consider improved surveillance and control measures for fish stocks that are managed jointly, in accordance with the agreements referred to in Article 1 of this annex.

Fisheries Protection Zone around Svalbard

The special legal situation that applies to the areas of Svalbard allows the regulation of fishing to be determined in accordance with two different laws. Regulations on fishing in Svalbard's territorial waters and the inner waters are determined in accordance with the Svalbard legislation, while regulations on fishin in the protected zone are determined in accordance with zone laws.

The zone legislation must also be read in conjunction with the Act of 6th June 2008 No. 37 on the management of wild living marine resources (Marine Resources Act), which also applies in the economic zone. In practice, foreign fishing is usually regulated in accordance with the zone legislation, while the practice of fishing by Norwegian vessels is regulated in accordance with the Marine Resources Act.

Pursuant to the Act of 17th December 1976 No. 91 relating to Norway's economic zone (NEZ), the Royal Resolution of 3rd June 1977, established a fisheries protection zone in the sea areas off Svalbard. Its purpose was for the conservation of living marine resources and the regulation of fishing and hunting.

The outer limit for the fisheries protection zone extends a distance of 200 nautical miles from the lines connecting the archipelago's outer points. In addition, the zone is bounded by the outer limits of the economic zone off the Norwegian mainland.

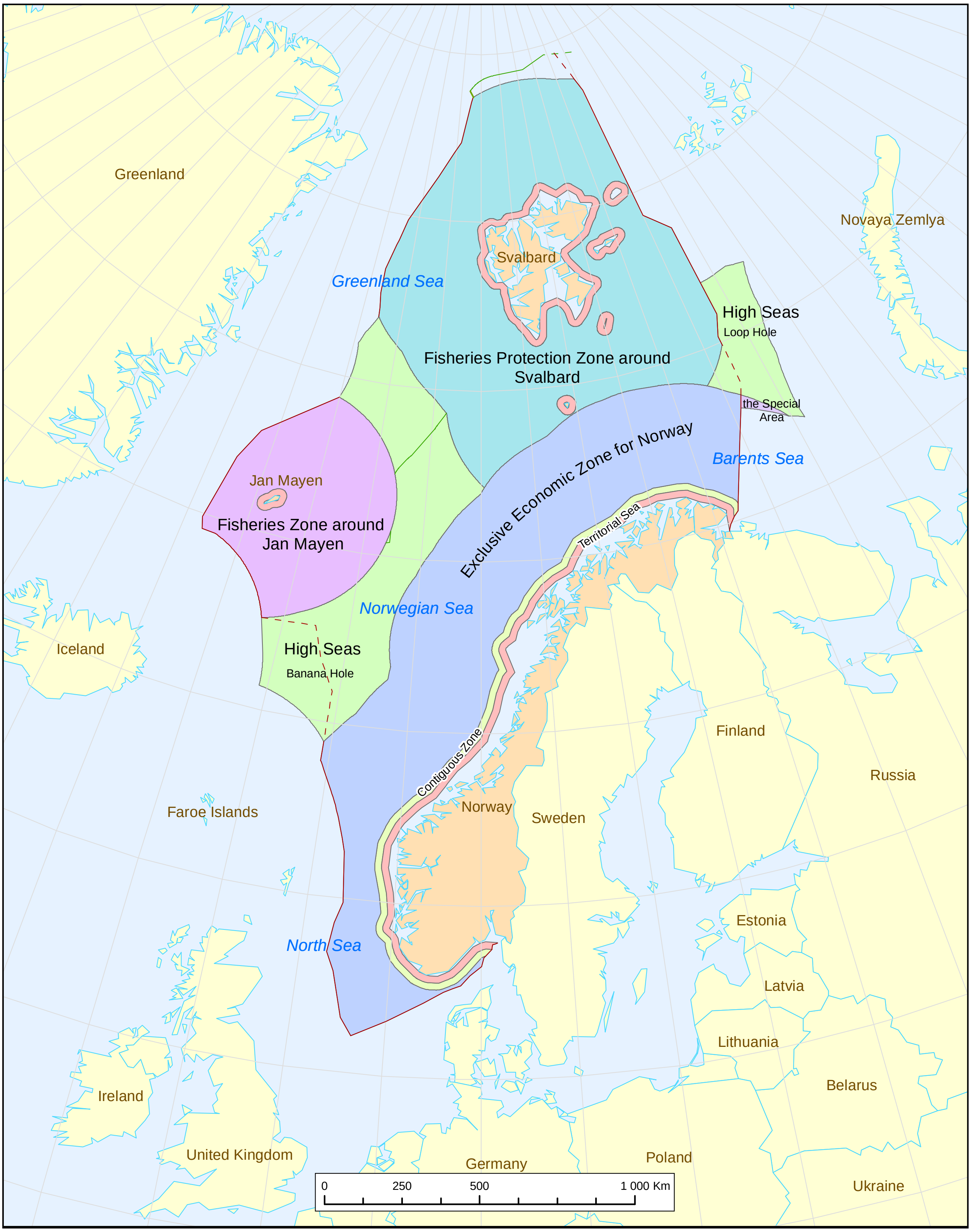
Where the fisheries protection zone adjoins any state authorities' area, the boundary is drawn in accordance with the agreement.

On 28th April 1978 the Fisheries Ministry established the Norwegian economic zone in accordance with the legislation of 17th December 1976. The regulations on the fisheries protection zone around Svalbard was established by the Royal Resolution of 3rd June 1977. The regulations provide rules on minimum mesh size of gear permitted and minimum size of fish permitted to be trapped or retained on board.

Fishery Zone around Jan Mayen

The Fisheries Zone of 200 nautical miles from Jan Mayen was established in accordance with the zone legislation with effect from 29 May 1980 without the restrictions that apply to the fisheries protection zone around Svalbard. As with the fisherie protection zone around Jan Mayen there is not a full economic zone but a zone that is limited to fishing purposes. Unlike the Norwegian mainland, there are no special fishing limits around Jan Mayen. The regulations for foreign fishing in NEZ are basically similar to the fisheries zone a ound Jan Mayen.

The outer limit for the fishing zone shall be drawn at a distance of 200 nautical miles (one nautical mile = 1852 meters) from the baselines set for Jan Mayen. It shall not exceed the median line in relation to Greenland or outside the line that constitutes the outer limit of Iceland's economic zone which is now laid down in the Icelandic Act No. 41 of 1st June 1979. Where the fishing zone adjoins the zone outside East Greenland the median line shall be drawn in accordance with the agreement.



Chartlet showing FISHERY ZONES and FISHERY PROTECTION ZONES Source: NHS

– – – – Agreed Delimitation Line of the Continental Shelf

The Fisheries Ministry is authorised to make provisions concerning the management of the fishery zone with a view to the protection of fish stocks, restrictions on foreign fishing and ensuring rational, prudent and reasonable fishing practice, taking into account the agreements that must be endorsed by a foreign state.

The Fisheries Ministry is authorised to issue regulations regarding existing enforcement of the provisions issued for fisheries zone .

The Coast Guard conducts control of the zone boundaries and ensures that the various regulations within the zones are observed.

The main fisheries in the Barents Sea, fisheries protection zone around Svalbard and the Jan Mayen zone

Directorate of Fisheries

Fishing for cod, Saithe and haddock are the most important fisheries for a large portion of the deep-sea fleet that has permission to fish in the Barents Sea. Fishing for these species occurs with varying intensity depending on the areas and seasonal variations. Below is an attempt to provide a general description of the Norwegian fisheries in the Ba ents Sea.

COD is a predatory fish associated with the seabed but in the Barents Sea it can, during parts of the year, stays much more in open water. Juveniles (0–2 years) consume a lot of zooplankton while fish and seabed organisms are the most important food of the older cod. Photo: Eiliv Leren

Where cod is caught in the Barents Sea will depend on the seasonal migration patterns. It is not unusual for cod to be caught northwards of 78°N, but the main cod fishing of the oceangoing fleet ta es place mainly south of 76°N.

Cod fishing is conducted throughout the year but with varying intensity. At the beginning of the year cod fishing is often sporadic while the fishing fleet waits for the influx of cod to the spawning grounds off the coast of Troms, Vesterålen and the Lofoten Islands. At the beginning of the year it follows the fis from the area south of Bjørnøya and further east to the Nordkappbanken. Fishing intensity will gradually increase nearer the coast, continuing towards the near coast fishing banks. This fishing is expected to be maintained right up to mid-April. At times fishing will be very intense which occasionally leads to conflict bet een the various fishing gear g oups.

Fishing for cod and haddock takes place during most of the year around Bjørnøya, but with greatest intensity in the summer months and autumn. There will also be cod fishin that extends north of Bjørnøya, in Storfjordrenna and along the edge of Bjørnøya and north to Isafjorden on Svalbard and in the area of Hopen.

In general, the most intensive cod fishing off the Norwegian coast is expected during the period from February to June and around Bjørnøya and Svalbard during the period June to November.

Saithe has a powerful and muscular body, and is a good swimmer. It is easy to recognise by the light area under the jaw and the straight line on its sidelines.

Photo: Eiliv Leren

The Norwegian deep sea fishing for saithe is mainly a trawl fishery and takes place in the Norwegian economic zone and relatively close to the coast, with greatest intensity west of Nordkapp. Saithe is sometimes caught while fishing for cod and haddock in the Svalbard zone.

NORTH ARCTIC HADDOCK is a cod fish that is occasionally found along the coast north of Stad, in the Barents Sea and on the west side of Svalbard. Growth can vary widely from year to year and from area to area but on average the young haddock grow 7–9 cm per year. Speed of growth declines with age. Photo: Eiliv Leren

Norwegian deep-sea fishing for haddock is conducted with both trawl and auto-line. Both the trawl and auto-line fishe - ies are carried out to a large degree as mixed fishing, as these fish often swim with cod and saithe. Haddock is also caught when fishing for other species. In addition, there are two areas which frequently stand out as haddock fields at certain times of the year. One area is located between 71°N and 72°N on the west edge on Tromsøfla et. It is fished during the period from December to March. The other area is to be found on Gåsbanken which lies in the Russian zone of the Barents Sea. Haddock can also be caught on Vesterålsbankene and the area around Bjørnøya. The Bjørnøya area is often closed because of the non-permitted mixture of undersized haddock.

Example of the trawlers used in trawling for cod, saithe and haddock Photo: Directorate of Fisheries

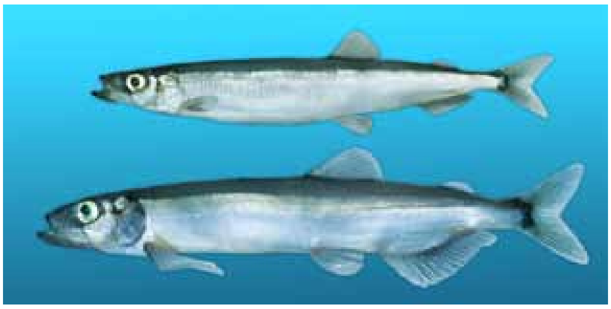
PRAWNS are the most important shellfish resource in the North Atlantic, producing an annual total catch of about 450 000 tonnes. The species is also found in the colder parts of the Pacific Ocean Photo: Eiliv Leren

Prawn fishing in the Barents Sea represents a small quantity of the pelagic fish specie .

Prawns are caught by trawling. The largest amount of prawns caught in the Barents Sea is fished in the area off Thor-Iversenbanken, northwards in the area east of Hopen and on the west side of Svalbard.

The fleet currently consists mostly of factory vessels that are ice-strengthened. In recent years, however, operating margins in this business have been very small, and there is only a minority of prawn trawlers that still operate throughout the year. In addition, some other vessels with a permission to fish for prawns only participate in certain periods of the year.

An example of an ice-strengthened prawn-trawler Photo: Harald Valderhaug



Capelin is a small salmon fish with distribution in the polar regions of the northern hemisphere. Capelin is a typical pelagic schooling fish which feeds on plankton organisms. They mainly spawn only once, which means they die soon afterwards Photo: Eiliv Leren

Capelin is caught with pelagic trawl and purse seine. Fishing is a typically seasonal occupation where the location of the fish is entirely dependent on the capelins' migration. The major quantity of the catch goes to fishmeal and oil, but a significant amount is used for animal and fish food. In addition, capelin roe is available for human consumption. Capelin is also a sought after delicacy in some markets and, before spawning occurs, a quantity is also available for human food.

The fishing is distributed throughout the Barents Sea depending of the capelins' spawning migration.

During some seasons in the 70's winter fishing started as far easterly as the Karahavet but now it seldom extends further than to the coast of Novaya Zemlya. When fishing starts in the easterly Barents Sea, there is most often an easterly drift towards the coast of Norway. As a rule capelin migration continues westwards in the Barents Sea and moves towards the Norwegian zone along the coast of Russia. There can also be a westerly drift. Capelin spawn migration can occur further west in the Barents Sea between Finnmark and Svalbard. The fleet then follows the capelins' migration towards the coast of Finnmark and Troms. When the commercial winter fishery is opened, it will commence with larger purse-seine and trawling vessels. When the stock is nearer the coast trawlers and smaller purse-sein vessels will participate. Fishing can at times be very intensive when the capelin is close to Norwegian coast. A concentration of 50–100 vessels is not unusual within a radius on 10 to 20 nautical miles.

Capelin fishing has been closed for several years but following good management of the stock it re-opened for direct fis - ing in January 2009.

NORWEGIAN SPRING-SPAWNING HERRING (herring). Herring is a pelagic fish that swims in shoals in open waters. It belongs to the Atlantoscandinavian herring stocks along with two other stocks, the Icelandic summer-spawning, and the Icelandic spring-spawning herring. Source: imr.no Photo: Eiliv Leren

Fishing for herring has a long tradition. As far back as the Eldre Edda (a collection of ancient Norwegian poems) which date from the years 900–1000 we can read about Tors «Herring and buck meat». The poem is 1000–1100 years old but shows a way of life for Norwegians that goes even further back in time. In the Håkon Jarls saga we get the impression that during Harald Hårfagre's time, significant herring fishing took place off the Helgeland coast. From it we learn about Kveldulfsønnen Grim being engaged in purse-seining and therefore can assume that it existed more than one thousand years ago off the coast of Helgeland.

Fishing for Norwegian spring-spawning herring has been mainly conducted with purse-seining and trawling. Considerable shore-sein fishing was also carried out in the past but today only occasionally. The fleet consists of all types from small coastal vessels to trawlers and large purse-sein boats. Load capacity ranges from 10 tons of 1500 tonnes. Fishing is a very important source of income for the fleet and the many people involved in it.

Availability and quality are best before the period in which spawning migration begins. The fish are, however, in quite large quantities in the Norwegian Sea/Smutthavet during the summer and also while migrating to the spawning grounds. Spawning is mainly from the middle of March off the Møre coast before the fish again set course for the Norwegian Sea. The main operational area for herring is the Barents Sea but sometimes there are plenty of herring to be found in the fjords of northern Norway. Over the centuries the herring has had a migration pattern that has changed in cycles of fifty to sixty years where, after periods of rich fishing, they have disappeared, only to return a few years later. It has gradually been accepted that there are some «stocks» of Norwegian spring-herring that may have a more local distribution. For example, there are herring that stay more or less the whole year in the same districts, fjords or sea areas.

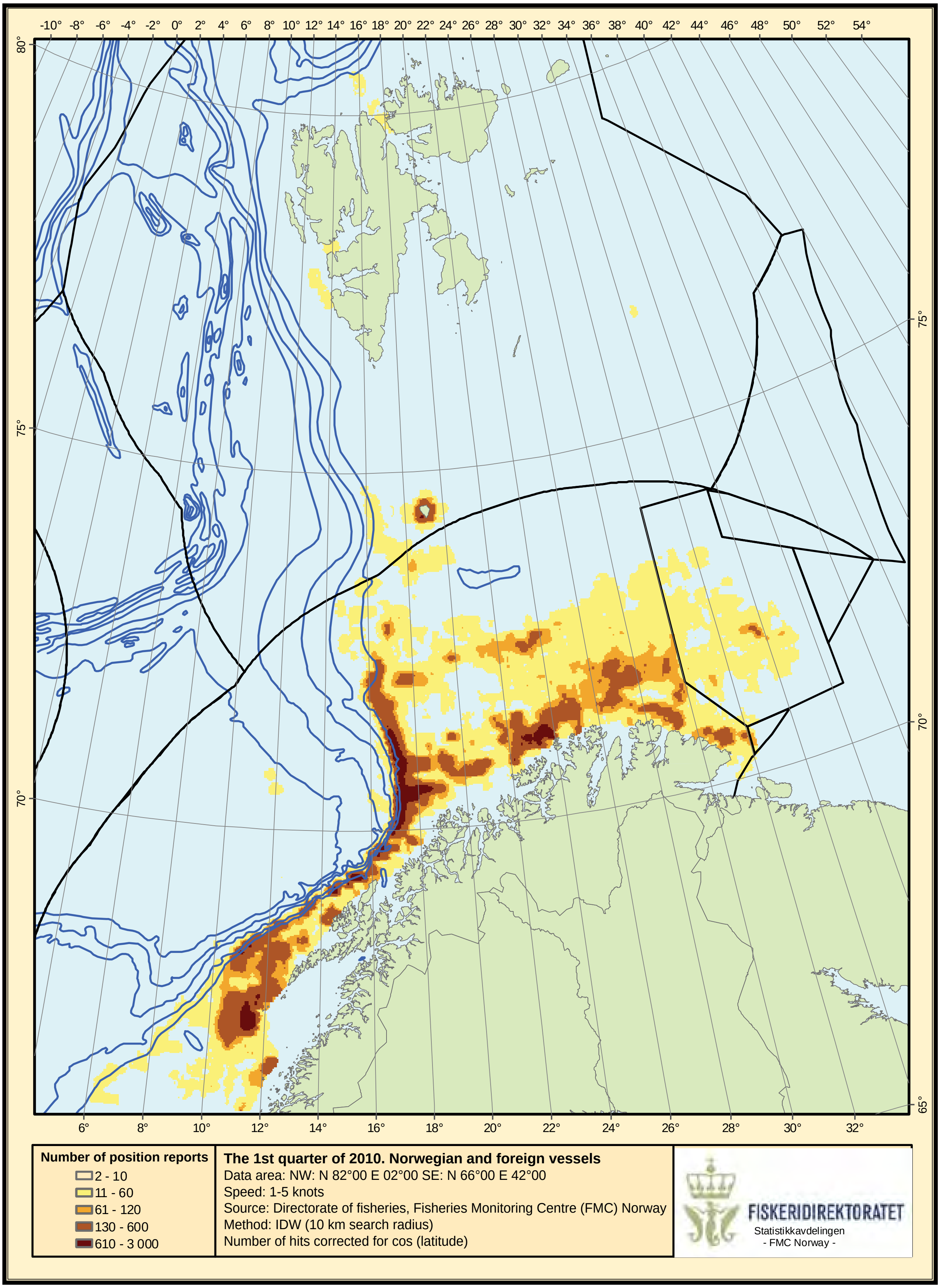
Norwegian spring-spawning herring migrate over large areas within the Norwegian and Barents Seas. Fishing is carried out over correspondingly large areas, from the Svalbard zone in the north, across large parts of the Norwegian Sea, to the Norwegian coast and in some years south to Rogaland. The herring is also then fished with purse seine and flo ting trawl. Most of the catch is for human consumption and only small quantities which, for various reasons, do not reach quality requirements or because of constraints in the capacity of reception apparatus; it is processed as meal and oil. Fishing in the Barents Sea and the northern part of the Norwegian Sea usually starts in July-August. Vessels mainly from Færeøe Islands, Iceland and Russia then participate in the fis - ing. During August the herring migration begins in the near coast waters west and north of Troms and Vesterålen and the participation by Norwegian fishing essels increases.

Examples of Norwegian fishing vessels participating in fishing for herring and capelin with purse sein and floating trawl

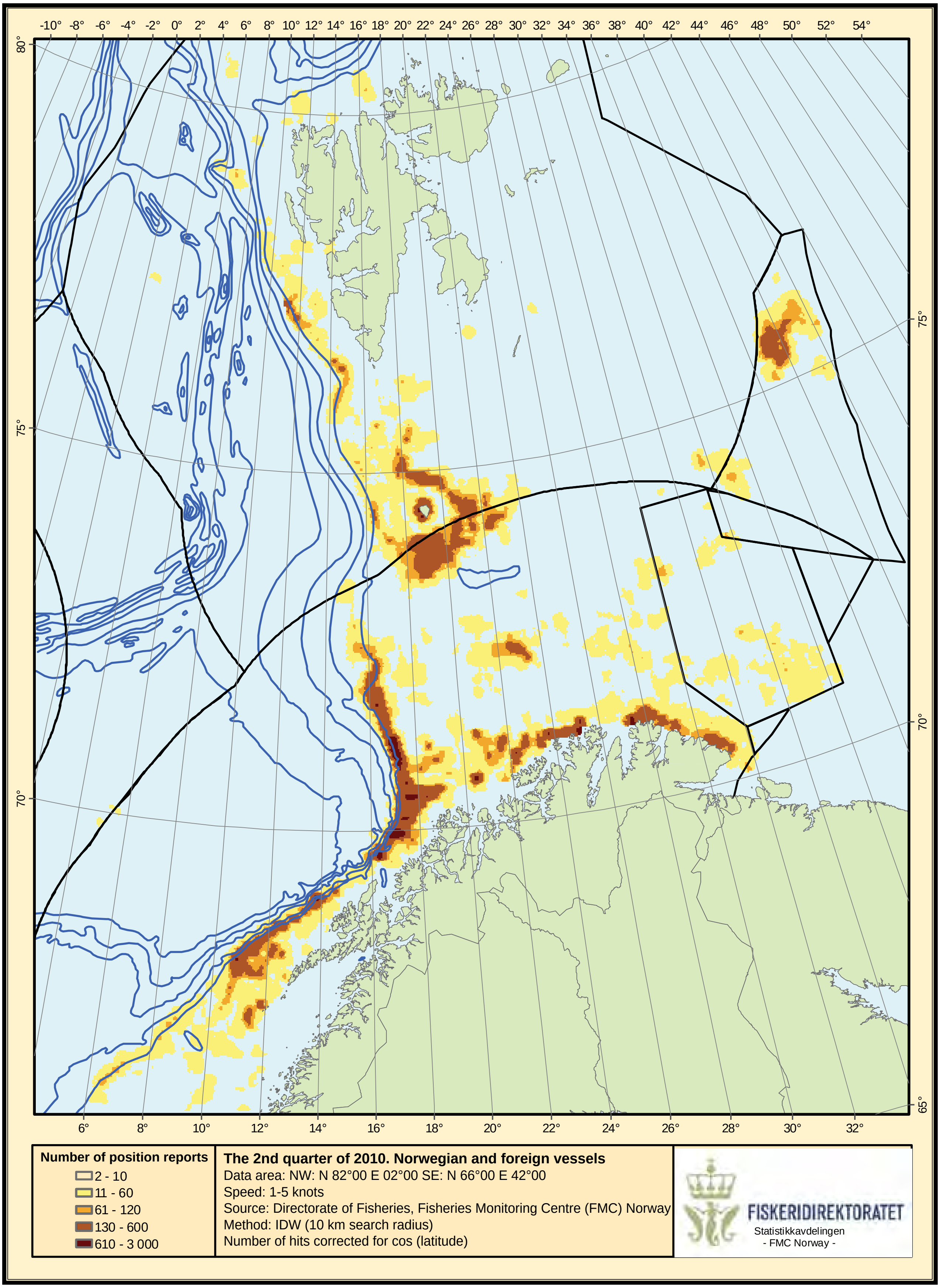
Photo: www.fiskeri.no

Charting the activity of fishing vessels in the Barents Sea, Svalbard and Jan Mayen

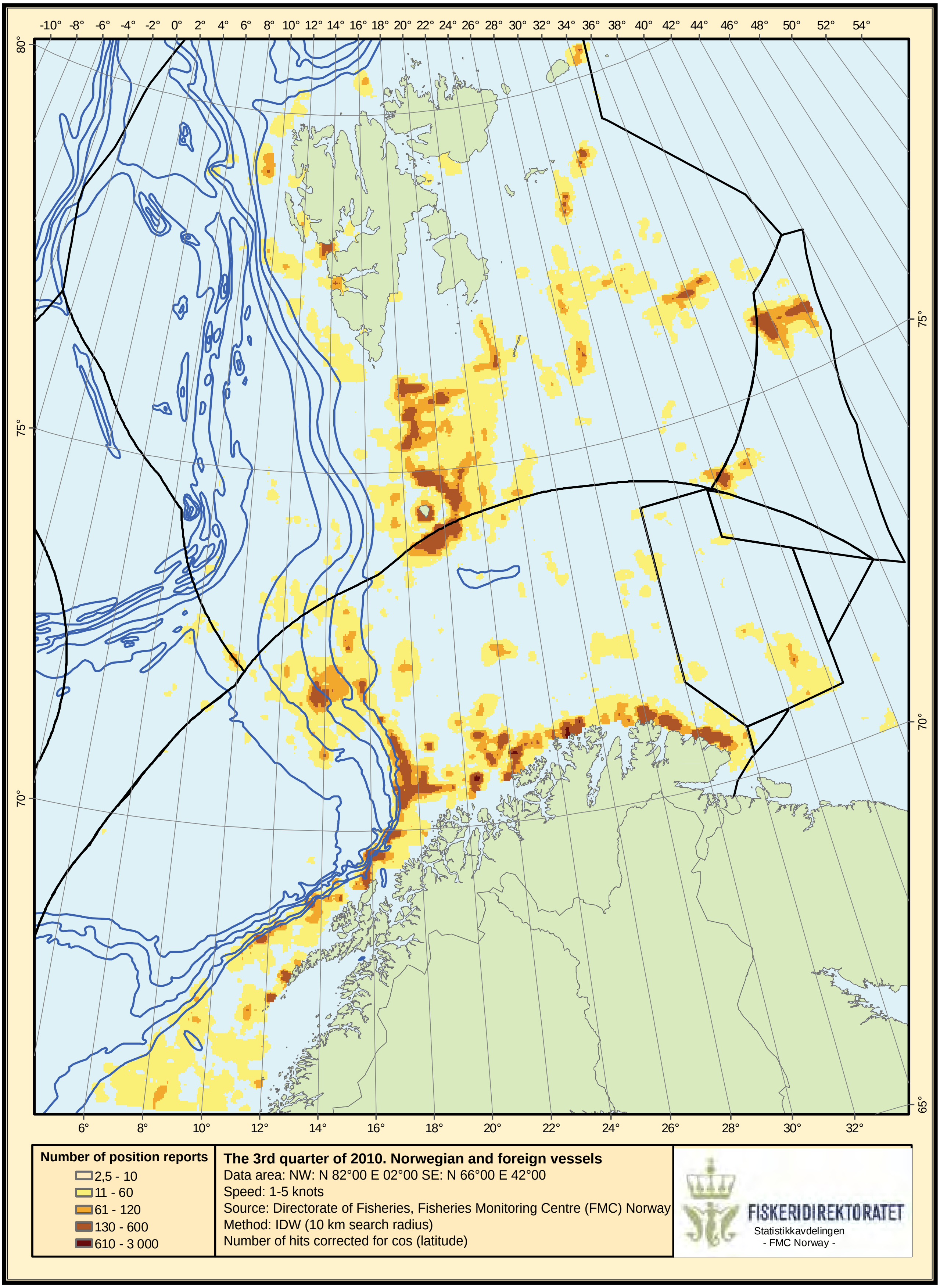
Satellite tracking of all Norwegian fishing vessels with a length of over 24 m was introduced with effect from 1st July 2000. From 1st October 2008, the tracking limit was reduced from 24 m to 21 m. On the 1st July 2010 the limit was lowered to 15 m. At present there are 700 Norwegian vessels of that size that are subject to tracking obligations, 624 of which have installed the equipment and are involved in fishing. Information is automatically transmitted, via satellite communication equipment, to the Norwegian Fisheries Monitoring Centre (FMC). The equipment identifies the boat's position, course and speed automatically once every hour, twenty-four hours each day, no matter where the boat may be in the world.



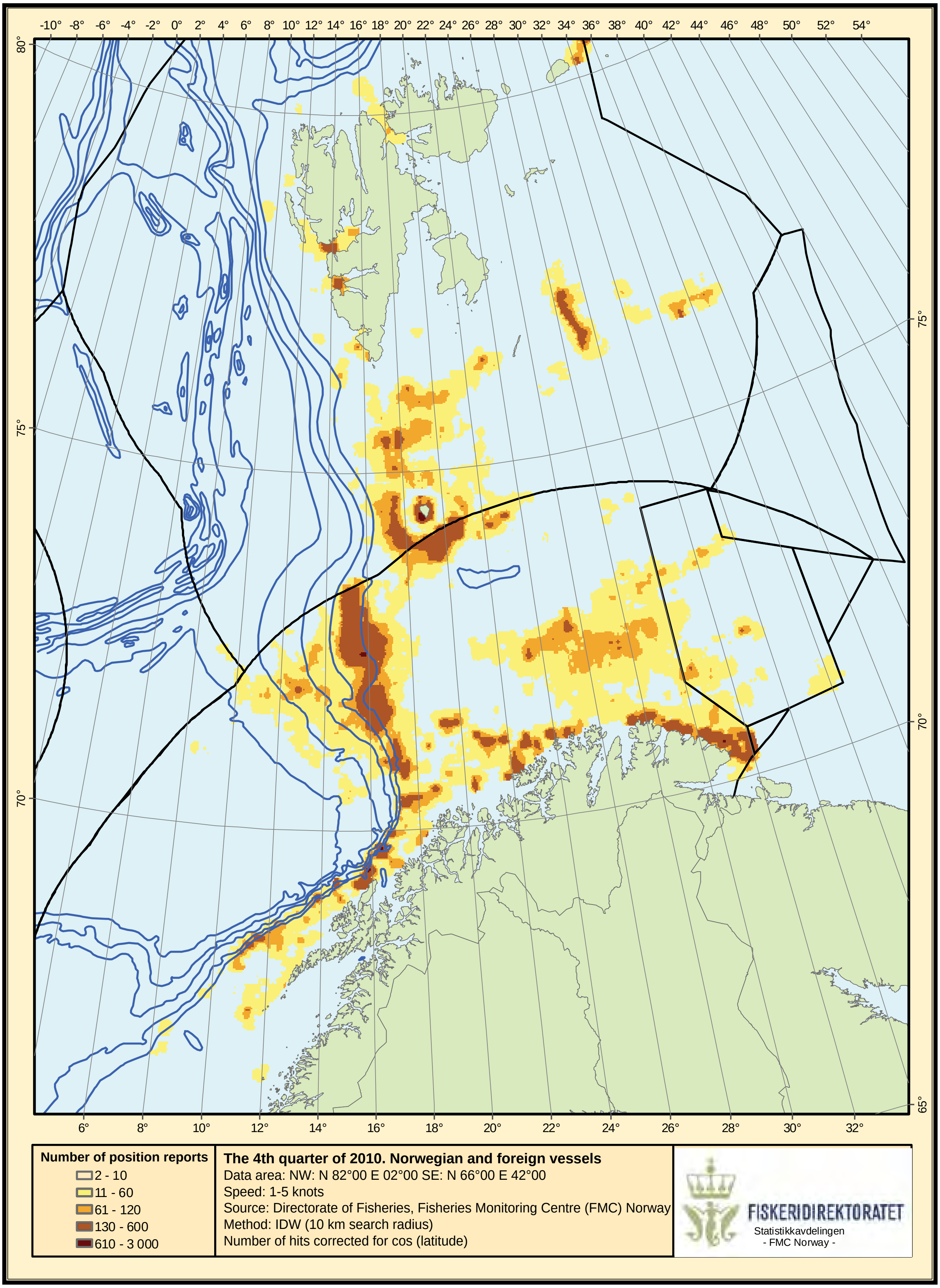
The tracking data in the above chart shows the activity of fishing vessels over 21 m with a speed of under 5 knots in the 1st quarter of 2010. The fishing noted during this period is mainly for cod (spawning) in the Barents Sea and the near coast areas along the coast from Røst to East Finnmark. There is more fishing for cod and haddock in the area from Fugløybanken to about 71°30'N. In addition, it can be seen that there is limited activity of prawn trawling around Svalbard. The tracking chart does not show the activity of fishing vessels under 21 m, which are therefore not represented on the chart.



The tracking data in the above chart shows the activity of fishing vessels over 21 m with a speed of under 5 knots it the 2nd quarter of 2010. The activity during this period shows more varied fishing than in the 1st quarter. Cod fishing is in the final phase and is in the near coast areas, becoming wider spread and with great activity near Bjørnøya and on the west side of Svalbard. From the middle of the period the near coast fishing moves to a different fishery where there are more haddock and saithe. In addition the chart shows an increasing activity of prawn trawling east and southeast of Hopen and limited activity of prawn trawling in the near coast around Svalbard. The tracking chart does not show the activity of vessels under 21 m, which are therefore not represented on the chart..

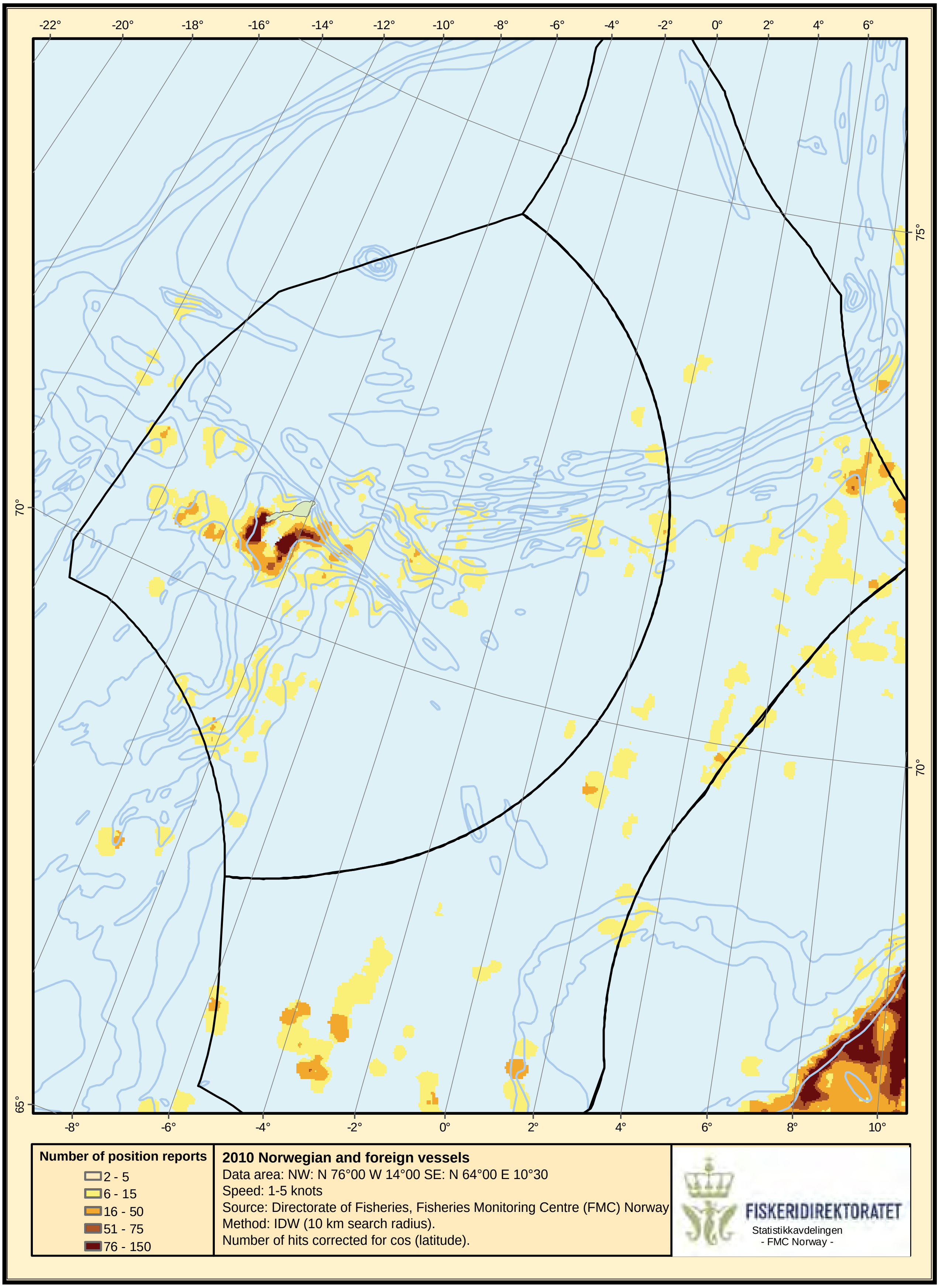


The tracking data in the above chart shows the activity of fishing vessels over 21 m with a speed of under 5 knots it the 3rd quarter of 2010. Fishing for cod takes place mainly around Svalbard and north and east of Hopen. Prawn fishing is now mainly limited to Hopendjupet and the near coast around Svalbard. There is also an increase in herring fishing west of the edge of the Norwegian Sea. In the near coast areas of the Norwegian coast the predominant fishing is mainly for saithe and haddock. The tracking chart does not show the activity of vessels under 21m, which are therefore not represented on the chart.



The tracking data in the above chart shows the activity of fishing vessels over 21 m with a speed of under 5 knots it the 4th quarter of 2010. Fishing for cod and haddock takes place mainly around Svalbard and north and east of Hopen. It can be seen that cod fishing starts to take place on Nordkappbanken. There is also an increase of fishing for Norwegian spring spawning herring south of 72° and west of Fugløybanken and Tromsøflaket. Prawn fishing is now mainly limited to the near coast waters around Svalbard. In the near coast waters of the Norwegian coast the predominant fishing is for saithe and sporadic fishing for cod and haddock. The tracking chart does not show the activity of vessels under 21 m, which are therefore not represented on the chart.

Jan Mayen and Smutthavet

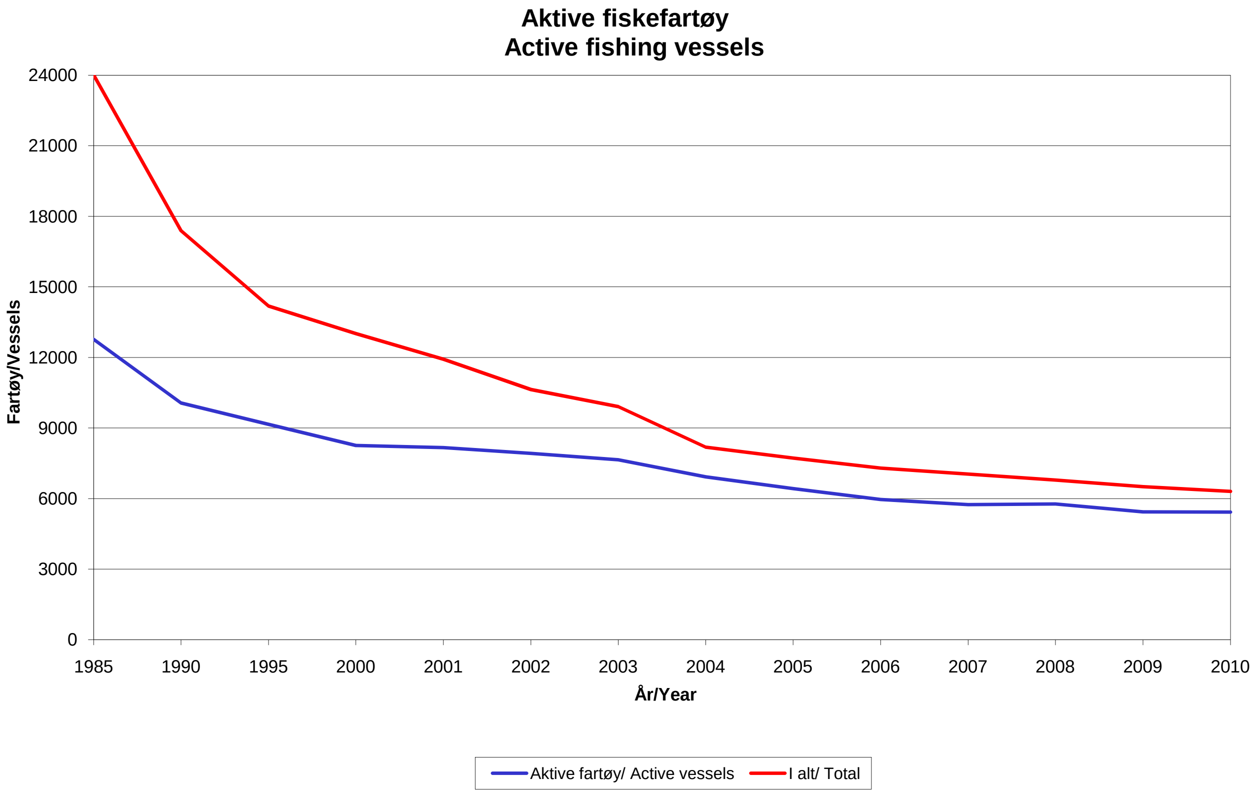


Fishing in the main areas around Jan Mayen is mainly sporadic. In the waters near the island there will be periods of limited seabed trawling for prawns. In some years there will also be periods when limited minkie whale hunting takes place in this area, all depending on quotas and hunting availability. Overall, little or no fishing activity is expected in this area. This also applies to Banana Hole (Smutthavet) when in the summer months and into autumn there will be some fishing activity by foreign vessels fishing for herrings and other species.

Structuring of the fishing fleet

The diagram below shows that the number of Norwegian vessels in the fishing fleet has declined considerably in the last twenty years and that fishing vessels are now larger and more mobile than previously.

The table below shows the increase in numbers of fishing vessels during the period from and including 1985 to and including 2010.



The diagram shows total number (red curve) of Norwegian fishing vessels and the blue curve indicates how many vessels were involved in fishing activities during the period 1985 to 2010 in Norway. Source: Fisheries Directorates marks Register.

Rules of fishing in the Svalbard Zone

From the Regulations on mesh, catches and size, etc., for fishing in the fishery zone of Svalbard

CHAPTER VII. PROHIBITION OF FISHING IN SPECIFIC AREAS

Section 24. Prohibition of fishin

In the following areas of the territorial waters, all other fis - ing operations than shrimp trawling and dredging for molluscs are prohibited:

1. Around Bjørnøya.
2. Outside the baselines off the west coast of Spitsbergen from Sørkapp to 80° N and west of 14° E.

Rules for fishing in the Jan Mayen Zone

Contains current rules that apply to fishing in the Jan Mayen zone.

Ice at Sea

By The Norwegian Polar Institute

Sea ice

Sea ice in the Arctic has decreased considerably in recent years both in extent and thickness. Sea ice is nowdominated by younger ice, - there is more of first year ice and less older ice, (second or multi-year ice) the so-called Polar ice pack. Pack ice at sea consists mainly of sea ice which is frozen seawater. In some areas there is also glacial ice from the calving glaciers.

Sea ice extent on the northern hemisphere varies with the seasons and covers an area on approx 5–15 million km^2 (0.5 to 1.5 times Europe's surface area). The ice extent is lowest in September and largest in March. The September sea ice has declined significantly in recent years. The amount of older ice in particular has decreased dramatically. The total volume of ice is estimated to be about 13,000 km^3 in the summer and 16,500 km^3 at the end of winter (figures from 2010). Production in the winter is mostly offset by the summer melt, but also by, for example, the East Greenland Current carries about 2,000 to 3, 000 km^3 of pack ice out of the Arctic Ocean during the course of one year.

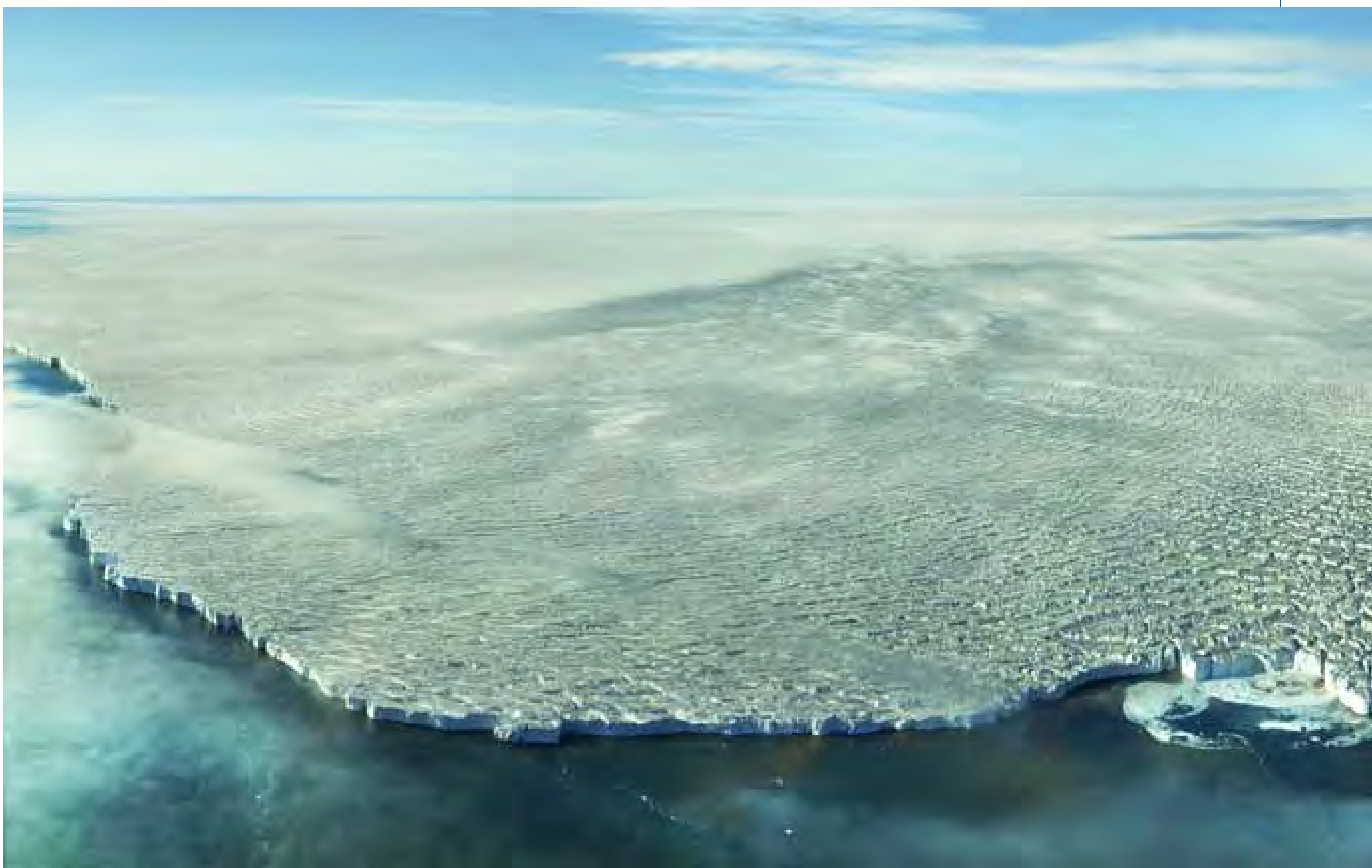
The areas around Svalbard and the Barents Sea

The sea areas around Svalbard and the Barents Sea are char-acterised by seasonal sea ice which melts in summer; so-called first year ice. In the fjords it forms landfast ice. In the areas northeast of Svalbard some ice survives the summer and then forms second year ice and possibly multi-year ice if it survives several summers. Multi-year ice (from the Arctic Basin) can drift into the Barents Sea.

Framstrait

Framstrait is characterised by pack ice from the Arctic Ocean transported southwards by the East Greenland Current along the east coast of Greenland. Some of the pack ice is multi-year ice that can be several meters thick and deformed after being packed and screwed over time. The Transpolar drift transports ice which has formed along the coasts of Siberia across the Arctic Ocean and out again through Fram Strait – taking about 2 to 4 years.

BRÅSVELL GLACIER, Nordaustlandet Photo: Eiliv Leren



ICE COVERED SEA
Photo: Sebastian Gerland, Norwegian Polar Institute

SEA ICE (OLDER ICE/ARCTIC PACK ICE)
Photo: Hinrich Bäsemann, Norwegian Polar Institute

Jan Mayen

In recent years there has been little ice around Jan Mayen, but pack ice is occasionally present.

Ice formation

Seawater with a salinity of 33 ‰ has a freezing point of about -1.81 °C. Cooling water increases its density and thereby the weight. The heavier water sinks until it meets a layer of the same or greater density. This creates a vertical circulation until the entire upper layer is mixed and cooled to freezing point. The process is enhanced by the waves and wind, increasing the thickness of the mixed upper water layer. The whole of the upper layer of water must be cooled to freezing point before ice can be formed. With no wind this layer is most often quite thin and forms shell ice on so-called Nilas ice layer on the surface. If there is wind frazil ice can be suspended throughout the whole mixed layer. When this thin solid ice cover is broken by the wind and sea into small pieces which grind against each other, they become rounded with raised edges and then known as pancake ice. However, if there is wind the whole layer can form blue/grey grease ice that accumulates at the surface and forms a solid ice cover.

In heavy seas this can also occur directly from brash lumps. When it first begins to freeze in the autumn, new ice forms quickly. In sheltered areas this can become fast ice while in the open sea it will be broken up and moved around by the wind and currents as pack ice. The pack ice grinds together or slackens depending on variations of winds and currents, and the shape and size of ice floes. Some of the ice formed in winter does not melt in the summer and frezes

PACAKE ICE
Photo*:* Rudi Caeyers, Norwegian Polar Institute

Stranded «ICEBERG» glacier ice Photo: NHS

further during the following winter with subsequent deformation. In the Arctic Basin this can happen year after year and finally the heavy old ice (multi-year ice) is formed, which drifts around in the area until flowing out with the East Green land Current. Relatively limited amounts are transported into the Barents Sea, the Bering Sea or through the Canadian Arctic Archipelago. The level ice in the Arctic Ocean will not grow to more than 3–4 m in thick ness because the freezing on the under side gradually becomes so slow that the addition is compensated by melting in summer. Ridged ice can reach up to 20–30 m in thick-ness with ridge keels and some hummocks even greater. Global warming with its ensuing increase of melting in the summer period has in recent years resulted in a general reduction of ice thickness and less old multi-year ice.

Icebergs and glacier ice

The specific weight of sea ice is about 0.9 (without snow cover), which means that only 1/9th of the volume is seen above the surface. Gla-cier ice has a similar specific weight as sea ice.

The icebergs in Svalbard's waters stem from glacier fronts that have a grounded front towards the sea. The ice normally breaks from the glacier front in thin slices which rotate and float. The dimension of ice around Svalbard varies greatly but can be tens of metres in horizontal plan. During the so-called glacier surge, which occurs at intervals varying between 30 and several hundred years, hundreds of icebergs are formed from the glaciers. Under rare extreme weather conditions with little pack ice, flat (tabular) icebergs can break loose and drift with wind and currents. Austfonna on Nordaustland constitutes the longest continuous marine grounded ice front in the northern hemisphere.

The most and greatest (highest) icebergs in the North Atlantic Ocean stem from the great glaciers on both sides of Greenland. They follow the coastal streams until joining the Labrador Current which then transports them to towards the Newfoundland Banks and occasionally still further. This occurs especially in the autumn and early summer, so that shipping routes during those occasions are moved southwards.

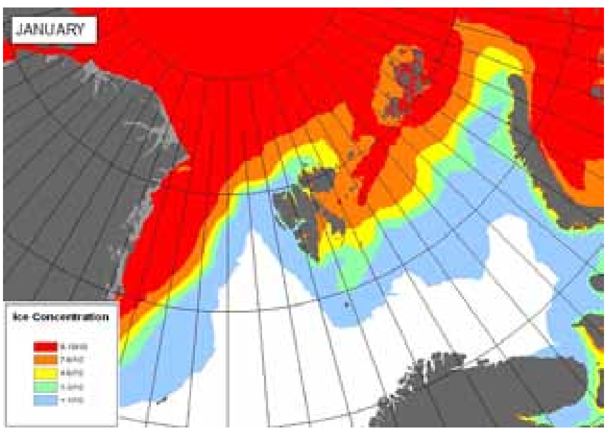
Melting icebergs are easily recognised by their crackling sound, which is caused by air pockets within the ice. As the ice melts the air is forced from the pockets where it has been trapped under pressure in the ice.

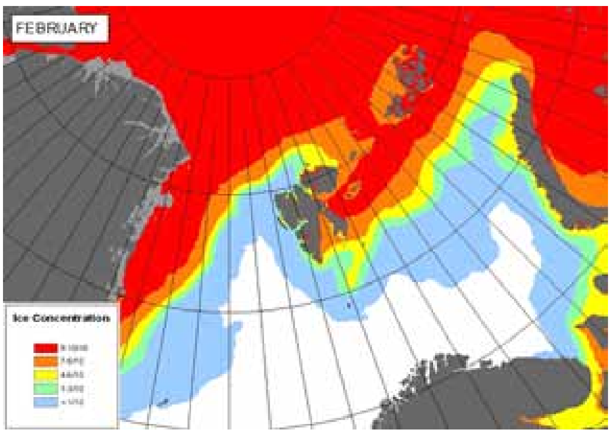
In addition to sea ice and icebergs there is also river ice. River ice in the Arctic Ocean comes from the great rivers in Canada and Siberia and melts along those coasts. The same occurs in the fjords of Greenland. In Svalbard the rivers are too small to form ice of any significanc .

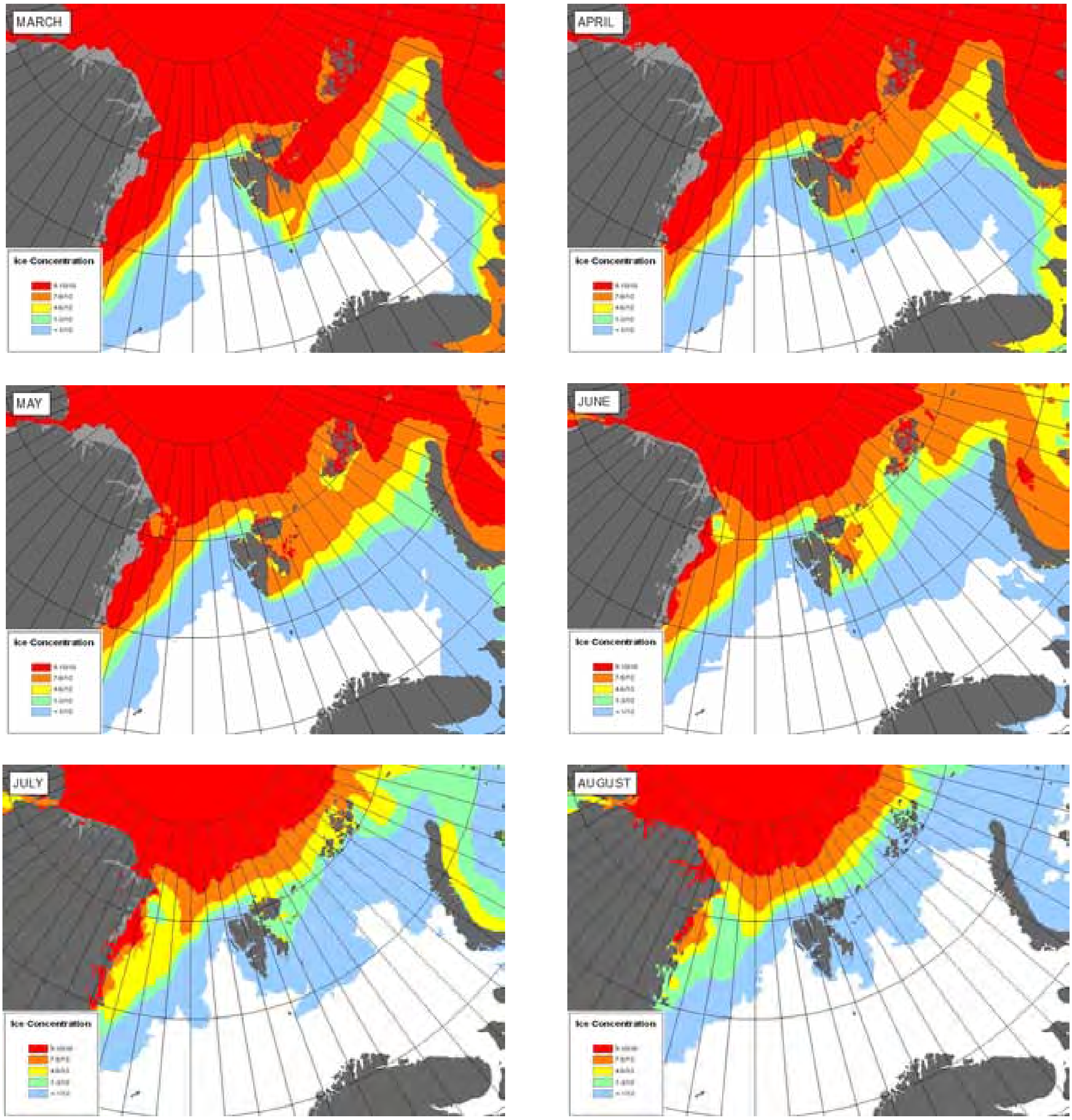
Some geographic ice areas

For the local ice conditions in Svalbard's waters, reference should be made to the respective sections in this volume and the Sea Ice Extent charts on pages 68–70.

The average pack ice limit in the various seasons of the year changes relatively little in the course of time. It has therefore been natural for hunters who have worked in the various areas to name the ice masses according to the localities. The northward moving warmer current from the Norwegian Sea divides the pack ice into two main areas Østisen and Vestisen (East and West Ice). Østisen is comprised of the pack ice east of the large deep in the Norwegian Sea and up to Novaya Zemlya. Østisen is again divided into two areas: Nordisen, between Svalbard and Semlya Frantsa Iosifa, Nordøstodden, an ice tongue across Sentralbanken. Names of local land areas are also used. Vestisen means in general the pack ice between Iceland, Greenland and Sval bard. Jan Mayen Field with Odden and Nordbukta lie within this area.







Source: Meteorological Institute

Sea ice distribution 2001–2010. The figures show the monthly average ice concentration for the period 2001–2010. The colour code follows the standard code defined by the World Meteorological Organisation (WHO) and gives varying concentration intervals.

Light blue shows area of less than 1/10 of the surface covered by ice, and is categorised as open water.

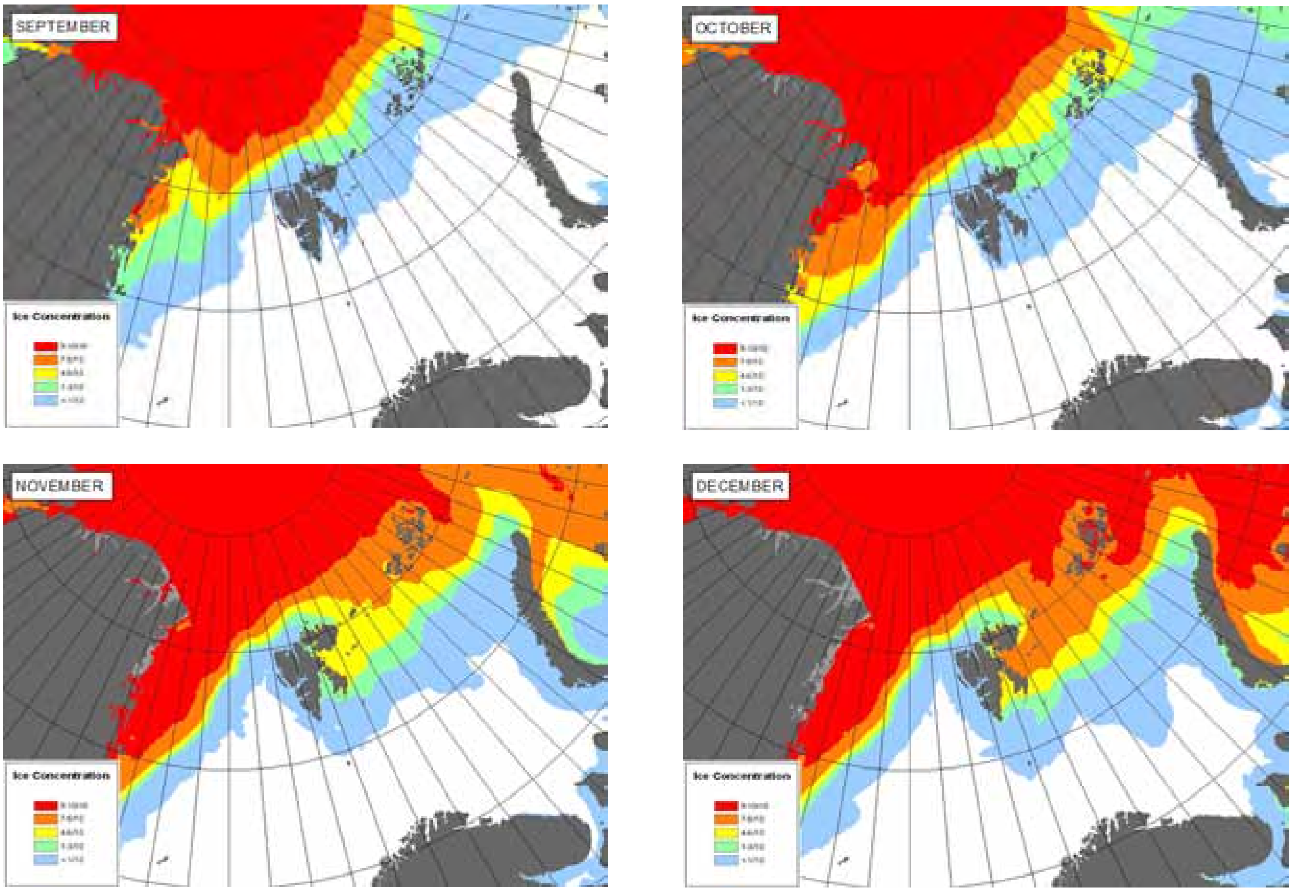
Green shows an area with very open pack ice with ice cover 1/10–3/10.

Yellow shows open pack ice with ice cover 4/10–6/10

Orange shows close pack ice with ice cover 7/110–8/10

Red shows ice cover of 9/10–10/10 and is categorised as very close pack ice

The grey colour along the shore shows 10/10 ice cover that is attached to the coast and therefore does not drift, the so-called fast ice.



Source: Meteorological Institute

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The grey colour along the shore shows 10/10 ice cover that is attached to the coast and therefore does not drift, the so-called fast ice.

Ice terms

Gradually, an ice terminology has developed which varies somewhat from region to region, as well as internationally. In addition, the use of given ice terms has varied, because the ice has generally been described with regard to different vessels, and their ability to proceed through the ice. This occurs particularly with adjec-tives such as «thin», «light», «heavy», «severe», «even», etc.

INTERNATIONAL ICE NOMENCLATURE

In order to arrive at a more uniform assessment of the ice, the World Meteorological Organization published an ice glossary in 1970. In 1982, this was also published in Norwegian by *Det Norske Meteorologiske Institutt*. Apart from some abbreviations of the descriptions, this is repeated in its entirety in the following as a contribution to reaching an unambiguous understanding of the ice terms.

Ice terms arranged by subject:

1. FLOATING ICE: Any form of ice found flo ting in water.
   - 1.1 Sea ice: Any form of ice found at sea which has origina ted from the freezing of sea water.
   - 1.2 Glacier ice: Ice formed on land or in an ice shelf, found flo ting in water. The concept includes ice that is stranded or grounded.
   - 1.3 Lake ice: Ice formed on a lake, regardless of observed location.
   - 1.4 River ice: Ice formed on a river, regardless of observed location.

2. DEVELOPMENT
   - 2.1 New ice: A general term for recently formed ice.
     - 2.1.1 Frazil ice: Fine spicules or plates of ice,

suspended in water.

2.1.2 Grease ice: A later stage of freezing than frazil ice when the crystals have coagulated to form a soupy layer on the surface. Grease ice reflects little light, giving the sea a matt appearance.

2.1.3 Slush: Snow which is saturated and mixed with water on land or ice surfaces, or as a viscous flo ting mass in the water after a heavy snowfall.

2.1.4 Shuga: An accumulation of spongy whit ice lumps, a few centimeters across; they are formed from grease ice or slush and sometimes from anchor ice rising to the surface.

2.2 Nilas: A thin elastic crust of ice.

2.2.1 Dark nilas: Nilas which is under 5 cm in thickness and is very dark in colour.

2.2.2 Light nilas: Nilas which is more than 5 cm in thick-ness and rather lighter in colour than dark nilas.

2.2.3 Ice rind: A brittle shiny crust of ice formed on a quiet surface.

2.3 Pancake ice: Cf 4.3.1

2.4 Young ice: Ice in the transition stage between nilas and first- ear ice, 10–30 cm in thickness.

2.4.1 Grey ice: Young ice 10–15 cm thick.

2.4.2 Grey-white ice: Young ice 15–30 cm thick.

2.5 First-year ice: Sea ice of not more than one winter's growth.

2.5.1 Thin first- ear ice: First-year ice 30–70 cm thick.

2.5.2 Medium first- ear ice: First-year ice 70–120 cm thick.

2.5.3 Thick first- ear ice: First-year ice over 120 cm thick.

2.6 Old ice: Sea ice which has survived at least one summer's melt.

2.6.1 Second-year ice: Thicker and less dense than first year ice. In contrast to multilayer ice, summer melting produces a regular pattern of numerous small puddles.

2.6.2 Multi-year ice: Up to 3 m or more thick which has survived at least two summers' melt. Hummocks even smoother than in second-year ice, and the ice is almost free of salt. Color, where bare, is usually blue.

3. FORMS OF FAST ICE

3.1 Fast ice: Sea ice which forms and remains fast along the coast, where it is attached to the shore, to an ice wall, to an ice front, between shoals or grounded icebergs. Vertical fluctuations may be observed during changes of sealevel. It may extend a few metres or several hundred kilometres from the coast. If it is thicker than about 2 m above sea-level it is called an ice shelf.

3.1.1 Young coastal ice: The initial stage of fast ice formation consisting of nilas or young ice, its width varying from a few metres up to 100–200 m from the shore line.

3.2 Icefoot: A narrow fringe of ice attached to the coast, unmoved by tides remaining after the fast ice has moved away.

3.3 Anchor ice: Submerged ice attached or anchored to the bottom.

3.4 Grounded ice: Floating ice which is aground in shoal water (cf stranded ice).

4. PACK ICE: Includes any area of driftng sea ice, other than fast ice.

4.1 Ice cover: The ratio of an area of ice of any concentration to the total area of sea surface.

4.2 Concentration: The ratio between visible sea area and ice given in tenth or eight parts.

4.2.1 Compact pack ice: Pack ice in which the concentration is 10/10 (8/8) and no water is visible.

4.2.2 Very close pack ice: Pack ice in which the concen-tration is 9/10 to less than 10/10 (7/8 to less than 8/8).

4.2.3 Close pack ice: Pack ice in which the concentration is 7/10 to 8/10 (6/8 to less than 7/8).

4.2.4 Open pack ice: Pack ice in which the concentration is 4/10 to 6/10 (3/8 to less than 6/8), with many leads and polynyas.

4.2.5 Very open pack ice: Pack ice in which the concentration is 1/10 to 3/10 (1/8 to less than 3/8) and water preponderates over ice.

4.2.6 Open water: Pack ice in which the concentration is 1/10 (1/8). Freely navigable.

4.2.7 Open water with glacier ice: A large area of freely navigable water in which sea ice is present in concentrations less than 1/10 (1/8). When there is no sea ice present, the area should be termed ice-free, even though icebergs are present.

4.2.8 Ice-free: No sea ice present.

4.3 Forms of flo ting ice:

4.3.1 Pancake ice: Predominately circular pieces of ice from 30 cm – 3 m in diameter and up to about 10 cm in thickness, with raised rims due to the pieces striking against one another. It may be formed on a slight swell from grease ice, shuga or slush or as a result of the breaking of ice rind, nilas or, under severe conditions of swell or waves, of grease ice. It also sometimes forms at some depth, at an interface between water bodies of different physical characteristics, from where it flo ts to the surface; its appearance may rapidly cover wide areas of water.

4.3.2 Floe: Any relatively fl t pieces of sea ice 20 m or more across. Floes are subdivided according to horizontal extent as follows:

4.3.2.1 Floe giant: Over 10 km across.

4.3.2.2 Floe vast: 2–10 km across.

4.3.2.3 Floe big: 500–2000 m across.

4.3.2.4 Floe medium: 100–500 m across.

4.3.2.5 Floe small: 20–100 m across.

4.3.3 Ice cake: Any relatively fl t piece of sea ice less than 20 m across.

4.3.3.1 Small ice cake: An ice cake less than 2 m across.

4.3.4 Floeberg: A massive piece of sea ice com posed of a hummock, or a group of hum mocks frozen together, and separated from any ice surroundings. It may typically protrude up to 5 m above sealevel.

4.3.4.1 Floebit: A relatively small piece of sea ice, normally not more than 10 m across composed of (a) hummock(s) or part of (a) ridge(s) frozen together and separated from any surroundings. It typically protrudes up to 2 m above sea level.

4.3.5 Ice breccia: Ice of different stages of development frozen together.

4.3.6 Brash ice: Accumulations of flo ting ice made up of fragments not more than 2 m across, the wreckage of other forms of ice.

4.4 Arrangement.

4.4.1 Ice field: Area of flo ting ice consisting of any size of floe , which is greater than 10 km across (cf. patch).

4.4.1.1 Large ice field: An ice field over 20 km across.

4.4.1.2 Medium ice field: An ice field 15–20 km across.

4.1.3 Small ice field: An ice field10–15 km a oss.

4.4.1.4 Ice patch: An area of flo ting ice less than 10 km across.

4.4.2 Ice massif: A variable accumulation of close or very close ice covering hundreds of square kilometers which is found in the same region every summer.

4.4.3 Belt: A large feature of drift ice arrange ment; longer than it is wide; from 1 km to more than 100 km in width.

4.4.4 Tongue: A projection of the ice edge up to several kilometers in length, caused by wind or current.

4.4.5 Strip: Long narrow area of flo ting ice, about 1 km or less in width.

4.4.6 Bight: An extensive crescentshaped indentation in the ice edge, formed by either wind or current.

4.4.7 Ice jam: An accumulation of broken river ice or sea ice caught in a narrow channel.

4.4.8 Ice edge: The demarcation at any given time between the open sea and sea ice of any kind, whether fast or drifting.

4.4.8.1 Compacted ice edge: Close, clear-cut ice edge compacted by wind or current; usually on the windward side of an area of drift ice.

4.4.8.2 Diffuse ice edge: Poorly defined ice edge limiting an area of dispersed ice; usually on the leeward side of an area of drift ice.

4.4.8.3 Ice limit: Climatological termreferring to the extreme minimum or extreme maximum extent of the ice edge in any given month or period based on observations over a number of years.

4.4.8.4 Mean ice edge: Average position of the ice edge in any given month or period based on obser vations over number of years.

4.4.8.5 Median ice edge: Median (50% occurrence) position of the ice edge in any period based on a sufficien number of observations (cf. ice limit and mean iceedge)

4.4.8.6 Fast-ice edge: The demarcation at any given time between fast ice and open water.

4.4.9 Ice boundary: The demarcation at an given time between fast ice and drift ice or between areas of drift ice of different concentrations (cf. ice edge).

4.4.9.1 Fast ice boundary: The ice boundary at any given time between fast ice and drift ice.

4.4.9.2 Concentration boundary: A line approximating the transition between two areas of drift ice with distinctly diffrent concentrations.

4.4.10 Iceberg tongue: Cf. 10.4.2.

5. FLOATING-ICE MOTION PROCESSES

5.1 Diverging: Ice fields or floes in an area are subjected to diverging or dispersive motion, thus reducing ice concentration and/or relieving stresses in the ice.

5.2 Compacting: Pieces of flo ting ice are said to be compacting when they are subjected to a converging motion, which increases ice concentration and/or produces stresses which may result in ice deformation.

5.3 Shearing: An area of drift ice is subject to shear when the ice motion varies significant y in the direction normal to the motion, subjecting the ice to rotational forces.

6. DEFORMATION PROCESSES

6.1 Fracturing: Pressure process whereby ice is permanently deformed, and rupture occurs.

6.2 Hummocking: The pressure process by which sea ice is forced into hummocks.

6.3 Ridging: The pressure process by which sea ice is forced into ridges.

6.4 Rafting: Pressure processes whereby one piece of ice overrides another.

6.4.1 Finger rafting: Amended by ETSI-I (2001) to read: Type of rafting whereby interlocking thrusts are formed like «fingers» alternately over and under the other.

6.5 Shore ice ride-up: A process by which ice is pushed ashore as a slab.

6.6 Weathering: Processes of ablation and accumulation which gradually eliminate irregularities in an ice surface.

7. OPENINGS IN THE ICE

7.1 Fracture: Any break or rupture through very close ice, compact ice, consolidated ice, fast ice, or a single flo resulting from deformation processes. Length may vary from a few meters to many kilometers.

7.1.1 Crack: Any fracture of fast ice, consolidated ice or a single floe which may have been followed by separation ranging from a few centimeters to 1 m.

7.1.1.1 Tide crack: Crack at the line of junction between an immovable ice foot or ice wall and fast ice, the latter subject to rise and fall of the tide.

7.1.1.2 Flaw: A narrow separation zone between drift ice and fast ice, where the pieces of ice are in chaotic state; it forms when drift ice shears under the effect of a strong wind or current along the fast ice boundary (cf. shearing).

7.1.2 Very small fracture: 1 to 50 m wide.

7.1.3 Small fracture: 50 to 200 m wide.

7.1.4 Medium fracture: 200 to 500 m wide.

7.1.5 Large fracture: More than 500 m wide.

7.2 Fracture zone: An area which has a great number of fractures.

7.3 Lead: Any fracture or passage-way through sea ice which is navigable by surface vessels.

7.3.1 Shore lead: A lead between drift ice and the shore or between drift ice and an ice front.
7.3.2 Flaw lead: A passage-way between drift ice and fast ice which is navigable by surface vessels.
7.4 Polynya: Any non-linear shaped opening enclosed in ice. Polynyas may contain brash ice and/or be covered with new ice, nilas or young ice.
7.4.1 Shore polynya: A polynya between drift ice and the coast or between drift ice and an ice front.
7.4.2 Flaw polynya: A polynya between drift ice and fast ice.
7.4.3 Recurring polynya: A polynya, which recurs in the same position every year.

8. ICE-SURFACE FEATURES
8.1 Level ice: Sea ice which has not been affected by deformation.
8.2 Deformed ice: A general term for ice which has been squeezed together and in places forced upwards (and downwards).
8.2.1 Rafted ice: Type of deformed ice formed by one piece of ice overriding another.
8.2.1.1 Finger rafted ice: Type of rafted ice in which floes thrust «fingers» alternately over and under the other.
8.2.2 Ridge: A line or wall of broken ice forced up by pressure. May be fresh or weathered. The sub-merged volume of broken ice under a ridge, forced downwards by pressure, is termed an ice keel.
8.2.2.1 New ridge: Ridge newly formed with sharp peaks and slope of sides usually 40°. Fragments are visible from the air at low altitude.
8.2.2.2 Weathered ridge: Ridge with peaks slightly ounded and slope of sides usually 30° to 40°. Individual fragments are not discernible.
8.2.2.3 Very weathered ridge: Ridge with tops very rounded, slope of sides usually 20–30°.
8.2.2.4 Aged ridge: Ridge which has under-gone considerable weathering. These ridges are best described as undulations.
8.2.2.5 Consolidated ridge: A ridge in which the base has frozen together.
8.2.2.6 Ridged ice: Ice piled hapha zardly one piece over another in the form of ridges or walls. Usually found in first ear ice (cf. ridging).
8.2.2.6.1 Ridged ice zone: An area in which much ridged ice with similar characteristics has formed.
8.2.2.7 Shear ridge: An ice ridge formation which develops when one ice feature is grinding past another. This type of ridge is more linear than those caused by pressure alone.
8.2.2.7.1 Shear ridge field: Ma y shear ridges side by side.
8.2.3 Hummock: A hillock of broken ice which has been forced upwards by pressure. May be fresh or weathered. The submerged volume of broken ice under the hummock, forced down-wards by pressure, is termed a bummock.
8.2.3.1 Hummockedice:Seaicepiledhaphazardly one piece over another to form an uneven surface.When weathered, has the apperance of smooth hillocks.
8.2.3.2 Rubble field: An area of extremely deformed sea ice of unusual thickness formed during the winter by the motion of drift ice against, or around a protrud-ing rock, islet or other obstruction.
8.3 Standing floe: A separate floe standing vertically or inclined and enclosed by rather smooth ice.
8.4 Ram: An underwater ice projection from an ice wall, ice front, iceberg or flo . Its formation is usually due to a more intensive melting and erosion of the unsubmer-ged part.
8.5 Bare ice: Ice without snow cover.
8.6 Snow-covered ice: Ice covered with snow.
8.6.1 Sastrugi: Sharp, irregular ridges formed on a snow surface by wind erosion and deposition.
8.6.2 Snowdrift: An accumulation of windblown snow deposited in the lee of obstructions or heaped by wind eddies. A crescentshaped snowdrift, with ends pointing downwind, is known as a snow barchan.

9. STAGES OF MELTING
9.1 Puddle: An accumulation on ice of melt-water, mainly due to melting snow, but in the more advanced stages also to the melting of ice. Initial stage consists of pat ches of melted snow.
9.2 Thawholes:Verticalholesinseaiceformedwhensurface puddles melt through to the underlying water.
9.3 Dried ice: Sea ice from the surface of which melt-water has disappeared after the formation of cracks and thaw holes. During the period of drying, the surface whitens.
9.4 Rotten ice: Sea ice which has become honeycombed and which is in an advanced state of disintegration.
9.5 Flooded ice: Sea ice which has been flooded by melt water or river water and is heavily loaded by water and wet snow.
9.6 Shore melt: Open water between the shore and the fast ice, formed by melting and/or as a result of river discharge.

10.ICE OF LAND ORIGIN
10.1 Firn: Old snow which has recrystallized into a dense material. Unlike ordinary snow, the particles are to some extent joined together; but, unlike ice, the air spaces in it still connect with each other.
10.2 Glacier ice: Ice in, or originating from, a glacier, whether on land or flo ting on the sea as icebergs, bergy bits or growlers.
10.2.1 Glacier: A mass of snow and ice continu-ously moving from higher to lower ground or, if aflo t, continuously spreading.
10.2.2 Ice wall: An ice cliff forming the seaward margin of a glacier which is not aflo t. An ice wall is aground, the rock basement being at or below sea-level (cf. ice front).
10.2.3 Ice stream: Part of an inland ice sheet in which the ice fl ws more rapidly and not necessarily in the same direction as the sur-rounding ice. The margins are sometimes clearly marked by a change in direction of the surface slope but may be indistinct.
10.2.4 Glacier tongue: Projecting seaward exten-

sion of a glacier, usually aflo t. In the Antarctic, glacier tongues may extend over many tens of kilometers.

10.3 Ice shelf: A flo ting ice sheet of considerable thickness showing 2–50 m or more above sea-level, attached to the coast. Usually of great horizontal extent and with a level or gently undulating surface. Nourished by annual snow accumulation and often also by the seaward extension of land glaciers.

10.3.1 Ice front: The vertical cliff forming the sea ward face of an ice shelf or other flo ting glacier varying in height from 2–50 m or more above sealevel (cf. ice wall).

10.4 Calved ice of land origin.

10.4.1 Calving: The breaking away of a mass of ice from an ice wall, ice front or iceberg.

10.4.2 Iceberg: A massive piece of ice of greatly varying shape, protruding more than 5 m above sealevel, which has broken away from a glacier, and which may be aflo t or aground. Icebergs may be described as tabular, domeshaped, sloping, pinnacled, weathered or glacier-bergs.

10.4.2.1 Glacier berg: An irregularly shaped iceberg.

10.4.2.2 Tabular berg: A fl t-topped iceberg. Most tabular bergs form by calving from an ice shelf and show horizontal banding (cf. ice island).

10.4.2.3 Iceberg tongue: A major accumulation of icebergs projecting from the coast, held in place by grounding and joined together by fast ice.

10.4.3 Ice island: A large piece of flo ting ice protruding about 5 m above sea-level, which has broken away from an Arctic ice shelf, having a thickness of 30–50 mandan area of from a few thousand sq.m to 500 km² or more, and usually characterized by a regularly undulating surfacewhich gives it a ribbed appearance from the air.

10.4.4 Bergy bit: A large piece of flo ting glacierice, generally showing less than 5 m above sea-level but more than 1 m and normally about 100–300 m² in area.

10.4.5 Growler: Piece of ice smaller than a bergy bit and flo ting less than 1 m above the sea surface, a growler generally appears whith but sometimes transparent or blue-green in colour. Extending less than 1 m above the sea surface and normally occupying an area of about 20 m², growlers are difficul to distinguish when surrounded by sea ice or in high sea state.

11. SKY AND AIR INDICATIONS

11.1 Water sky: Dark streaks on the underside of low clouds, indicating the presence of water features in the vicinity of sea ice.

11.2 Ice blink: A whitish glare on low clouds above an accumulation of distant ice.

11.3 Frost smoke: Fog-like clouds due to contact of cold air with relatively warm water, which can appear over openings in the ice, or leeward of the ice edge, and which may persist while ice is forming.

12. TERMS RELATING TO SURFACE SHIPPING

12.1 Beset: Situation of a vessel surrounded by ice and unable to move.

12.2 Ice-bound: A harbour, inlet, etc. is said to be icbound when navigation by ships is prevented on account of ice, except possibly with the assistance of an ice-breaker.

12.3 Nip: Ice is said to nip when it forcibly presses against a ship. A vessel so caught, though undamaged, is said to have been nipped.

12.4 Ice under pressure: Ice in which deformation proces ses are actively occurring and hence a potential impediment or danger to shipping.

12.5 Difficult a ea: A general qualitative expression to indicate, in a relative manner, that the severity of ice conditions prevailing in an area is such that navigtion in it is difficult

12.6 Easy area: A general qualitative expression to indicate in a relative manner, that ice conditions prevailing in an area are such that navigation in it is not difficult

12.7 Area of weakness: A satelliteobserved area in which either the ice concentration or the ice thickness is significant y less than that in the surrounding areas. Because the condition is satellite observed, a precise quantitative analysis is not always possible, but navigation conditions are significant y easier than in surrounding areas.

12.8 Ice port: An embayment in an ice front, often of a temporary nature, where ships can moor alongside and unload directly onto the ice shelf.

13. TERMS RELATING TO SUBMARINE NAVIGATION

13.1 Ice canopy: Drift ice from the point of view of the submariner.

13.2 Friendly ice: From the point of view of the submariner, an ice canopy containing many large skylights or other features which permit a submarine to surface. There must be more than ten such features per 30 nautical miles (56 km) along the submarine's track.

13.3 Hostile ice: From the point of view of the submariner, an ice canopy containing no large sky lights or other features which permit a submarine to surface.

13.4 Bummock: From the point of view of the submariner, a downward projection from the underside of the ice canopy; the counterpart of a hummock.

13.5 Ice keel: From the point of view of the submariner, a downward-projecting ridge on the underside of the ice canopy; the counterpart of a ridge. Ice keels may extend as much as 50 m below sea-level.

13.6 Skylight: From the point of view of the submariner, thin places in the ice canopy, usually less than 1 m thick and appearing from below as relatively light, translucent patches in dark surroundings. The under surface of a skylight is normally fl t. Skylights are called large if big enough for a submarine to attempt to surface through them (120 m), or small if not.

Navigation in ice

To be able to navigate a vessel safely through waters with dif-ficult ice conditions is not something one can do by studying alone, but requires long practical experience of navigatio in pack ice. For those who do not have this experience, it will, however, be useful to summarize some of the general experience obtained through such navigation.

The first condition for a successful result is that one knows one's vessel with regard to its maneuvering abilities and capacity to endure the stresses in the ice. One should know, for example, whether the engines are suitable so that the vessel, even during an attempt at full speed, can ram an ice flow without suffering damage. Vessels which are not ice strengthened should not go alone into pack ice which covers more than 4/10 of the sea surface; and even then only when it is known that it is a matter of a strip of ice which will be passed, or that the vessel can come out again quickly on the same side.

When navigating in ice, it is a matter of taking the vessel forward towards the destination with the least possible forcing without deviating too much from the main course. The best conditions from navigating in pack ice are days with clear air and an even, thin cloud cover. When a vessel approaches the ice, at a long distance the ice will be noticeable by ice blink (ice sky) and course can be set in the direction where the water sky is nearest. If it is a comparatively narrow stretch of ice, the water sky will be able to show beyond the ice blink, and on steers then towards the narrowest part of the ice blink. Dark strips in the ice blink indicate that there are leads or open water in the ice. If there are no such obvious signs of water sky, one steers in the direction where the ice blink is least sharp, as the pack ice is probably more scattered there. After snowfall, the reflections in the clouds become sharper and the signs consequently easier to interpret.

With a cloud free sky, there cannot be any ice blink in the usual sense, but a yellow-white haze can indicate the existence of ice. Under such conditions, an ice edge far beyond the horizon can also be mirage. The ice can then appear thicker than it is in reality, and the reflection often shows inverted and «waving» in the air. Where there may be openings in the ice, the reflections will ppear to be broken by a dark blue colour.

Frost smoke and fog can be seen at long distance, often from near the ice edge. The frost smoke occurs when cold air blows over the open water in the ice or out from the ice edge. Fog also generally lies over the ice when comparatively warm air blows in from the open sea.

In less visibility, such as at night or in misty and foggy weather, one must be observant of other signs. The best safeguard against unpleasant surprises is an extra sharp lookout. Brash ice will usually give warning in good time of the ice edge itself, except when the wind and current direction is such that all the ice is packed together with compacted edge. Other signs of ice are a sudden fall of temperature for example, or that the seawater temperature falls to 0° or colder at the surface. The waves subside and the wind becomes more even when it blows from the ice edge. In calm weather with fog and with swell running towards the ice edge, the breaking can be heard far away. The ice is surrounded by a weak light glare so that the fog appears milky white, and vessels proceeding at slow speed can avoid collision with ice bergs and heavier ice floes by paying attention to this. In thick fog (especially with clear skies), thick rainy weather and on dark autumn nights, occasional ice bergs are the greatest danger, as a part from any calved ice, there is no sign to indicate that they are present in the waters. If there is any such danger present, the vessel should heave to if conditions allow. Anchoring can be dangerous, unless it is done in shallow water, as ice bergs can come drifting at a rather high speed.

Before one proceeds into the ice, the ice conditions must be thoroughly studied from the mast top, when one notes the openings, polynya, ice thickness, any rotten ice etc. Generally speaking, direction of the vessel should be carried out from the crow's nest, as one will have the best view from there. It will give good guidance on the thickness and division of the ice ahead by comparing it with the ice already passed. When it comes to assessing the possibility of forcing through the nearest ice, this can be done just as well from the bridge, as from there it will be easier to judge the thickness and structure of the individual floes, and thereby the best point for breaking through the ice.

R/V «Lance» in the ice
Foto: Jon Aars, Norwegian Polar Institute

The controller of the forcing must have good knowledge of the vessel's strength and efficiency, as he of course selects the means of progress which spares the vessel most without deviating from the main direction. If the ice is compact, it is often profitable to go along the ice edge until more open ice is found. If the wind blows against the ice edge, looser ice can be expected some way inside it, whereas in the opposite case, tighter ice can be expected. When steering into or out of the ice, order a direction as far as possible at right angles to the ice edge. If the ice edge is heavy and compact with the sea right in, the vessel will be exposed to heavy shocks or pressure with any forcing.

Under way in new ice, rotten ice or such, stress on the vessel and engines is least when speed can be held evenly against en even pressure. Otherwise, passage is made by bowing, boring and turning.

Ice can be the large and slightly heavier ice floes which are naturally the best point of breaking through the ice. The vessel is directed in towards these and with suitable course driven at full speed if necessary. Immediately before the ice rammed, engines are stop-ped. If the stem is rounded, it is forced some way up on the ice, which is then most often broken by the vessel's weight. If the ice does not yield, the vessel will shake heavily, roll easily, and usually slide back down from the ice floe by itself. If the vessel has a tendency to drive up too high, so that there is danger of remaining stranded, full speed astern must be turned already before forward movement has stopped. The bowing is repea-ted if necessary at the same point of attack until crack forma-tion appears, which will gradually widen to allow passage. The crack should open more than width of the vessel, as otherwise there is danger of the vessel becoming fast in the ice if it tries to force further in. In such cases, one should study to try forcing in another place. Sometimes, adjoining floes can press so hard that the crack does not open, and it may be necessary to push these away first, preferably to leeward if there is wind in the area. Work always with the ice and not against it.

Boring and turning are the most effective methods of working way forward through tight pack ice along leads and cracks. When boring, a crack between 2 floes is attacked, and as the vessel squeezes in, full rudder is used. When such forward movement ceases, put the helm hard over to the opposite side with engines at half speed. Continue until the floes give way and a lead is formed large enough to allow the vessel to con-tinue forwards. If one is not successful in going forwards by bowing or boring, one can try to turn the floe away, preferably to leeward.

The bow is brought up against the floe which can most easily be moved, and with helm hard over and full speed on the engines, use the vessel as a turning point, when the floe is gradually turned away. During all these operations, stop must be rung on the engines when a hard contact is expected, in order to get away again – usually at full speed – when contact with the ice is attained. During such maneuvers, one should also have a special lookout astern, to keep an eye on that the rudder and propellers do not become damaged by the ice. Any underwater foot can be particularly dangerous. The danger of suffering damage to the rudder and propellers can be reduced somewhat by trimming the vessel down astern, but if there is a strong wind, this can be less successful as the bow then forms a large wind trap. Generally, one will obtain the best results, with least possible risk to rudder and propellers, by using large rudder angles and short periods with large engine power.

A vessel which has driven itself fast can use several methods, and usually in combination, to get itself loose again. A usual method is to lay out an ice anchor and to use it as a warp, as well as at the same time filling and emptying the forwards and aft tanks. For a smaller vessel, it can also be useful to make it roll by help of a heavy object on the boom, which is carried from side to side. It often pays to work out of the ice by polling away floes in the vicinity to make room for those which are to be pushed away from the vessel. In any use of explosives, the charge must be placed well down, or preferably beneath the ice some way from the vessel, in order to achieve the best result, when at the same time the danger to the vessel is least.

Out at sea, the pack ice will have a tendency to slacken towards flood tid , and tighten towards ebb.

A vessel which has become fast in the ice must keep the life saving gear ready. In precarious situations, the lifeboats should be set down on the ice in the vicinity with the necessary provisions and equipment, as in the worst case, the vessel can be destroyed in an instant. When two openings in the ice are separated by a neck of ice, one must not try to force through if the ice is pressed together or there is tendency to hummocking. No vessel can withstand the pressure which develops under such conditions, and one may only wait and try to avoid everything which may bring the vessel into such an area.

If the vessel gets into very thick ice which moves quickly with the current, it can occasionally be advantage to drop the ice anchor on one of the larger floes, preferably in a bight of the floe edge. It is also possible to drive at full speed into a floe and remain lying there as in a dock. The ice floes do not remain in the same position in relation to each other, as they drift at dif-ferent speeds, and polynyas which offers a favorable opportunity to continue will form now and then. If it is possible, smaller vessels should choose the lee side of a thick floe which stands on the bottom, as this will shelter the vessel against passing ice bergs. The relative position of the ice floes also changes more quickly while the vessel maintains its position. One must, however, by regular sounding, check that it is not too shallow when one approaches a shoal.

Should visibility become poor, a vessel which works forward through cracks and leads in tight pack ice should stop and use the ice anchor, as otherwise, it can easily come up into completely close ice, and it can then be difficult to get out again even if the visibility improves. If, however, one goes into broken ice and poor visibility occurs, it is not advisable to stop, but continue carefully at slow speed. If not, the ice can quickly close again around the stern. When the ice is forced together by wind from the open sea, and the temperature is above freezing point, the ice will open again as soon as the wind drops because of the pressure from the hummocked ice which had formed.

Ridges are formed across the direction of movement of the ice, whereas leads and cracks on the other hand generally go with the direction of movement. When a vessel has got into ice difficultie , and wishes to try to get out again into open sea to avoid delay or getting beset, it is almost always most advisable to turn back the same way in which it entered. It has often been shown that difficulties become greater when another route is chosen. Even though the vessel has got into the ice almost at a tangent to the supposed direction of the ice edge, one should not choose the direct route out again unless the ice edge is visible, or another vessel in the vicinity can report by radio that it can see the ice edge. Water sky is not to relied on completely, when it only needs to indicate a large lead or polynya. The least trace of swell is in general a good guidance.

With offshore winds, a lead is usually formed between land and the pack ice. This shore lead is often used by vessels and under such conditions – as well as when at anchor in a bay or the like – one must be ready for whatever must be done in case the wind should turn to an onshore wind. In such case the vessel should go towards the lee side of an islet or any stranded ice berg if posible. If there are no such possibilities, the vessel must try to get out of the ice in time in order to risk being beset or carried on the shoal or shore. One must particularly keep clear of capes, as the pressure is greatest off them.

If a collision with an ice berg is not to be avoided, one must try to let the vessel receive the impact direct on the bow, as the strain thereby becomes the least possible, and at the same time, the danger is reduced that an under-water foot can tear out the bottom or damage rudder and propellers. Generally, one must be aware that the direction and speed of drift of an ice-berg and the pack ice around are usually different, as the current has considerably greater – and the wind less – influence on the deep draught ice bergs, than the pack ice. Grounded ice floes are a clear sign of foul water, and the echo sounder must be kept going. On the other hand, the waters are navigable within the bays where there are ice bergs, and in the sounds where ice bergs and calf ice drift through. Here, however, one must be aware that a tidal current in the same direction can suck outside ice into the sound and pack it together. Several vessels have been crushed in such conditions. A good aid to avoid grounding in unknown and unsounded waters will be to proceed with an anchor paid out at a suitable depth – if the permits – and keep it there by the winch brakes without using the stoppers.

Sailing along a glacier front

In recent years there have been some unfortunate incidents where vessels in the fjords have sailed too close when glacier fronts have calved. This has caused both personal injury and material damage. When navigating close to a glacier front the mariner should therefore exercise great care and watch for the following changes:

- Calving is a random process. It is not possible to predict when an ice block may collapse, how big it will be or how it will fall into the sea.
- 200 metres is considered a reasonable minimum distance to avoid the direct affect of the largest waves that follow a calving incident.
- A safe distance cannot be assessed out from the height of an

ice front because the «hinge point» of the falling ice block may well lie deep below the water surface. Additionally, large ice blocks of ice can break loose below the water sur-face and may then move outwards, depending on the height of the ice front.

– The waves in the «splash zone» around the ice block are large, unpredictable and dangerous, especially for smaller vessels
– Farther away from the «Splash Zone» the waves lessen and become more regular, making it easier for vessels to ride them. The waves, however, increase when meeting shallower water or the shore, i.e. they become tsunami waves.
– Small boats should not land in the immediate proximity of an ice front.
– In some situations; in narrow fjords, shallow fjords or areas where the ice front is more than 40–50 metres high, vessels should maintain a distance of at least 200 metres.

Supplementing of water stocks from ice

Snow requires almost twice as much heat as ice to provide the same quantity of water. With regard to the economic operation of the vessel, it is therefore important to find ice fresh enough to be used as cooking water. New ice has high salinity, is comparatively soft, and has a fibrous and sheet like appearance. Practically, older ice (multi-year ice) gradually becomes like fresh ice – clear and blue – almost transparent, has a shell-shaped fracture surface and is harder than new ice. In summer, it often forms large pools with melted water on old floes of pack ice, and especially at the base of ridges it can be excellent fresh water if the ice beneath is thick and solid, not rotten and holed – in such a case it becomes brackish. The same can be the case if the pool lies so close to the ice edge that sea water washes or blows in over the edge.

Sea ice consists of clear ice crystals which enclose a multitude of small cavities filled with water of extra high salinity (brine). The ice will become less salty as the salt dissolves down through the ice and is finally carried away. When the ridges and ice floes have survived one summer or more, this ice will be almost without salt. The melt water which forms in pools on the ice in summer will then be entirely fresh, and can be used to supplement the vessel's water store.

The mechanisms of icing at sea

Icing at sea can be divided into two main types:
1. Atmospheric icing
2. Sea spray icing

The most important characteristics are briefly described in the following:

1. Atmospheric icing

Atmospheric icing is caused by freezing fresh water, which is supplied by either;
– super cooled drizzle or rain
– snow or sleet
– super cooled fog
– frost smoke

Super cooled drizzle/rain will form when the droplets fall from a layer of the atmosphere with temperature above 0 °C and through a layer close to the surface with sub-zero tempe-ratures.

Super cooled fog occurs when humid air is cooled down during transportation over cold landmasses or ice-covered waters, while frost smoke is a phenomenon which may arise over open sea at sub-zero temperatures when the temperature difference between surface water and air is at least 9 °C. The cold air, even if it is saturated, will contain little humidity. The air close to the sea surface will, however, be heated by the con-tact with the water, and approaches a temperature close to the sea surface temperature. This air will take up water vapour, and approaches saturation at its new temperature. Convection and wind will then mix this damp, relatively warm air with the cold air above. Hence the warm air will be cooled again, and part of its humidity will condense to supercooled waters droplets; frost smoke. This phenomenon is most common in Arctic regions close to land or ice-covered waters, but is also well known in Norwegian fjords during cold winter days.

As an illustration of the occurrence of frost smoke in the Barents Sea, the phenomenon can be observed 6–8% of the time during the winter months at Bjørnøya (Bear Island) and Hopen, while as far off the coast as Tromsøyflaket the probabi-lity of frost smoke in winter is reduced to about 1%.

A particular type of frost smoke is known and feared amongst seafarers in the North Atlantic as «black frost». The frost smoke is then extending above the bridge windows of the vessel, causing loss of sight. However, if frost smoke conditions are combined with strong winds leading to heavy turbulence and steady supply of new, cold air supporting the necessary temperature difference, the frost smoke can extend even higher. Frost smoke reaching an altitude of 100 m can be observed in the fjords.

Further off the coast (or ice pack) the frost smoke has ten-dency to dissolve if temperature difference between air and water is not maintained or rise to banks of low clouds with a typical level of a few hundred meters.

2. Sea spray icing

Sea spray icing is dependent on parameters such as:
– wind speed
– air temperature
– sea surface temperature
– salinity
– humidity
– droplet size and distribution
– sea state
– size and type of structure/vessel
– course and speed (of vessel)

Sea spray is generated in two different ways. The most important one is by impact between the waves and the structure/ vessel. The amount of this type of spray, which we call collision-generated sea spray, is affected the course and/or speed of the vessel. An angle of 15-45° relative to the waves speed. An angle relative to the waves of 15–45° will generate maximum spray, and spray will increase with increased vessel speed. The other type of spray, called spin-drift, is lifted from the wave crests by the wind.

This process will start at moderate wind speeds (about 20 knots), but will not contribute with spray of any significance at

ICING on R/V «Lance»
Photo: Jon Aars, Norwegian Polar Institute

deck level and higher until the wind has reached gale force (above 40 knots). However, this wind-generated spray is not influenced by the shape, size, speed or course of the structure or vessel in question. Wind speed and air temperature are the most important parameters affecting sea spray icing intensity. Wind speed has an obvious effect on the generation of sea spray. In addition it influences the cooling rate of the airborne dro-plets. The intensity of icing will steadily increase with decreas-ing air temperature from about – 2 °C (freezing temperature of sea water with a salinity of 35) and down to the lowest temperature to be anticipated in offshore operations.

The influence of the sea surface temperature on the icing intensity is less than for the wind speed and air temperature. It is of importance in initial stages of icing, i.e. at moderate wind speeds and air temperatures down to – 5 °C, but has a marginal influence at high icing intensities, i.e. high cooling rates of airborne droplets. It should be mentioned, however, that the sea temperature has indirect effects on the icing intensity:

– The air near the surface is heated by the sea water. Relatively warm surface water will decrease the duration and intensity of an icing event more than colder water, and hence reduce the resulting ice thickness.
– The heat potential in the surface water, even if the temperature is only slightly above 0 °C, has a de-icing effect in the wave-washing zone of a structure or a vessel.

Variations in salinity within ranges valid for the polar oceans have only minor effects on the icing intensity, but salinity infl - ences the properties of the accreted ice, and is therefore of importance when necessary de-icing energy input and appropriate de-icing techniques are discussed.

Methods for transforming the interrelations between parameters affecting sea spray icing to given icing intensities are available. Most of them are based on field data collected on smaller and moderately sized vessels. The most well-known of these methods are the icing diagrams published by the German meteorologist H. O. Mertins in 1967, see page 79. They are based on 400 reports of icing events on German trawlers operating in the North Atlantic waters, and have proven to give quite reliable results on that type of marine units.

When using the diagrams, however, it should be remembered that they are valid for only a narrow range of vessel sizes and speeds, since all reports are from trawling operations, with corresponding speeds from 2 to 5 knots. A vessel steaming at full speed will accrete considerably more ice than indicated in the diagrams. Hence there exist numerous reports of icing events with intensities far beyond the maximum intensity in Mertins' diagram. As an example, a skipper on a Norwegian purse seiner operating in the Barents Sea could tell about an ice build-up on one occasion of 10–15 cm/hour.

Sea spray icing is by far the most common type of icing, and usually the most serious of the two main types of offshore icing. Only 5-10 % of the recorded icing events in the North Atlantic waters are caused by atmospheric icing, alone or along with sea spray icing. There are examples, however, where atmospheric icing has caused very serious problems for moderately-sized vessels, and appearing at the same time as sea spray icing it will increase the total icing intensity, and may hence be decisive foe an accident to happen.

3. Characteristics of ice

Atmospheric and sea spray icing have some differences in features which should be mentioned. While sea spray icing will decrease with increasing height above sea level, atmospheric icing will form a more or less uniform layer of ice on all surfaces to the top of the structure or vessel. This is of importance on oil platforms, with their height above sea level of 10–100 m.

The properties of the accreted ice are different for atmospheric and sea spray icing. Atmospheric icing forms a freshwater ice which is tough and difficult to remove, while the saline ice formed by sea spray icing is normally more fragile, porous and filled with pockets of brine, and is therefore easier to remove, especially shortly after the formation. Drainage of brine will, however, take place continuously, and after some time the ice will be considerably more difficult to remove. This effect should be borne in mind when de-icing techniques are considered.

4. Vessel operations

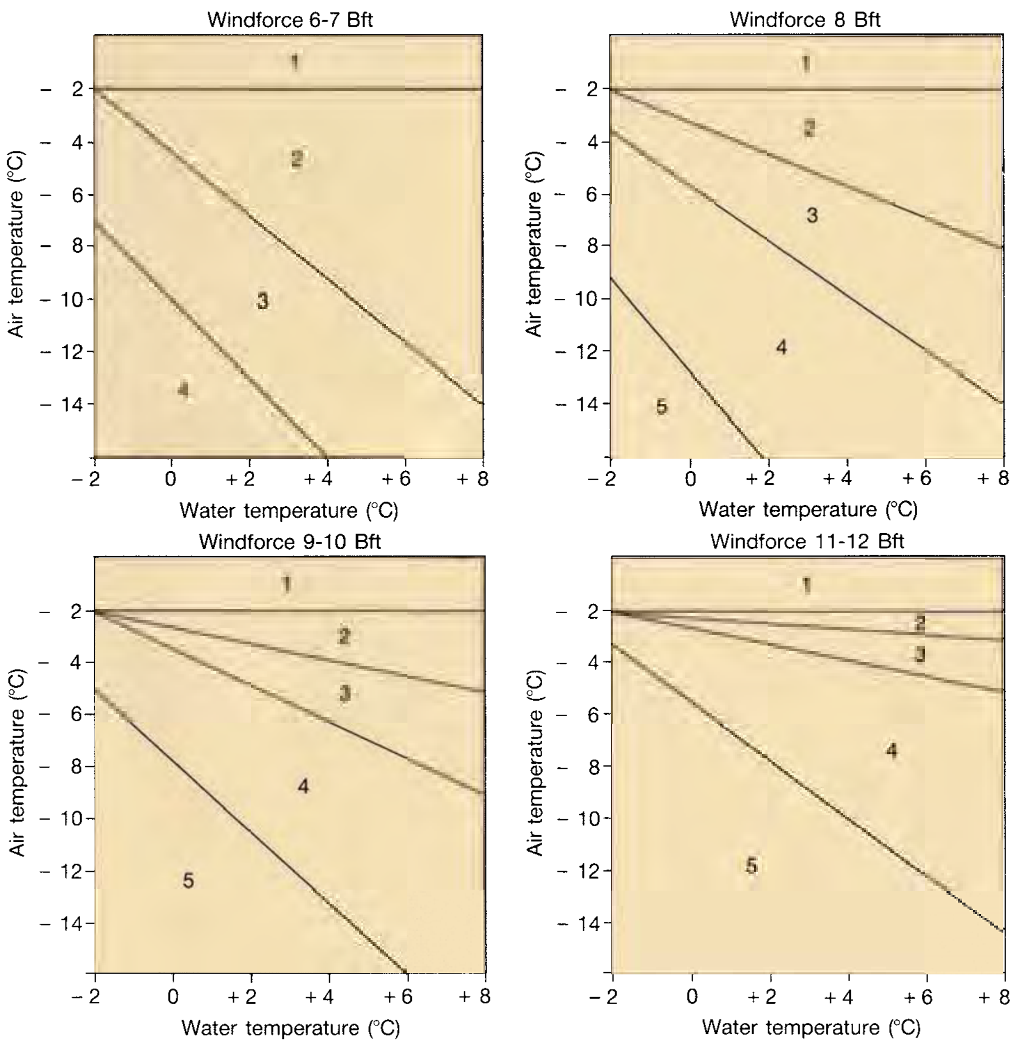
The most hazardous result of vessel icing is the extra top weight due to accretion of ice, which in extreme cases causes loss of stability and capsizing. More than 80 vessels are thus lost during a 15 years period in northern waters where icing is considered to be main factor.

Other effects of icing, less dramatic, but more frequently occurring, are listed below. In different ways they hamper operations and reduce personnel safety. The effects are related to smaller and medium-sized vessels in general. Specific vessel types are vulnerable to the effects in various extents:

– Small diameter components of water ice up easily. Icing on railings and foremast with stays and rigging may form a «curtain» of ice, and the corresponding sail effect makes it difficult or even impossible to keep a heading to the wind. This reduces the chances of keeping the vessel «dry» with respect to water on deck.
– If railings and freeing ports freeze, water on deck will be trapped, resulting in extra weight and reduced stability.
– Heavy icing on the fore body of a vessel results in a trim on the bow, which again may lead to poor steering properties and reduced speed. This is most unfavorable in an already difficult situ tion.
– Ice on aerials and antennas can cause short circuit, and hence reduce the ability of safe navigation and communication. A special type of slushy ice formed near 0 °C as a mixture of e.g. snow and sea spray can make a radar set completely blind by absorbing the electromagnetic radiation from the antenna.
– Ice on wheelhouse windows reduces the possibilities of safe maneuvering. However, electric heating of window glasses has reduced this problem, but during certain circumstances bridges of ice may form between the window frames, and the outlook is hampered even if the window glasses are free from ice.
– Rescue equipment as life boats, davits and infl table rafts are typical ice collectors, and the use of them in a critical situation can be very difficult, if icing occurs.
– During icing, hatches, winches and other deck equipment may be put out of operation until extensive deicing has taken place.
– Personnel safety is reduced due to slippery decks, ladders and railings, and even the slightest degree of icing is suffic - ent to achieve this. In addition extra hazards are exposed to personnel during de-icing operations in heavy weather, and final y the effect on the human body due to low temperatures and wind causes slowed-down reaction and danger of frost-bite.

5. Potential countermeasures

Many of the problems related to ice accretion can be reduced or even eliminated. This can be achieved by passive methods, like icing warnings and careful design of the units in question, or by active methods, like handling procedures and application of anti-icing/de-icing techniques:



Rate of iceing: 1. No
2. Low 1-3 cm/24 hours
3. Moderate 4-6 –»–
4. Heavy 7-14 –»–
5. Very heavy > 15 –»–

Fig 12

The table shows the icing on vessels under various wind, sea and air temperatures

Passive methods

A reliable forecast of icing events included in the established meteorological services will enable operators to prepare for the problems to come.

Active methods

If an icing event occurs, certain procedures can reduce ice accretion.

A vessel has a number of handling alternatives, depending on the circumstances. These are well known for an experienced captain, and could be such as speed reduction, course alteration, seeking shelter near land (or ice edge) and steaming into warmer waters.

Finally a type of ice control which gains increasing interest and consideration should be mentioned. That is installation of different types of anti- or de-icing that can be mechanical, thermal or chemical.

Tides

There is a general description of the tidal variations along the Norwegian coast, with definitions and constants, etc, in «The Norwegian Pilot» Volume 1. This section therefore deals only with the tidal variations around Svalbard, in the Barents Sea and Jan Mayen. The Norwegian Hydrographic Service has a permanent tide recorder in Ny-Ålesund. All other knowledge is based on short series of measurements and tidal models. The tide reproduces itself as a wave and this is again composed of many individual waves (harmonic variations). See «Den norske los» volume 1 for further explanation. The two most important individual waves are called M_2 and S_2, and the main contributors are the moon and the sun. Each wave has amplitude and a phase (harmonic constants) and table 1 shows M_2 and S_2 for places around Svalbard where we have sufficient y long recordings to determine the constants (at least 30 days). The magnitude Z_0 gives the height difference between Chart Datum (the Lowest Astronomical Tide) and Mean Sea Level. The tide table and tidal observations for Ny-Ålesund are available on Statens kartverk's internet page, www.vannstand.no.

Harmonic constants

Place	Position		M_2		S_2		Z_0
	N	E	H cm	g °	H cm	g °	cm
Dunøyane	77°04'	14°55'	49,3	17	18,4	62	97
Sveagruva	77°51'	16°39'	50,0	46	19,5	99	100
Trygghamna	78°14'	13°52'	50,3	26	19,0	71	99
Longyearbyen	78°13'	15°38'	52,2	25	19,9	70	105
Ny-Ålesund	78°56'	11°57'	45,7	33	17,0	80	91
Mosselbukta	79°54'	16°01'	35,5	70	13,5	120	71
Franklinsundet	80°15'	18°31'	28,7	71	12,3	130	58
Kinnvika	80°03'	18°11'	27,0	85	9,4	136	54
Strilane	79°32'	19°02'	28,0	109	8,7	163	56
Pescheløya	79°01'	20°57'	36,6	153	12,8	216	72
Henckeløyane	78°33'	20°10'	36,9	339	24,5	43	92

Table 1. Phase (g) and amplitude (H) to the two largest tidal constituents M2 and S2. Phases are calculated for time zone UTC + 1 (Norwegian normal time) and given in degrees, while amplitudes are expressed in cm. Z0 is the height difference between Chart Datum and Mean Sea Level.

The tidal wave in the easterly part of the Norwegian Sea is formed in the North Atlantic Ocean and spreads northwards between the Shetlands and the Færeøe Islands. Essentially, the wave follows the continental shelf in the boundary area between the North sea and the Norwegian Sea and then along the Norwegian coast, along the shelf between the Barents Sea and the Norwegian Sea, along the west coast of Svalbard and into the Arctic Ocean. In the Arctic Ocean the wave swings eastwards along the continental shelf. A part of the wave follows the Norwegian coast into the Barents Sea.

The propagation speed of the wave depends on the depth of water and it travels fastest in the deeper areas. The propagation rate is slight on the Barents Sea side where it is much shallower than the Norwegian Sea. Models also show that there is a so-called amphidromic point a little to the east of Bjørnøya. An amphidromic point is a place where there is almost no tidal variation and the tidal wave rotates around the point in a tidal cycle of approximately 12.5 hours. In Figure 1, which shows tidal heights and phases calculated from a mathematical model, the amphidromic point can be clearly seen.

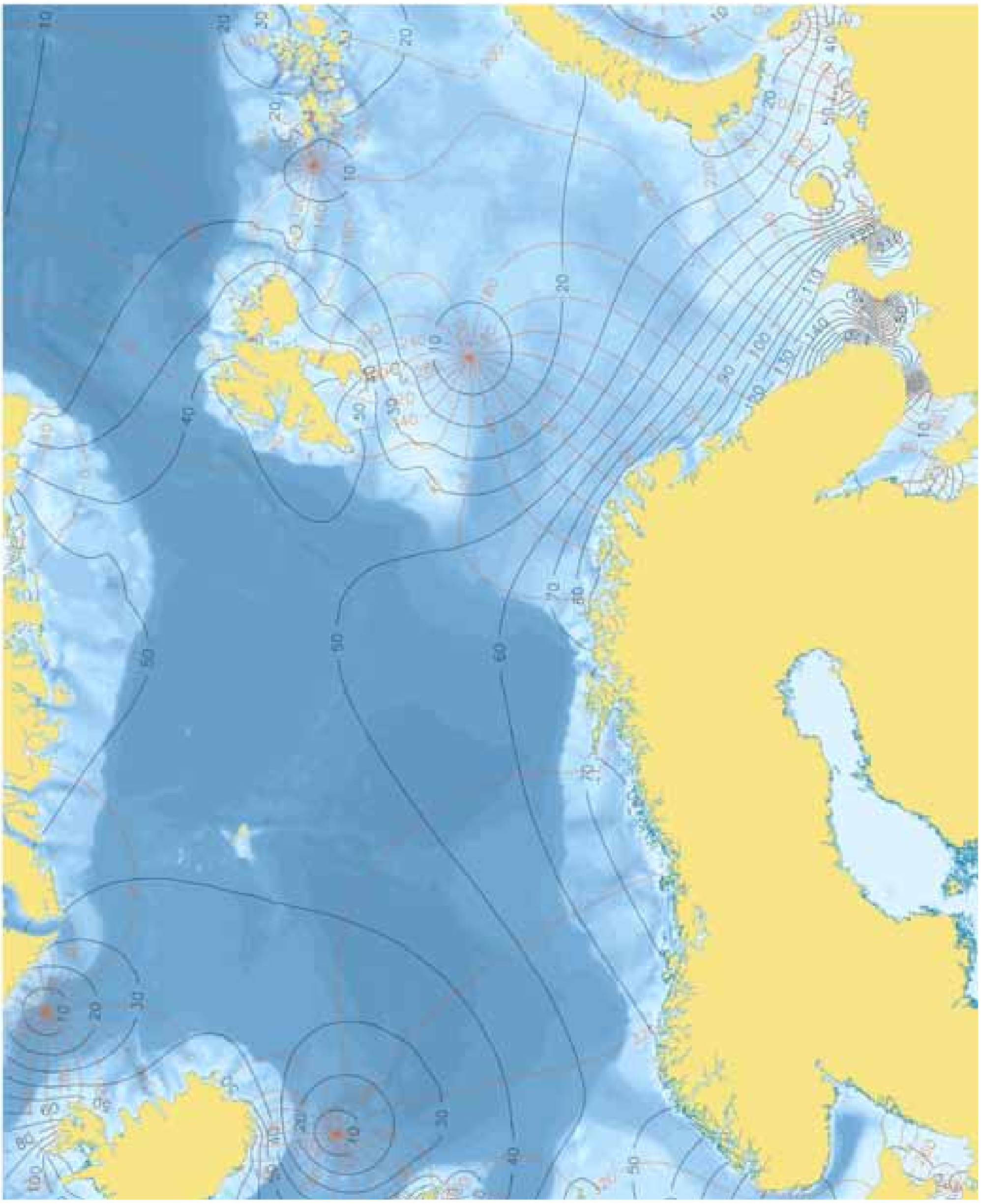


Figure 1, Phase and amplitude of the semi/diurnal constituent M2, which is due the moons influence, is the most important constituent in this area. Lines where the phase is constant are shown in purple. The phase is expressed in degrees and calculated in relation to the time zone UTC+ 1 (Norwegian Standard Time). A phase difference of 20 degrees corresponds to approximately 41 minutes. Lines where the amplitude is constant are shown in red. Amplitude is expressed in centimeters.

(Tidal Data is from a sea model prepared by the Norwegian Meteorological Institute. Coast lines from GSHHS. Depth Data from ETOP01.)

Every year the Norwegian Hydrographic Service takes tidal recordings at various sites around Svalbard, and there is enough material for the construction of a secondary port (table 2). This shows the time difference and the height correction factors between the tide in the secondary port and the tide in Longyearbyen. Accuracy is best on the west side of Spitsbergen. On the east side conditions are different and the values in the table must be considered as averages. The recordings indicate in particular that time delays can vary considerably during the course of one month but there is, however, an impression of when high and low water occur.

Secondary Ports table, with Longyearbyen as the standard port

Sekundary port	Position		Tim correction (t = hrs)	Height correcton factor
	North	East		
Hornsund	76°57'	15°46'	-20 min	0,92
Dunøyane	77°04'	14°55'	-16 min	0,94
Sveagruva	77°51'	16°39'	46 min	0,96
Trygghamna	78°14'	13°52'	2 min	0,96
Longyearbyen	78°13'	15°38'	0 min	1,00
Forlandsrevet, sørsiden	78°40'	11°09'	4 min	0,96
Ny-Ålesund	78°56'	11°57'	17 min	0,88
Magdalenefjorden	79°33'	11°02'	40 min	0,86
Virgohamna	79°43'	10°55'	4 min	0,80
Norskøyane	79°50'	11°33'	60 min	0,78
Worsleyhamna	79°42'	13°36'	1 t 25 min	0,74
Mosselbukta	79°54'	16°01'	1 t 35 min	0,68
Franklinsundet	80°15'	18°31'	1 t 35 min	0,55
Kinnvika	80°03'	18°11'	2 t 00 min	0,52
Strilane	79°32'	19°02'	2 t 50 min	0,54
Sofiaøya	79°14'	20°05'	3 t 55 min	0,59
Pescheløya	79°01'	20°57'	4 t 15 min	0,70
Kapp Bessels	78°35'	21°47'	4 t 40 min	0,71
Halvmåneøya	77°15'	23°10'	7 t 30 min	0,72
Henckeløyane	78°33'	20°10'	-1 t 30 min	0,77
Hopen	76°31'	25°04'	7 t 20 min	0,48
Bjørnøya N, Herwighamna	74°30'	18°59'	17 min	0,92
Bjørnøya S, Sørhamna	74°22'	19°10'	-25 min	0,49
Bjørnøya, Austervåg	74°29'	19°12'	35 min	0,66
Jan-Mayen	70°58'	-08°41'	-23 min	0,79

Table 2. The time difference and height ratio is between the tide in a selected secondary port in Svalbard, Bjørnøya and Jan Mayen, and the standard port of Longyearbyen. The time delay is given in hours and minutes and the height correction factor is the relationship between the tidal height in the secondary port and in the standard port (Longyearbyen). The tidal height at the current location is found by multiplying the tidal height in Longyearbyen by the height correction factor.

Ocean currents in the Barents Sea

Institute of Marine Research

Water masses

There are three main water masses with associated current systems in the Barents Sea. These are Coastal Water, Atlantic Water and Arctic Water and they are distributed as indicated in figu e 2.

The coastal water has salinity lower than 34.8 (34.8 grams salt per kg of sea water). This salinity occurs in the boundary area with the Atlantic Water, while it decreases towards the coast. In the Coastal Water, the salinity is lowest in summer because of river runoff from land. The temperature at the surface varies greatly through the year, and from year to year. Off Troms, it varies between 8–12 °C in summer, and between 3.5–5.5 °C in winter. Further east, off Vardø, both the summer and winter temperatures are 1–2 °C lower. The most typical feature of the Atlantic Water is that the level of salinity is greater than 35.0. This salinity occurs in the Atlantic Water along the west coast of Spitsbergen and in the Barents Sea east to about 30° E. Further east in the Barents Sea the salinity decreases somewhat, but the Atlantic Water can be traced to the coast of Novaja Zemlya. The maximum temperature at the surface varies between 8–10°C off Tromseøfla et and decreases then both eastwards into the Barents Sea and northwards along Spitsbergen (figu e 2). In winter, the temperature at the surface decreases to 3–4°C, decreasing gradually both northwards and eastwards to about 0 °C near the ice edge.

The Arctic Water has salinity of less than 34.8 and temperature lower than 0 °C. This water mass covers the northern part of the Barents Sea and the coastal region close to Spitsbergen. In winter these water masses are almost always ice covered. The ice melt in summer forms a surface layer (10–20 m) of melt water with low salinity, and the temperature in this water layer rises to 2–4 °C.

The area where the Atlantic Water and the Arctic Water meet and mix is called the Polar Front (figu e 2). The Polar Front is well defined around Sval¬bardbanken and near Sentralbanken. Further east the front becomes less and less defined and gradually disappears completely. The position of the front varies little in the area round Bjørnøya. Further east climatic changes largely determine the position of the front. The position of the Polar Front to a large degree determines the maximal extension of ice in winter. For this reason it is therefore only in limited areas that water with negative surface temperatures occur during the winter period.

Ocean currents

General

The ocean currents are a combination of several independent periodic and non-periodic movements which makes it difficul to give a generally valid description of the conditions. It is often appropriate to divide the currents into three main components; tidal currents, wind generated currents and the mean current (residual current).

The tides can be considered as a very long and fl t wave which moves across the ocean. The water level variations associated with this wave cause the tidal currents. During the course of a tidal period (12 h 25 min), the tidal current will turn through 360° but it is normally strongest in two main directions. Both the strength and main directions vary from place to place but always so that the mean tidal current over a tidal period are zero. In the open ocean the currents are usually strongest around high and low water.

When the wind blows across the sea surface it will set up a current in the open ocean which has a speed at the surface of 2–4 % of that of the wind, and which in direction lies some few degrees to the right of the prevailing wind direction. This current is very irregular but with strong winds the wind current will generally determine the total direction of the surface water movement.

The mean current or residual current is that which remains in the current pattern when the tidal current and the wind generated current are removed. The forces behind the residual current are various and the current relates to the persistent part of the current pattern.

Current measurements

The main features of the ocean currents are obtained by analysing the distribution of temperature and salinity at various depths. Most of the dominant currents in the Barents Sea became known in this way. To get exact information on the speed and direction it is necessary to measure the currents.

Many current measurements have been made, in the area between Troms and Bjørnøya, but comparatively few in the rest of the Barents Sea. Current measurements are carried out in three different ways. The method most used up to the present has been to fasten current meters to moored rigs which gives information on the current at the observation point during the period of deployment. The second method is to use drifting buoys, which follow the current in the surface layer. The buoys transmit their positions several times daily via satellite to the receiver, building a picture of how the water masses move. These drifting buoys have been of great importance in obtaining information in detail of the current pattern on a number of the bank areas in the Barents Sea. The third method of measuring the current is with the aid of an acoustic instrument attached to a ship. This measures the current in the area in which the ship is sailing.

Ocean current charts

Although the main features of the ocean currents are known (see Fig 3), there is still a lack of detailed knowledge. The Coastal Water follows the coast off Troms and Finnmark, and then continues along the Murmansk coast. Off Troms and Finnmark, the ocean currents are influenced to a large degree by the shoal and deep water areas. This is clearly seen over Tromsøyfla et which is mainly covered by the Coastal Water. In this area there are several large and small eddies. These eddies are more or less permanent (figu e 3). The average current rate varies between 10–30 cm/sec in most places (1 knot corresponds to about 50 cm/sec). In areas with large eddy presense the water masses will stay for long periods and here the mean rates are less than 5cm/sec. On the northern edge of Tromsøyfla et maximum fl w rates of 80 cm/sec have been measured, of which the tidal current contributes about half. In a small number of places in the coastal area the maximum can reach up towards 100 cm/sec, but then only for short periods.

Figure 2. Distribution of the three main water masses in the Barents Sea: Coastal Water, Atlantic Water and Arctic Water. The approximate positions of the boundary areas are indicated. The figures show the surface temperature in summer and winter (the numbers in parentheses). The figure indicates the areas which are wholly or partly covered by ice in the winter.

Figure 3. The surface current in the Barents Sea. The arrows show the current direction but the length of the arrows has no relevance with the currents' rate or stability. The different arrows indicate Coastal Water, the Atlantic Water and the Arctic Water.

1. *The Norwegian Coastal Current*
2. *The Norwegian Atlantic Current*
3. *The North Cape Current*
4. *The Murmansk Current*
5. *West-Spitsbergen Current*
6. *Persey Current*
7. *East-Spitsbergen Current*
8. *Bjørnøy Current*
9. *Sørkapp Current*

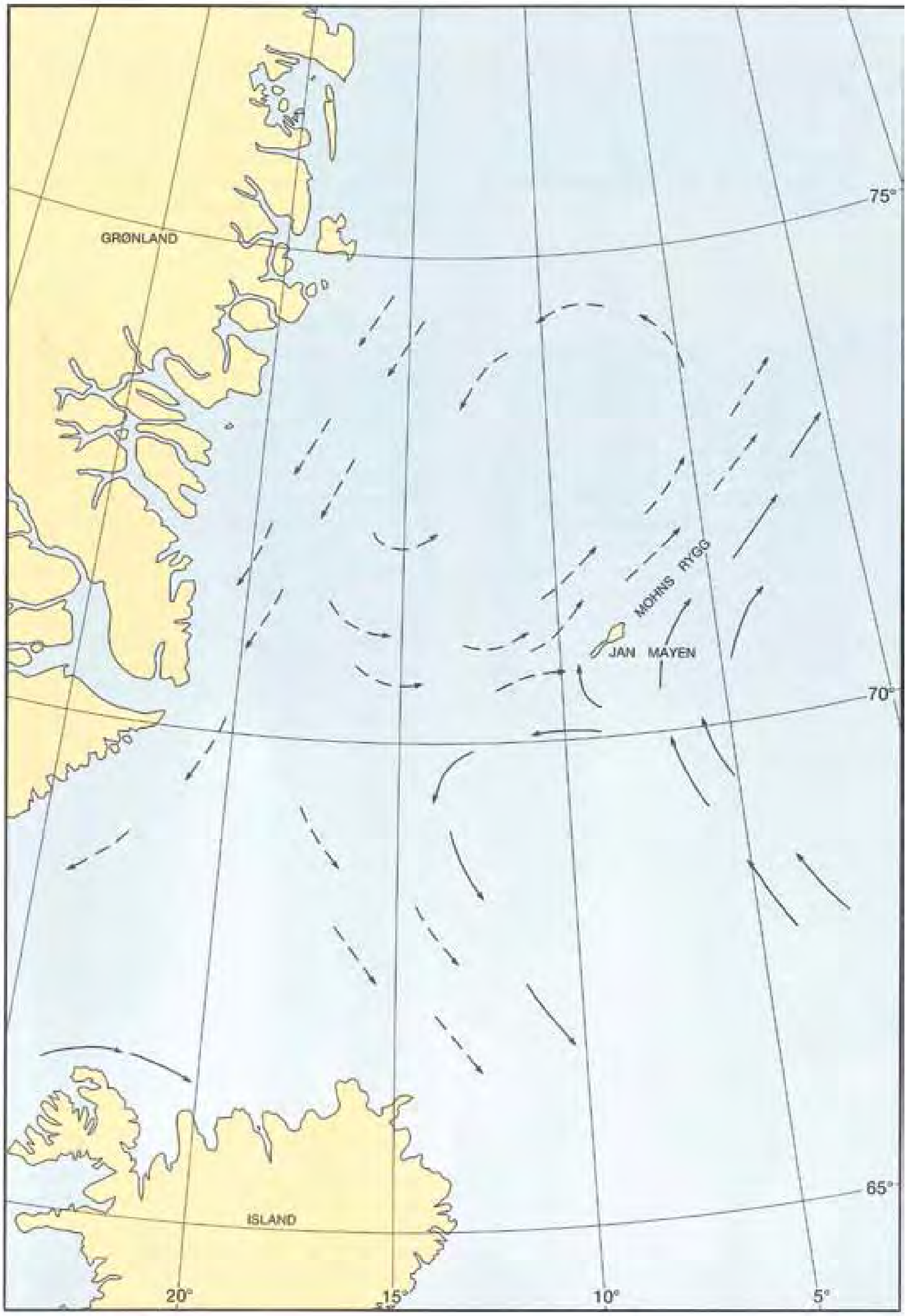


Figure 4. A simplified diagram of the surface currents in the area around Jan Mayen.

The North Atlantic water pours through the gap between the Faeroes and Shetlands to form the Norwegian Atlantc Current. The greater part of this water mass moves towards the Norwegian coast and continues northwards on the outside of the Coastal Current. North of Tromsøyfla et the North Atlantic Current divides into two branches. The North Cape Current fl ws into the Barents Sea where it divides into several branches at about 30° E (Fig 3). The water which fl ws northwards in Hopendypet meets the Arctic Water and, because of its greater density, the Atlantic Water sinks down from the surface and then continues beneath the Arctic Water which fl ws in approximately the opposite direction. Some of the Atlantic Water runs northwards west of Storbanken but some fl ws eastwards between Storbanken and Sentralbanken. On the surface a branch of the North Cape Current continues eastwards south of Sentralbanken and then northwards along the coast of Novaja Zemlya. This branch is called the Murmansk Current.

That part of the North Atlantic Current which fl ws northwards along the west side of Spitsbergen is called the West-Spitsbergen Current. On its way northwards it sends a branch current into Storfjordrenna.

The mean fl w rates in the Atlantic Water are low. In Bjørnøyrenna, the residual current is 10–20 cm/sec. The current is twice as strong if tidal effects are included. In particular circumstances the current can reach up to 70–80cm/sec in this area. Eastwards in the Barents Sea the current rates in these water masses change little. In the branch which runs northwards in Hopendypet, current surveys west of Sentralbanken show slower speeds. The residual current is less than 10 cm/sec but the tidal addition leads to the total current usually reaching 30–40cm/sec. No direct observations have been made of the surface current in the West-Spitsbergen Current but it is reasonable to expect that conditions are much the same as in the North Cape Current.

Little is known of the origin of the Arctic currents. Some of the water comes from the Barents Sea itself but the rest is carried in through the openings in the east and north. The Persey Current transports water from the areas south of Franz Josef Land westwards in the Barents Sea towards Hopen. A small part of this current fl ws south to Sentralbanken but most of it fl ws westwards to the east side of Svalbardbanken where it is known as the Bjørnøya Current.

The East-Spitsbergen Current enters the Barents Sea from the north. Part of it fl ws into the Bjørnøya Current while the rest fl ws between Edgeøya and Hopen towards Storfjordrenna. Here it meets that part of the Bjørnøya Current which has fl wed around Svalbardbanken, and together they round the southern point of West-Spitsbergen under the name of Sørkapp Current. This cold current continues northwards as a coastal current inside the West-Spitsbergen Current. It is an important transport route for the ice masses found along the west coast during the winter half of the year. All the cold currents are otherwise important routes for ice transport.

Less is known of the current rates in the Arctic water masses than of those in the two other main systems in the Barents Sea. Current measurements in the Persey Current on Storbanken gave a residual current to southwest of less than 5cm/sec. When the tide was included rates were around 20–30 cm/sec. The strongest currents in the whole of the Barents Sea are probably found on and around Svalbardbanken. At times the residual current around Bjørnøya can be between 40–50 cm/sec. With a tide of the same strength it is therefore not unusual for the current to reach 100 cm/sec. Under exceptional conditions, therefore, it can be assumed that the current may reach upwards of 150 cm/sec.

Jan Mayen

Two current systems determine the conditions round Jan Mayen (fig 4). The East Greenland Current carries cold water masses from the Arctic Ocean southwards along the east coast of Greenland. A branch from this, the Jan Mayen Current, fl ws towards Jan Mayen and continues northeastwards along Mohns Ridge. This branch is of importance in the formation of the ice headland in Vesterisen.

A branch of the Norwegian Atlantic Current fl ws towards Jan Mayen from the southeast. One part continues along Mohns Ridge by the side of the Jan Mayen Current, while another part fl ws on the southern side of Jan Mayen. The ocean current in the area southwest of Jan Mayen are complicated.

The Polar Front lies between the two water masses. South of Jan Mayen the position of the front varies sharply while north of the island the front follows Mohns Ridge and the position varies little. The maximum extent of the ice in winter broadly follows the position of the front.

Magnetic conditions around Svalbard

By the Norwegian Polar Institute

The magnetic variation at Herwighamna on Bjørnøya was 8°45' easterly in 2011. At present the variation increases by about 15' annually.

The first magnetic observations in Svalbard were made by Willem Barentz during his discovery of the archipelago in 1596. He found the magnetic variation to be 13° W on Bjørnøya. From subsequent, ever increasing numbers of expeditions, information has gradually become available on D (variation), I (inclination) and H (horizontal intensity). The results of these observations up to 1953 are included in the Norwegian Polar Institute (NPI) Skrifter no. 110 «Magnetic observations in Svalbard 1596-1953» by Kaare Z. Lundquist. Comprehensive regional observations were carried out by NPI's Svalbard Expeditions in 1957 and 1958. New magnetic measurements were carried out by NPI during the years 1985–1999. Since 2000 global models of the variation have been used. These take no account of local variations in the earth's crust. The isogonal chart, figu e 5, shows the magnetic variation for 2010.

Since 1952 the University of Tromsø, Tromsø Geophysical Observatory, has conducted fi ed magnetic measurements on Bjørnøya, and at Isfjord radio in 1964–65. This station was moved to Ny-Ålesund in 1966 where it still operates. In 1988 a station was established on Hopen and in 1994 by Longyearbyen. The observations are today used for ionospheric physics purposes.

The magnetic variation on Svalbard varies from +2° in the west to +19º in the east, in relation to geographic north in 2010. Annual change is from +15' to +20' easterly. There is a great difference in variation from west to east, while there is little change in the north-south orientation at the same longitude.

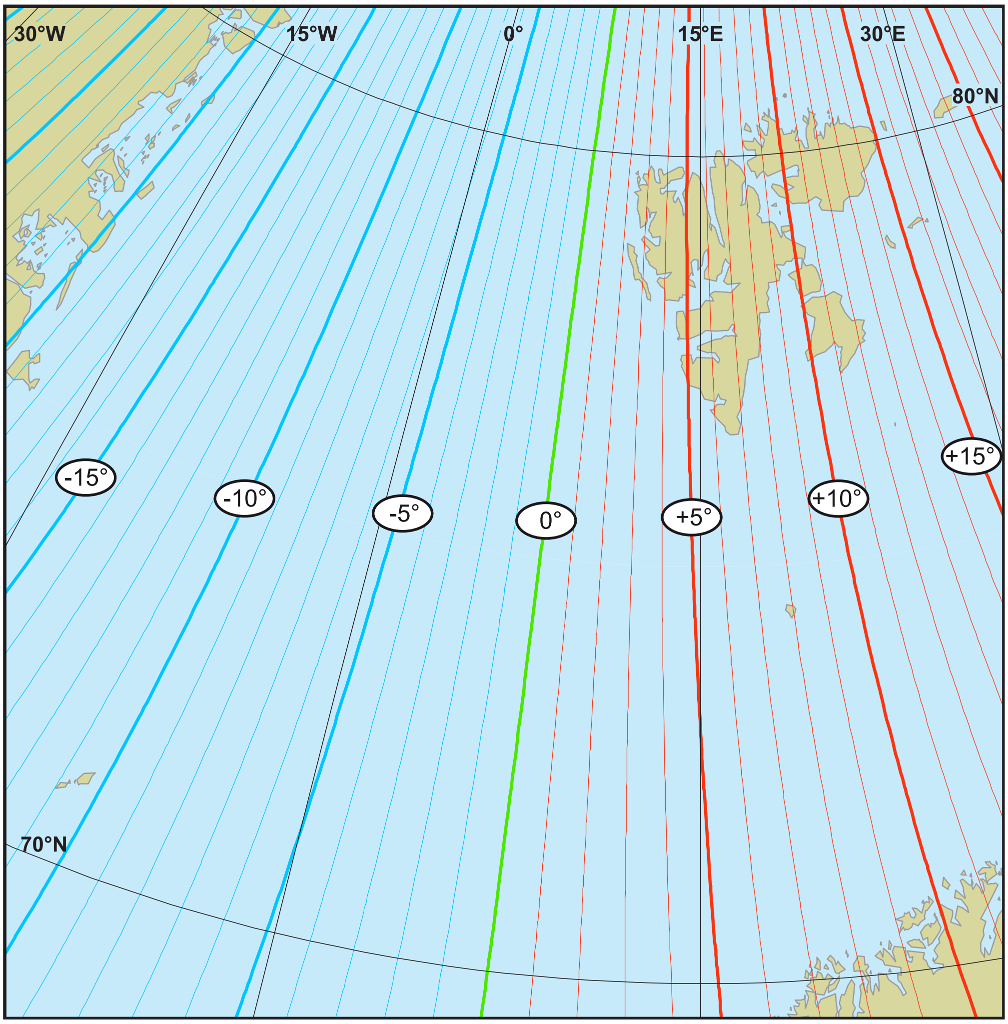


Figure 5. The chart shows isogonals for 2010, lines connect points with the same magnetic variation. Positive variations are easterly (red) and negatives are westerly (blue).

Source: World Magnetic Model 2010-2015 (WMM 2010)

Svalbard's protected areas

Text taken from Cruise Handbook for Svalbard, Polar Handbook no. 14, Norwegian Polar Institute

In 1925 the Svalbard Act was passed, and the treaty and act laid the foundation for the protection of numerous animal species and gradually also for the first protected areas. The two first plant protection areas were established as early as 1932. A strongly growing interest in oil, gas, coal and mineral prospecting in the 1960s along with increasing tourism led to intensify the planning of protected areas in Svalbard in the late 1960s. The work resulted in the establishment of three large national parks, two large nature reserves and 15 bird sanctuaries in 1973.

The primary objective of the protection resolutions in 1973 were «to protect the areas and their interconnected wildlife and flo a, for their intrinsic value and for scientific and educational purposes». Another important objective, particularly in the national parks, was to provide for access to untouched and distinctive wilderness for recreational purposes. The protection of Svalbard's untouched nature and character of wilderness are highlighted as a central motive for protection.

An evaluation of the protected areas in Svalbard in 1998 revealed among other things that the most biologically productive and species-rich land areas in the archipelago were weakly represented. Based on this, a new protection plan was initiated in 1998 and completed through a protection act that was passed in the autumn of 2003. From 1 January 2004, an expansion of the territorial border around Svalbard from four nautical miles to 12 nautical miles was implemented, considerably enlarging the protected areas, which included a marine zone that extended out from land to the new territorial borders in the sea. In the autumn of 2005, a new national park was established in the inner fjord of Wijdefjorden.

The current protected areas cover 65.2 % of Svalbard's land area and comprise 39 821 km^2 in total. Of the marine areas within the territorial border surrounding Svalbard, 86.5 % is now protected. The protected areas are:

Nordvest-Spitsbergen National Park

Total area: 9873 km^2 Land: 3684 km^2 Marine: 6189 km^2. Established 1973.

This national park has magnificent landscapes filled with contrasts and characterized by nunataks, glaciers that calve into the sea, islands and sounds. In this area we find Svalbard's largest strandfl t, Reinsdyrfl a. In the fjord of Bockfjorden there are hot springs and old volcanoes. The national park is rich in cultural remains from the whaling era, expeditions to the North Pole and from the trapping periods. Here are several areas of considerable cultural historical interest. A large number of bird cliffs are located in the area, along with various wildlife. There are several important nesting sites for ducks and geese. The bird sanctuaries Guissezholmen, Skorpa and Moseøya, and the Moffen Nature Reserve, with its important haul-out sites for walruses, lie within the border of the national park.

Forlandet National Park

Total area: 4634 km^2 Land: 616 km^2 Marine: 4018 km^2. Established 1973.

The whole island of Prins Karls Forland is included in the park. The island is characterized by a great mountain chain that spans from the north over more than half the length of the island. From the end of the mountain chain and southwards lies a great plain called Forlandsletta that stretches all the way south to the mountain at the southern end of the island. Beyond that, the landscape is characterized by steep glaciers and partly by moraines. The national park has great wildlife and several prominent bird cliffs, a small population of Svalbard reindeer and the world's northernmost population of harbour seals. Here are also two well-known and often visited haul-out sites for walrus. The national park has several important cultural remains from the whaling time, from overwintering trapping and from periods of mineral exploitation.

Sør-Spitsbergen National Park

Total area: 13 228 km^2 Land: 5030 km^2 Marine: 8198 km^2. Established 1973.

South Spitsbergen National Park is Svalbard's largest national park and includes a magnificent natural environment with majestic mountains (especially south of Hornsund), large continuous glacier-covered areas and long coastal plains. While the east coast is characterized by glaciers and moraines with no vegetation, vegetated strandfl ts dominate the west coast. In the park there are plenty of small and larger nesting localities for seabirds, ducks and geese, both on bird cliffs and on islands and islets. The bird sanctuaries Sørkapp, Dunøyane, Isøyane and Olsholmen, with considerable nesting populations of eiders and geese, are all located within the park. Along the west coast there is a fair population of Svalbard reindeer. Hornsund is an important area for polar bears. The polar bears that come to Hornsund with the drift ice around Sørkapp in late winter/spring migrate from Hornsund towards Storfjorden. The national park has important cultural remains from whaling in the 17th and 18th centuries, overwintering trapping, mining, tourism (Giæverhuset), research and World War II. A Polish research station is located in Hornsund.

Nordenskiöld Land National Park

Total area: 1362 km^2 Land: 1207 km^2 Marine: 155 km^2. Established 2003.

This national park is quite diverse. In the west lie great coastal plains between Bellsund and Kapp Linné. Further in lie mountain ranges and glaciers, and, all the way to the east, Svalbard's largest valley, Reindalen. This area is characterized by lush vegetation, some pingoes and moraines. In the lower Reindalen lies Stormyra, a 100 km^2 wetland and delta area. The national park has lush vegetation. Important nesting and moulting areas for eiders, waders and geese and several bird cliffs are located in the west. Lower Reindalen is an important nesting area for waders and ducks. Within the national park there is a large Svalbard reindeer population, especially in the Reindalen and its side valleys. The cultural remains in the area originate in whaling times (homestead sites, tryworks and graves), remains from Russian overwintering trapping and cultural remains tied to mineral exploitation.

NATURRESERVAT / *NATURE RESERVE*

NASJONALPARK / *NATIONAL PARK*

GEOTOPVERNOMRÅDE / *PROTECTED GEOTOP*

FUGLERESERVAT / *BIRD SANCTUARY*

Sassen-Bünsow Land National Park

Total area: 1230 km² Land: 1157 km² Marine: 73 km². Established 2003.

The national park is characterized by magnificent natural environments with important landscape elements like the two great valleys of Sassendalen and Gipsdalen, the mountain of Tempelfjellet and the glaciers at the head of the fjords of Billefjorden and Tempelfjorden. The area has well developed Quaternary geological elements like marine deposits, river deposits, patterned ground and several canyons. Large areas of continuous vegetation and several vulnerable plant species are found within the park. The national park has a great population of Svalbard reindeer, particularly in the valley of Sassendalen. There are also several large bird cliffs and important wetlands for waders. A considerable amount of pink-footed geese nest in the valleys. The fjords of Tempelfjorden and Billefjorden are important birthing and moulting grounds for ringed seals, attracting polar bears to the area in the wintertime. The cultural remains in the park mainly relate to overwintering trapping, among them the station of Fredheim, the main trapping station of the legendary Hilmar Nøis. Several places in the park also have important cultural remains of mineral exploitation and mining.

Nordre Isfjorden National Park

Total area: 2954 km² Land: 2050 km² Marine: 904 km². Established 2003.

This national park is characterized by fjords surrounded by large strandfl ts, like Bohemanfl a, Erdmannfl a and Daumannsøyra, where there is lush and species-rich vegetation. Important landscape elements are the glaciers draining southwards that calve into the fjords. Further on pronounced mountain massifs encircle the fjords: Skansen, Tschermakfjellet, Kapitol and Alkhornet are examples. The national park has rich birdlife and several bird cliffs and nesting grounds for eiders, waders and geese. A number of the fjords are important birthing and moulting grounds for ringed seals. Polar bears move regularly in the area during winter and spring. There are cultural remains from both Russian and Norwegian overwintering trapping in the park. There are also cultural remains of the whaling area and several important industrial remains. One of the latter is Bohemanneset where the first coal was mined in Svalbard and shipped out in 1899.

Indre Wijdefjorden National Park

Total area: 1127 km² Land: 745 km² Marine: 382 km². Established 2005.

The national park includes the inner parts of the fjord and the surrounding landscape with valleys, strandfl ts, glacier fronts and mountainsides. The main purpose has been to protect Arctic steppe vegetation and several very rare plant species. The exceptional vegetation is due to an extremely dry climate combined with a limestone-rich ground. The inner parts of Wijdefjorden is also a threshold fjord with distinctive characteristics and a scientifical y interesting cold water basin. The national park is not particularly rich in wildlife, but Svalbard reindeer, Arctic fox and common birds inhabit the park. Austfjorden is locally very important as birthing and moulting grounds for ringed seals, and the polar bears roam the area in early spring to hunt seals. In the national park there are cultural remains related to overwintering trapping – both Norwegian and Russian. The trapping station at Austfjordneset is still in use.

Nordaust-Svalbard Nature Reserve

Total area: 55 334 km² Land: 18 663 km² Marine: 36 691 km². Established 1973.

This nature reserve includes Nordaustlandet, Kvitøya, Hinlopenstretet, eastern Ny-Friesland on Spitsbergen and Kong Karls Land. Large areas of the reserve are covered by glaciers like Austfonna, Vestfonna, Kvitøyjøkulen and glacier arms of the large glaciers of Ny-Friesland. Characteristic for this reserve are also the large fjords on the west and north side of Nordaustlandet and on the north-west side of Hinlopenstretet. The purpose of the protection has been to conserve «a large and continuous, and to the extent possible an untouched natural environment on land and at sea with intact natural environments, ecosystems, species, natural processes, landscape elements and cultural remains, as a reference area for research». Within the reserve are considerable sources of value for protection. The reserve has a great number of large and smaller bird cliffs. Several of Svalbard's greatest haul-out sites for walrus are found here. A vigorous Svalbard reindeer population lives off the extremely unproductive vegetation. Kong Karls Land is the key area for the reproductive part of the Svalbard polar bear population. The northern part of Nordaustlandet is also considered of great importance for denning areas. A large number of polar bears spend the summer within the reserve. North and north-west on Nordaustlandet are plenty of lakes and rivers with Arctic char. In Kong Karls Land traffic is prohibited year-round. The restriction zone extends 500 m off the coast or surrounding skerries.

Søraust-Svalbard Nature Reserve

Total area: 21 826 km² Land: 6 400 km² Marine: 15 426 km². Established 1973.

The objective of establishing this reserve was more or less identical to the one for the Nordaust-Svalbard Nature Reserve. The Søraust-Svalbard Nature Reserve covers the two large islands of Edgeøya and Barentsøya, and also Tusenøyane, Ryke Yseøyane and Halvmåneøya. The two foremost islands are characterized by plateau mountains, plateau glaciers and large, ice-free valleys. On the west coast there are large vegetated strandfl ts, while the eastern parts are barren and dominated by large glacial areas. Tusenøyane, Halvmåneøya and Ryke Yseøyane are relatively poor in vegetation. Barentsøya and Edgeøya have large populations of Svalbard reindeer and Arctic fox. Both these islands are important year-round habitats for polar bears, and several denning areas are found there. There are always polar bears spending the summers on Tusenøyane, Halvmåneøya and Ryke Yseøyane. On Tusenøyane there are haul-out sites for several hundred walruses in each location. Tusenøyane is also the most important nesting area for brent geese in Svalbard. A great number of eiders nest there too. Within the nature reserve are plenty of cultural remains related to research and whaling, and also Norwegian and Russian overwintering trapping.

Bjørnøya Nature Reserve

Total area: 2982 km² Land: 177 km² Marine: 2805 km². Established 2002.

This nature reserve includes the whole island and marine areas encircling the island out to 12 nautical miles off the coast. There is a small area around the meteorological station excepted from the protection. Bjørnøya is protected partly on account of its bird cliff, the greatest bird cliff in the Barents Sea. The bird cliff is located on the southern tip of the island. Bjørnøya is also an important migration area for Svalbard's geese during spring and autumn migration. The island has a special ecology and several species rare to this latitude. In winter, polar bears often migrate south to Bjørnøya with the drift ice, if the ice edge reaches that far south – but rarely in the last years. The island has a number of rivers with Arctic char. Bjørnøya has a wide variety of cultural remains related to trapping, research and industrial remains from mineral exploitation. Within the reserve are three areas of time-restricted traffic prohibition due to nesting birds. One is located north-east on the island, and the other two are located around the bird cliffs in the south.

Ossian Sars Nature Reserve

Total area: 12 km² (includes only land areas). Established 2003.

Located innermost in Kongsfjorden, this area is surrounded by glaciers. The sources of value for protection lie in the lush vegetation comprising several rare and demanding plant species, but also a bird cliff and Arctic fox localities. This reserve is Svalbard's most species rich locality for vascular plants. The area is scientifical y important and has been a plant protection site since 1984.

Hopen Nature Reserve

Total area: 3186 km² Land: 46 km² Marine: 3104 km². Established 2003.

The nature reserve of Hopen includes the whole island and surrounding sea areas out to the territorial border at 12 nautical miles offshore. A small area around the meteorological station is not included. Hopen is very important as a denning, migration and feeding ground for polar bears. The island also has considerable bird cliffs with Brünnich's guillemots and kittiwakes. The landscapes of Hopen are very characteristic. There are also cultural remains from Norwegian overwintering trapping, slaughter sites for walrus and cairns erected by Thor Iversen in 1924.

Moffen Nature Reserve

Total area: 9 km² Land: 5 km² Marine: 4 km². Established 1983.

Moffen peaks only a few metres above sea level north of Spitsbergen. The island is made up of solid bedrock covered by large deposits of rocks and gravel that encircles a lagoon. Seen from the air, the island is shaped like a blue mussel. Moffen's value as a protected area relate to the island's great importance as a haul-out site for walrus. Several hundred walruses can be found here at the same time. Incidentally, the island is a nesting ground for a considerable number of eiders and Arctic terns. Sabine's gulls and brent geese are also observed nesting here. Traffic is prohibited on the island itself and in a 300 m zone around the island from 15 May to 15 September.

Festningen Geotope Protection Area

Total area: 17 km² Land: 14 km² Marine: 3 km². Established 2003.

The protection covers an area of Quarternary and other geological deposits, like the well-known Festningsprofilet (a 7 km long row of geological deposit layers), occurrences of fossil tracks of prehistoric reptiles and other interesting geological phenomena.

The bird sanctuaries (15)

Total area: 79 km² Land: 15 km² Marine: 64 km². Established 1973.

Traffic is prohibited in all bird sanctuaries between 15 May and 15 August, and this applies to all land areas and in a 300 m zone off shore, or off skerries at low tide.

1. Sørkapp Bird Sanctuary
2. Dunøyane Bird Sanctuary
3. Isøyane Bird Sanctuary
4. Olsholmen Bird Sanctuary
5. Kapp Linné Bird Sanctuary
6. Boheman Bird Sanctuary
7. Gåsøyane Bird Sanctuary
8. Plankeholmane Bird Sanctuary
9. Forlandsøyane Bird Sanctuary
10. Hermansenøya Bird Sanctuary
11. Kongsfjorden Bird Sanctuary
12. Blomstrandhamna Bird Sanctuary
13. Guissezholmen Bird Sanctuary
14. Skorpa Bird Sanctuary
15. Moseøya Bird Sanctuary

Heavy oil and traffic ba

Ban on use of heavy fuel oil for ships in the three largest national parks in Svalbard came into force 1.1.2010.
A general prohibition of traffic in eight protected cultural sites also came into effect on the same date.

The purpose of the ban is to avoid spills of heavy fuel oil in connection with maritime accidents, thereby reducing the risk of any possible discharge. Similarly, the ban on heavy fuel oil has been applied to protected areas on the east side of Svalbard since 2007. Heavy bunker oil has been banned from most of Svalbard's territorial waters since 1.1.2010.

The changes in the protection regulations in force for Svalbard also include traffic restrictions in some selected sites along the coast of Svalbard. The restrictions were introduced to preserve a small selection of affected and very valuable cultural heritage sites against damage and other effects resulting from traffic

Further details on the changes in the regulations:
The following changes in regulations 1973-06-01 No. 3780 establishing bird reserves and large protected areas in Svalbard, which include Northeast and Southeast Svalbard nature reserves, North-western Spitsbergen, Forlandet and South Spitsbergen National parks are enforced.

Heavy oil ban

Quality requirements of fuel for ships in North-western Spitsbergen, Forlandet and South Spitsbergen National Parks. Ships calling at the national parks are not permitted to use fuel other than quality DMA in accordance with ISO 8217 Fuel Standard, except for the shortest safe route through:

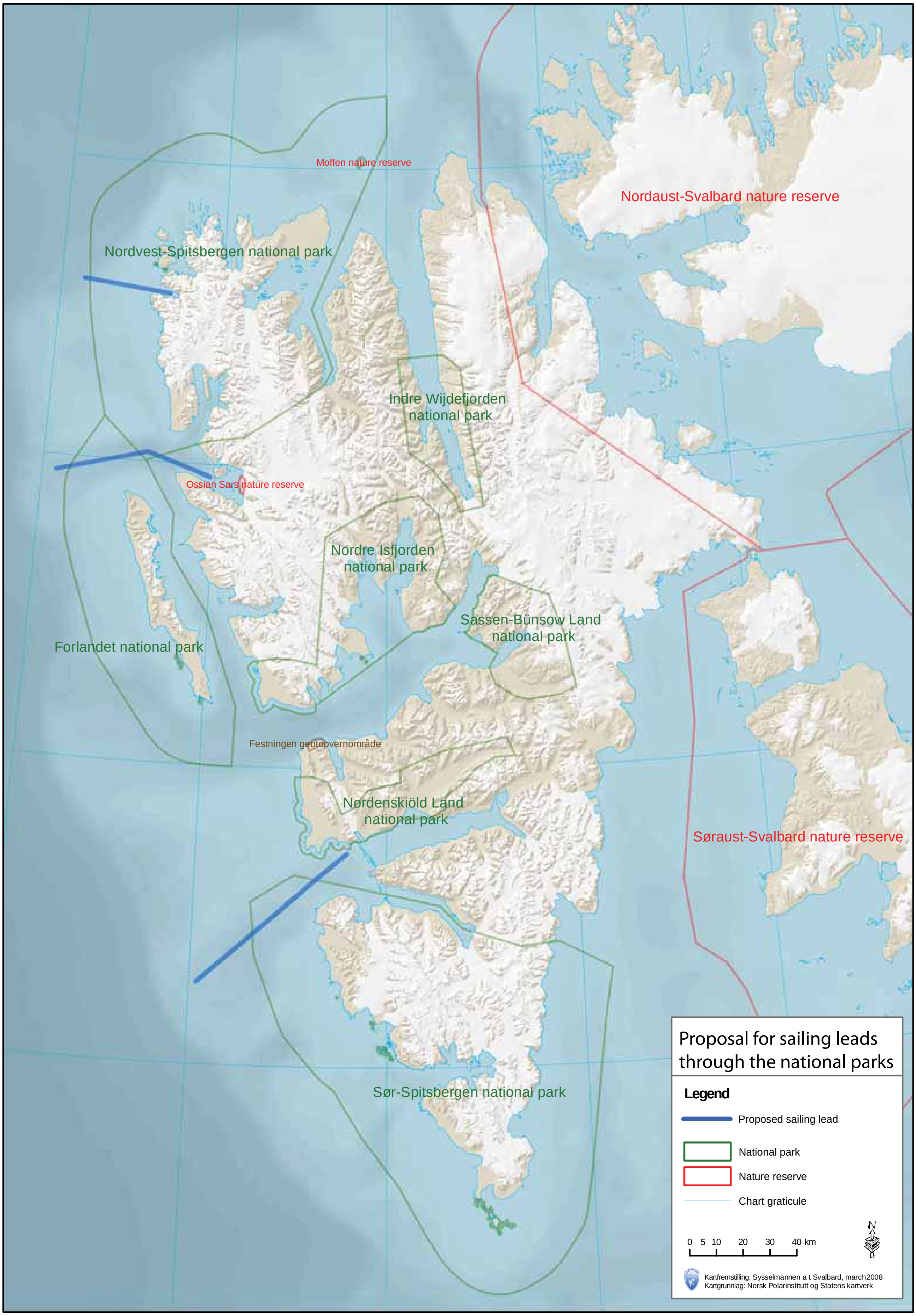
- The north-western part of South Spitsbergen National Park for sailing to and from Sveagruva
- The northern part of Forlandet National Park and the southern part of Northwest Spitsbergen National Park sailing to and from Ny-Ålesund until 1.1.2015
- Northwest Spitsbergen National Park for sailing to and from Magdalenefjord up to 1.1. 2015.

Traffic Prohibition near cultural heritage sites

A general prohibition on traffic has been introduced in the delimited areas around monuments and sites at or near:

- Ytre Norskøya, Likneset and Ebeltofthamna in Northwest Spitsbergen National Park
- Lægerneset in South Spitsbergen National Park
- Haudegen in the Northeast Svalbard Nature Reserve
- Habenichtbukta, Zieglerøya / Delitschøya / Spekkholmen Holmen and parts of Halvmåneøya in Southeast Svalbard Nature Reserve.

The District Governor, in consultation with the Ministry of Environment, will regulate or prohibit traffic in all or parts of protected areas if it is deemed necessary to preserve flo a and fauna. The concern for the preservation of cultural heritage sites have now been adopted on equal footing regarding plant and animal life as the criterion for assessing traffic estrictions.


Moffen nature reserve
Nordaust-Svalbard nature reserve
Nordvest-Spitsbergen national park
Indre Wijdefjorden
national park
Ossian Sars nature reserve
Nordre Isfjorden
national park
Sassen-Bünsow Land
national park
Forlandet national park
Festningen geotopvernområde
Nordenskiöld Land
national park
Søraust-Svalbard nature reserve
Sør-Spitsbergen national park
Proposal for sailing leads
through the national parks
Legend
Proposed sailing lead
National park
Nature reserve
Chart graticule
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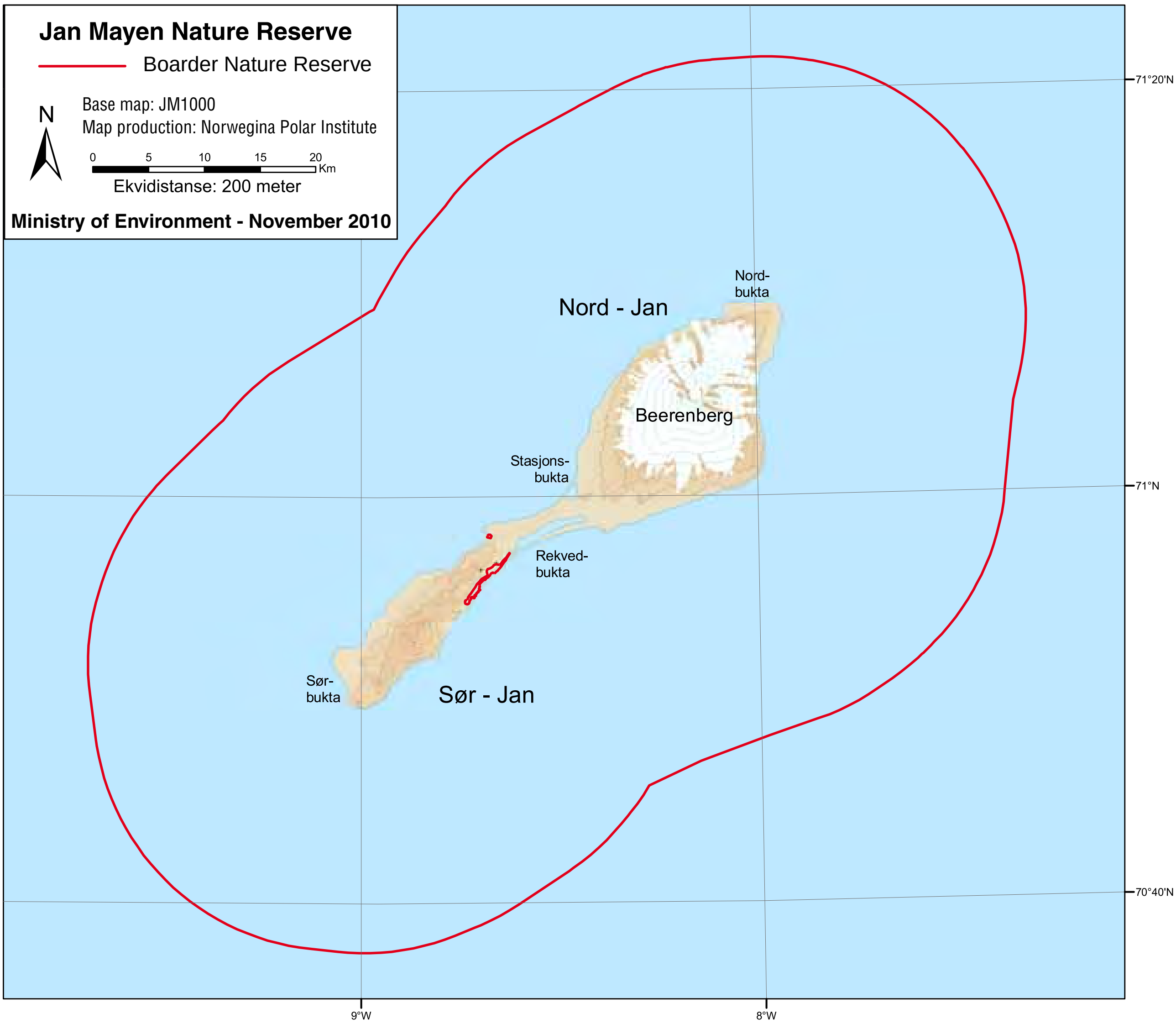
Kartgrunnlag: Norsk Polarinstitutt og Statens kartverk



Regulations for preservation of Jan Mayen Nature Reserve

Legal: Laid down by Royal Decree. 19. November 2010 pursuant to Act 27 February 1930 2 on Jan Mayen § 2 Submitted by the Ministry of Environment. The translations are unofficial and on y updated at the time of the translation. Should any doubt arise, the Norwegian text of the Act is valid and binding.

Chapter I Introductory provisions

§ 1 *Protection*

The island of Jan Mayen is a protected nature reserve under the designation of The Jan Mayen Nature Reserve.

§ 2 *Demarcation and scope*

The protected area includes;

– The whole island, with the exception of the activity area on the east side of the island (Olonkinbyen, the meteorological station and the airport) and the smaller area of Kvalrossbukta on the west side of the island.
– The adjacent territorial waters with the exception of a marine area in and 500 meters outside Båtvika.

The nature reserve is approx. 375 km^2 land area and about 4315 km^2 of marine area.

The limit of the nature reserve is shown on the attached map at a scale of 1:330 000 and 1:25 000, dated the Ministry of Environment November 2010. The location of break points for the nature reserve will be determined.

Copies of the Protection Regulations and map shall be kept by County Governor of Nordland, the Norwegian Directorate for Nature Management, the Directorate for Cultural Heritage and the Ministry of Environment.

§ 3 *Purpose*

The purpose of the protection is to preserve a virtually untouched Arctic island and adjacent sea areas, including the seabed, with distinctive landscapes, active volcanic systems, special flo a and fauna and many cultural relics, in particular ensuring the safety of;

– the island's spectacular and unique landscapes.
– the island's distinctive volcanic rocks and landforms.
– the island as a very important habitat for seabirds.
– the close relationship between life at sea and on land.
– the unique ecology that developed on isolated islands.
– the historical perspective of cultural relics from all the major eras in the history of Jan Mayen.
– the island and adjacent marine areas as a reference area for research.

Chapter II. Protection regulations

§ 4 *Landscape, environment, flora, fauna, cultural heritage, traffic and pollution*

1. Landscape, environment and cultural heritage

1.1 There must not be implemented activities that may affect the landscape, natural environment or cultural heritage sites such as; construction of buildings, facilities, including distribution facilities, and fi ed facilities, including antennas, parking of barracks and similar, laying of cables and wires, outlets, filling removal and storage of mass, removal of driftwood, leveling, construction of road, quay, landing, the use of fishing gear that can damage the sea floo , drainage and other form of draining, drilling, blasting, etc. and extraction of minerals or oil.

1.2 No person may damage, excavate, move, remove, alter, conceal or disfigu e protected fi ed or permanent monuments, or initiate actions that involve a risk of this happening.

1.3 The provision of section 1.1 does not prohibit;

– the use of permitted fishing gear in the sea with the exception of tools that can provide significant dam ge to the seabed.
– the necessary maintenance of the existing road between Olonkinbyen / airport and Kvalrossbukta.
– the necessary maintenance of the existing road / vehicle track between Trongskarkrysset and Gamle Metten.
– the use of driftwood to fuel and maintain the existing homes on the island and small bonfi es on site.

2. Plants and animals

2.1 Animals, plants and other living organisms are protected against damage. Destruction or disturbance of any kind is not allowed as a result of traffic

2.2 Plant or animal species, including genetically modifie species and forms, must not be introduced or exposed.

2.3 The provision in section 2.1 does not prohibit;

– The harvesting of wild marine resources in accor dance with the rules issued by the Ministry of Fisheries and Coastal Affairs. This exception does not apply to the use of tools that can provide significant damage to the seabed.

3. The protections of cultural monuments

3.1 Definition

In these regulations;

Cultural Heritage: All traces of human activity in the physical environment, including transportation, buildings and facilities of any kind.

Fixed heritage: heritage that is physically connected to the ground or to a particular locality.

Loose heritage: heritage that is not fi ed cultural heritage.

3.2 Automatically protected cultural heritage sites;

Structures and sites dating from 1945 or earlier, including aircraft and shipwrecks.

– Protected objects from 1945 or earlier, when they come to light by chance, upon examination, excavation or otherwise.
– Old Metten plant with associated fittings and equip ment.
– Traces of human graves of all kinds, including crosses and grave markers, memorials and bones and skeletal remains.
– Whale bones and skeletal remains of past harvest sites for whales.

The administrative authority shall decide in cases of doubt what is considered to be fi ed and loose cultural heritage and can cancel the protection of specific site .

3.3 In cases where there is there a danger of decay or owner / user inflicted damage to a protected monument, the administrative authority may require the owner or operator to implement measures to prevent deterioration or restore the damage. If the order is not complied with, the administrative authority may order that the work be carried out at the owner's or user's expense. The requirement to meet any incur red expenses for remedial action is enforceable.

3.4 Protected unfi ed objects are deemed to be state property when it seems clear that there is no longer reasonable opportunity to find out i there is an owner or who that owner is.

The administrative authority may entrust the monument in whole or in part, to the finde .

4. Traffic (non-motorised and motorised

4.1 All traffic shall be conducted in a manner th t does not harm or otherwise degrade the natural environment or cultural heritage or cause undue disturbance of wildlife.

4.2 Camping is permitted only for the station’s employees and their visitors.

4.3 Landing of persons from boats is not allowed within the reserve. The base manager may in special cases authorize the landing inside the reserve.

4.4 Landing of aircraft is prohibited in the reserve. In the period from 1 April to 31 August it is, beyond what is necessary for access to activity areas, forbidden to fly closer than 1 nautical mile from concentrations of birds and mammals. During the same period it is prohibited to use the ships whistle, firing shots, or otherwise cause severe noise within a distance of 1 nautical mile from nesting sites.

4.5 Use of motor vehicles in land is allowed only with the station’s transport equipment in running tracks and roads that are marked on the map below.

4.6 The provisions in 1.1 and 4.5 do not prohibit the use of alternative tracks in connection with necessary driving activity, when the existing road or vehicle track as shown on the maps are temporarily out of operation due to special weather or wind conditions.

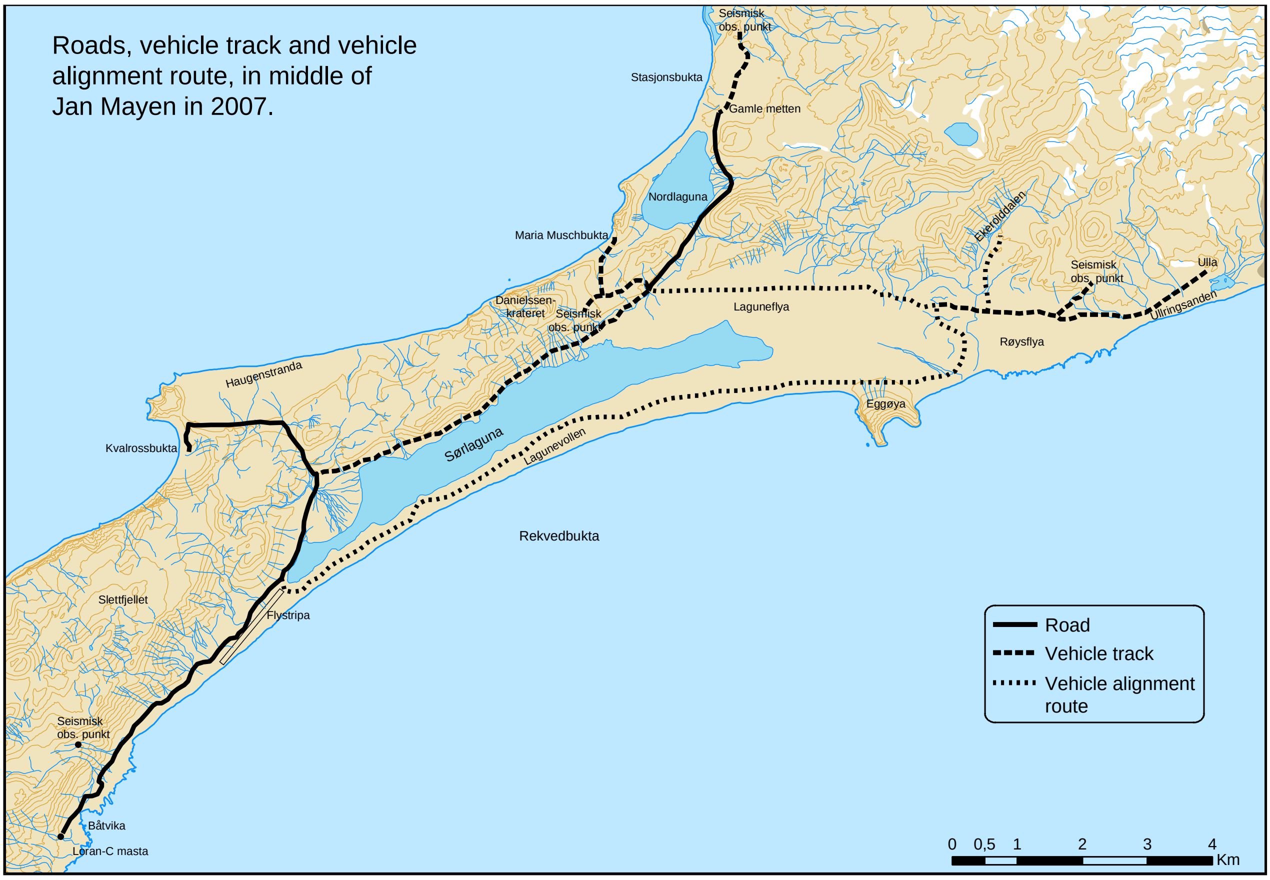
4.7 The provision in 4.5 does not prohibit travel by snow mobile or band wagon on frozen and snow-covered ground;

– for the transportation of supplies to the station, if the weather means that ships must call at another location on the island than in Båtvika,
– for the inspection and maintenance of installations,
– for transport in connection with maintenance and delivery of fuel and supplies to existing roadless cabins,
– when driving to the cabins for weekend trips and the recreation for employees at the station.

4.8 The administrative authority may by regulations prohibit / regulate any traffic in all or part of the nature reserve, if deemed necessary to avoid disturbance of wildlife or erosion to vegetation or cultural heritage.

5. Pollution

5.1 All pollution to air, water or ground which, causes or may cause injury or nuisance to the environment is prohibited with the exception of pollution caused by accepted motorized traffic and allowable emissions from the business areas.



5.2 It is forbidden to leave or clear waste.
5.3 Substances and articles which can harm plants and animals, which are unsightly or could pose a risk of contamination, should not be stored or left.

Chapter III. Exceptions and exemptions

§ 5 *General exceptions*

The provisions of § 4 do not prohibit;

- Emergency fi e, police or rescue, military operational activities and the supervision or oversight of the protected area.
- Investigations, management and maintenance of cultural heritage.

The administrative authority has the right and allow others to search for, excavate, investigate and document the protected monuments.

§ 6 *Exemptions*

The administrative authority may grant an exemption for;

- modific tions and minor additions to existing buildings
- the reconstruction of buildings destroyed by fi e or natural disaster
- the extraction of gravel from an area in Trongskaret (Blåsåsen)
- plants along the road between Kvalrossbukta and Båtvika related to activity within the business areas
- facilities on the sea floor associated with activity within the business areas
- the establishment of navigation aids and space-related ground infrastructure
- measures to address special needs in connection with the recreation of the station's employees.
- measures that may affect the protected monuments.

In addition to the measures mentioned in the first paragraph, the administrative authority may grant exemptions from the protection provisions in § 4, when there is a scientific or other special reasons for doing so.

If it turns out only when a project is underway that it may impact on a protected monument, the administrative authority must be notified immediately and the work stopped. The administrative authority shall decide as soon as possible whether the project can proceed and any conditions for it.

Cultural monument findings that appear through examination, excavation or other measures in the nature reserve shall be documented and preserved at the finder s expense, unless otherwise directed by the administrative authority.

The exemption referred to in the first and second paragraphs may only be granted if the envisioned measures are not contrary to the conservation objective of the Regulations or will not affect the conservation value.

In the case of dispensation the grounds for the decision must be documented to show how the administrative authority has considered the effects that the exemption could have on the environment, and what weight is placed on this.

Chapter IV. Management and procedures

§ 7 *Management Plan*

The administrative authority decides to carry out administrative measures to promote the objectives of the protection. It will develop a management plan with guidelines for the implementation of such measures. The management plan must be approved by the Directorate for Nature Management, after consultation with the Directorate for Cultural Heritage.

§ 8 *Managing Authority*

Ministry of Environment establishes authority for these regulations and designates who will supervise the nature reserve.

§ 9 *Procedural*

The Act of 10 February 1967 relating to procedure in cases apply to these regulations to the extent applicable.

Chapter V. Enforcement, sanctions and commencement

§ 10 *Suspension, removal or correction of illegal work performed*

The administrative authority may issue an order to the responsible party with a deadline for correction of conditions that are in violation of these regulations or regulations issued pursuant to this or prohibit continued activity. Over time is not to be imposed fines until the o der is completed.

If the order is not complied, the administrative authority may have the work done at the owner's or user's expense. The requirement to meet any incurred expenses for remedial action is enforceable.

§ 11 *Penalties, compensation and confiscation*

Any person, who willfully or negligently violates the provisions prescribed in or pursuant to these regulations, is punishable by fines or imprisonment for up to 1 year. Complicity is punishable in the same way.

Anyone who causes damage to protected monuments by contravening the provisions of this regulation shall pay compensation in accordance with general non-statutory rules for financial loss as a esult of the injury.

Any profit on the action as a result of a breach of any provision of this regulation shall be confisc ted for the benefit of the Treasury.

§ 12 *Entry into force*

This regulation comes into force immediately. From the same date, the Regulations 21 June 1974 No. 8792 concerning the protection of cultural heritage in Jan Mayen.

World Heritage

In 2007, Jan Mayen listed as Norwegian candidate for UNESCO World Heritage Site. All the islands or in close proximity to the Mid-Atlantic Ridge (MAR), among other things of great value as reference sites and study areas for the general understanding of the planet's geology and ecology. Jan Mayen is the northernmost of the islands in an international series of islands on which the nomination MAR belonging to Iceland, Portugal, Brazil, Britain and Norway included.

Svalbard's vegetation

Text taken from Cruise Handbook for Svalbard, Polar Handbook no. 14, Norwegian Polar Institute

SULPHUR BUTTERCUP
Photo: Anders Elverhøy, Norwegian Polar Institute

TUFTED SAXIFRAGE Photo: NHS

At first sight, Svalbard appears to be dominated by bare rocks, glaciers, ice and snow. However, for those with an eye for plant life, the land up north gives another impression. As trees and shrubs are absent in Svalbard, the ground vegetation becomes more visible. In summertime, fl wering plants, the dense moss tundra in the valleys, and the lush green vegetation under the bird cliffs are astonishing.

In Svalbard, plant growth and distribution are limited by large temperature fluctu tions, a short growth season, wind exposure and soil movement caused by freeze-thaw cycles. The most important factors determining plant distribution are temperature, bedrock type, soil texture and topography. In Svalbard the permafrost thaws 30–150 cm every summer, which makes it possible for plants to grow here. This active layer also permits drainage of precipitation and meltwater. Variations in the terrain, drainage and snow cover thickness and distribution contribute to the variation in habitats and vegetation types.

Productivity, vegetation belts and diversity

In Svalbard, the land area with productive vegetation is small. Less than 10% of the total land area has biological productivity of any importance, and the productivity is often restricted to small areas. A continuous vegetation cover is found in the lowlands near the coast and in the large, ice-free valleys.

During the last 120 years the vegetation has been mapped, described and categorized in different ways. According to the bio-climatic criteria currently used to classify regions of the Arctic, Svalbard is divided into the mid-Arctic tundra zone, the northern Arctic tundra zone and the Arctic polar desert. This division into zones reflects a decreasing gradient in mean temperature between the zones, for the warmest month annually. The zones are recognized by their different plant communities, defined by various plant and moss species. The zonal vegetation types for the mid-Arctic, the northern Arctic and the polar desert tundra zones are white Arctic bell-heather communities, Arctic wood-rush communities and Svalbard poppy communities, respectively.

SILÉNE ACAÚLIS (FJELLSMELLE) Photo: NHS

YELLOW MARSH SAXIFRAGE
Photo: Anders Elverhøy, Norwegian Polar Institute

SVALBARD POPPY Photo: NHS

ARCTIC HAIRY LOUSEWORT
Photo: Odd Harald Selboskar, Norwegian Polar Institute

WHITE ARCTIC BELL-HEATHER
Photo: Gunn Sissel Jaklin, Norwegian Polar Institute

Per 2008 about 165 vascular plants, 373 moss species, 764 lichen species and 624 species of fungi have been documented in Svalbard. Seven species of vascular plants appear to be permanent, but they are confined to areas with human settlements. Examples of these are tufted hair-grass (Deschampsia cespitosa), northern meadow-grass (Poa pratensis ssp. alpigena) and red fescue (Festuca rubra). In addition, over 20 introduced species with scarce distribution are known. In total, 68 Svalbard species do not grow on the Norwegian mainland, but fl - ristically link Svalbard to the Russian and Greenland Arctic. Three species are endemic – i.e., they grow only in Svalbard. Biological diversity in Svalbard is low compared to the Norwegian mainland.

Other important environmental factors and plant adaptations

There are two main groups of bedrock in the Svalbard archipelago. One is of granitic origin giving an acidic (low pH) soil type. The other bedrock type is of sedimentary origin, and often contains calcium, which supports nutrient-rich soil types with a higher pH. Some species prefer alkaline (high pH) soil types, for instance, mountain avens (white dryad, Dryas octopetala). Other species are most common in areas with acidic soil, such as white Arctic bell-heather (Cassiope tetragona ssp. tetragona).

Typical for many species of Svalbard plants is that they feature ecological and physiological adaptations to a harsh and changing climate. Tussocks and mat-forming growth forms, hairs, umbrella-shaped fl wers, elastic roots, clonal dispersal (by which the plant produces stolons or rhizomes) and nodes are commonly observed and are adaptations to an Arctic life. Most species are also perennial because Arctic plants grow very slowly. One season is often not sufficient to accumulate resourses for fl wering and seed production. The few annual species in Svalbard are very small, for instance, Iceland purslane (Koenigia islandica), diminutive gentian (Comastoma tenellum) and mountain eyebright (Euphrasia wettsteinii).

Important landscape forms and vegetation units

Ridges with a thin snow cover become free of snow early in spring, exposing plants to severe stress due to temperature fluctu tions, strong light, wind exposure and dry weather. Such areas are also characterizes by a relatively long growing season. The ridges host one of the most beautiful and interesting plant associations in Svalbard – the mountain avens heaths. In full bloom, they are a beautiful sight. In early June, species like mountain avens, purple saxifrage (Saxifraga oppositifolia) and various species of whitlow-grass (Draba spp.) can initiate growth. Habitats with a thicker snow cover (snow beds), become snow-free much later and therefore have a shorter growth season. This is the habitat for minute species such as polar willow (Salix Polaris), alpine bistort (Bistorta vivipara),

MOUTAIN AVENS
Photo: Ann Kristin Balto, Norwegian Polar Institute

PURPLE SAXIFRAGE, purple or pink petals Photo: NHS

SHETLAND MOUSE-EAR
Photo: Kit M. Kovacs & Christian Lydersen, NPI

pygmy buttercup (Ranunculus pygmaeus) and outspread snow-grass (Phippsia concinna).

The plant associations of the large valleys in central parts of Spitsbergen are dominated by bryophytes (mosses and liverworts). Plant associations here are characterized by a moisture gradient ranging from relatively dry moss tundra, to moist mires and wet marshes. Along with the bird cliff vegetation, these habitats are the most important grazing areas for reindeer

DWARF BIRCH
Foto: Åshild Ø. Pedersen, Norwegian Polar Institute

ALPINE DRABA
Foto: Ann Kristin Balto, Norwegian Polar Institute

OYSTERLEAF, the flowers are first red, then blue
Photo: Ann Kristin Balto, Norwegian Polar Institute

and geese in Svalbard.

The vegetation is lush by the foot of bird cliffs and other breeding places for birds. The moss, grass, and herb vegetation is Svalbard's most diverse and species-rich habitats.

At the coast, by the lagoons and by the river deltas, a special vegetation type occurs – the salt marsh. The salt marshes are distributed along a gradient of sea salt influenc .

COMMON SCURVYGRASS
Foto: Odd Harald Selboskar, Norwegian Polar Institute

Future scenarios and threats

Species diversity is closely related to the climate. Currently observed climate change in Svalbard is expected to cause changes in vegetation cover and species composition due to increased establishment of non-native species and altered competition between species. The plausible scenario for the future is that thermophilous (warm-loving) species, like dwarf birch, Arctic holy grass (Hierochloe alpina ssp. alpina), crowberry (Empetrum nigrum ssp. hermaphroditum and polar bilberry (Vaccinium uliginosum ssp. microphyllum), will expand in distribution.

ROSENROOT
Foto: Odd Harald Selboskar, Norwegian Polar Institute

Trampling from both humans and reindeer is detrimental to the vegetation cover. Secondly wind can increase erosion in dry areas, and in wet areas, a similar type of erosion is caused by freezing and thawing of water. Because of the permafrost, areas with continuous vegetation cover are especially vulnerable to damage because the insulating effect of the vegetation cover is damaged and leads to increased ground thaw and erosion.

Vegetation-rich areas such as the moss tundra, mires and marshes are especially vulnerable to trampling. The same applies to the steep hills below the bird cliffs. This is why tourist groups should always be directed around such vegetation. Our recommendation is that groups of tourists should walk on the dry and least vegetated areas where possible. The walk may seem tortuous and winding, but will be environmentally friendly.

SILENE WAHLBERGELLA (BLINDURT)
Photo: Harald Faste Aas, Norwegian Polar Institute

Svalbard's wildlife

Text taken from Cruise Handbook for Svalbard, Polar Handbook no. 14, Norwegian Polar Institute

Svalbard's wildlife is low in species diversity compared to temperate regions. However, those species that are present in Svalbard are often highly abundant, a pattern most pronounced for seabirds. Wildlife diversity peaks in the summer when migratory birds are present. This contrasts starkly with the wintertime, when only the hardiest species like Svalbard reindeer, polar bears, seals, Svalbard rock ptarmigan and Arctic foxes can be seen.

Species living here have adapted to the extreme conditions in Svalbard. The greatest challenge is to get enough food for survival and reproduction. Wintertime is a bottleneck. Darkness prevails and the ground is covered in snow and ice. Herbivorous animals face their greatest challenges in winter. The Svalbard reindeer and the Svalbard rock ptarmigan spend the summer and autumn building up a layer of body fat for survival through the winter when food supply is low. Utilization of this stored fat is crucial to maintain body functions until next summer. The same applies to the Arctic fox. The polar bear also builds fat reserves from January onwards during the birth and moulting season for seals, when prey is most accessible.

Most birds that breed in Svalbard solve the winter problem by migrating south in late summer/autumn. They spend the winter in a more favourable climate in areas with greater food availability. The Svalbard rock ptarmigan is the only landbound bird species that overwinters in the archipelago. Among the seabirds it is normally only the common eider, the long-tailed duck and the black guillemot that overwinter in Svalbard, and only in small numbers along the coast. There are also northern fulmars and glaucous gulls at sea.

In Svalbard life in the sea and life on land are closely connected. During the breeding season seabirds transport large amounts of nutrients from the sea to the bird cliffs. A pair of little auks adds about 1 kg of guano to the soil in one season. No wonder the slopes beneath the bird cliffs are extremely green and lush. Seabirds play an important ecological role as links between the marine and land-based ecosystems.

Polar bear beneath bird cliffs Photo: NHS

Good light conditions and relatively high temperatures in the summer create the basis for plant production and a rich wildlife both on land and, especially, in the sea. Snow conditions on land and sea ice conditions are decisive factors. Migrating geese arriving in mid-May and onwards need snow-free areas for a successful breeding season.

Mammals

A total of 19 species of marine mammals are found in Svalbard. This includes polar bears, walruses, fi e species of seals and 12 species of whales.

There are only three species of terrestrial mammals in Svalbard: Svalbard reindeer, Arctic fox and sibling vole. The vole was most probably introduced to Svalbard in animal fodder at the Russian mining settlement of Grumantbyen. Deliberate attempts to introduce other species – Arctic hare, hare and muskox – failed to establish populations capable of living there, and they have gone extinct.

Below is a brief description of some of the species you may see along the coasts of Svalbard.

POLAR BEARS eating on a beached whale Photo: NHS

POLAR BEAR visuting Photo: NHS

POLAR BEAR

Once heavily hunted, the polar bear was protected by law in 1973. Since then, the common population of Svalbard and Franz Josef Land – including the drift ice area – was estimated in 2004 to nearly 3000 animals. Polar bears may appear anywhere in Svalbard, but in summer they are most often seen in the north-western and northern parts of Spitsbergen, on the east coast and on Nordaustlandet and the surrounding islands. The polar bears are strongly tied to the sea and sea ice. Polar bears often follow the ice edge northwards in summer. Some however stay on land and starve through summer, unless they go for birds' eggs and chicks or are lucky to find a stranded whale carcass. Such incidents can bring together several polar bears.

Photo: Eiliv Leren

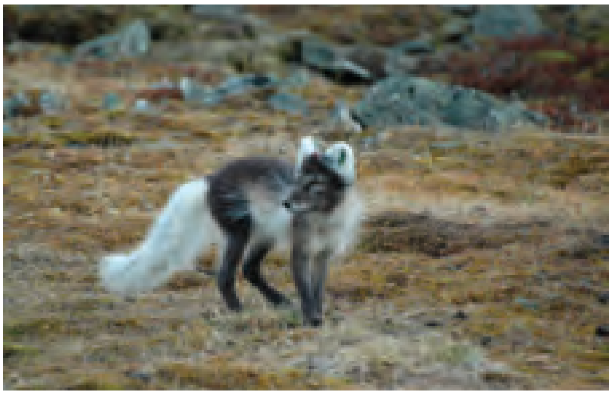
Photo: Eiliv Leren

MALE Svalbard reindeer Photo: NHS

FEMALE Svalbard reindeer Photo: NHS

SVALBARD REINDEER

The Svalbard reindeer is a sub-species of reindeer that only lives in Svalbard. Its short legs, short neck, small and rounded head and thick coat make up its characteristic appearance. Males are larger than females. Svalbard reindeers are widely distributed in Svalbard in areas with sufficient vegetation. The total population is estimated at 10 000 animals, and the most dense populations are found at Nordenskiöld land, in the valley of Reindalen and on the islands of Edgeøya and Barentsøya. During winter, the reindeer concentrate on ridges and plateaus with little snow cover and sparse vegetation. Early in the summer they move to lower areas, to the standfl ts, lowland plains, bottom of the valleys and beneath the bird cliffs where they can feed on the lush, nutritious vegetation. The reindeer gives birth to a single calf in June.

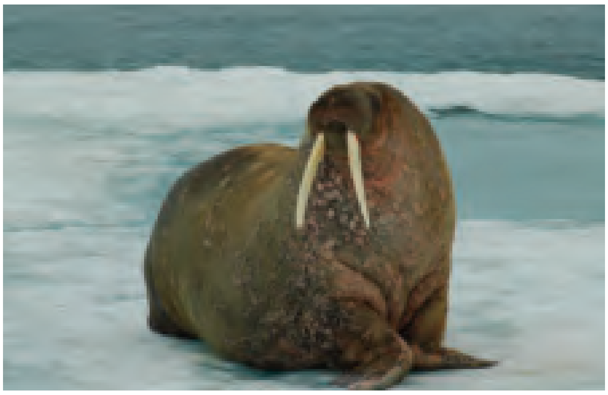


ARCTIC FOX Photo: NHS

Photo: Bjørn Frantzen/Norwegian Polar Institute

ARCTIC FOX

In Svalbard there is a large, thriving population of Arctic fox, and it is widespread in almost all of the archipelago. The Arctic fox is short-legged and has a short snout, short and rounded ears and a small body covered by a thick, well-insulating coat. The bottoms of the paws are covered in fur. The Arctic fox appears in two colour morphs – blue and white. The white morph is uniformly white in winter, and brown and yellowish in summer. The blue fox is dark brown/blue all year round. At the coast, the fox is closely associated with the bird cliffs, where food is plentiful in the form of eggs and chicks of common eiders, geese and seabirds. The fox hoards food in anticipation of a long and severe winter. Inland, food is less plentiful. Mating takes place between February and April, and in May–June the cubs (normal litter size 5–6) are born in underground dens in sandy slopes or in dens under large boulders.



WALRUS in Lomfjorden Photo: NHS

Curious WALRUSES by Andréetangen Photo: NHS

WALRUS

Svalbard and Franz Josef Land have a common walrus population. The walrus was protected in 1952, at a time when the Svalbard population was down to a few hundred animals. Estimates of the Svalbard population indicated in 2006 an approximate number of 2500 animals, predominantly males, but an increasing number of females with calves are observed in the east. Walruses are social animals and are often seen in groups when searching for mussels on the sea floor and when resting on land or during moulting. They prefer lying on ice floes or fast ice, if possible.

BEARDED SEAL Photo: Eivind Leren

BEARDED SEAL Photo: NHS

BEARDED SEAL

The bearded seal is the largest of the seals in Svalbard. Females can reach weights of 425 kg in spring. Males are smaller than females. Bearded seals prefer areas of shallow water with drifting pack ice. In Svalbard, they amount to several thousand animals. This seal may be seen in most fjords, often resting on ice-floe . Where not hunted, the bearded seal may seem very trustful. Moulting takes place in June.

RINGED SEAL
Photo: Bjørn Frantzen/Norwegian Polar Institute

RINGED SEAL

The ringed seal has a circumpolar distribution. The Svalbard population is estimated to about 100 000 individuals. The ringed seal is the most widespread and common seal at this latitude due to its unique ability to maintain breathing holes in the fast ice all year round. The ringed seal is a small seal, with adult animals weighing 50–100 kg. A ringed pattern in its fur explains the common name. It is dependent on sea ice for birthing, moulting (May–July) and haul-out. During the moult, seals congregate in fjords with remaining fast ice.

HARBOUR SEAL Photo: Kit Kovacs/Norwegian Polar Institute

WHITE WHALE Photo: Fredrik Broms/Norwegian Polar Institute

HARBOUR SEAL
The world's northernmost population of harbour seals is found in Svalbard, comprising approximately 1000 animals. They are concentrated at Prins Karls Forland, but in summer you may come across them all along the western coast of Spitsbergen.

Other seal species that can be seen around Svalbard are harp seals and hooded seals.

BOWHEAD WHALE
The bowhead whale is large and broad, has a bowed shaped head and lacks a dorsal fin. It reaches lengths of 14–18 m, and the female is the larger sex. Bowhead whale blows can be recognized by their V-shape. It is the only species of the baleen whales to stay in Arctic waters year round. The Svalbard population is very small, but numbers are unknown. The bowhead whale is protected by law in Svalbard since 1939.

WHITE WHALE
This is a medium sized toothed whale, and males can reach lengths of 4.5 m and weigh 1500 kg. Females are somewhat smaller. The number of white whales in Svalbard is not known. Being a social whale, it can often be spotted moving in groups near land. In Svalbard white whales occur mostly in coastal areas, but also in areas of dense pack ice. The white whale is also commonly known as beluga.

Other whales and dolphins that may be observed in waters around Svalbard are narwhal, blue whales (relatively rare), fin whales, humpback whales, minke whales, sperm whales, northern bottlenose whales, orcas (killer whales), pilot whales and white-beaked dolphins. All of these species, except the minke whale, are protected.

Birds

A brief introduction to some of the most characteristic bird species in Svalbard follows.

SVALBARD ROCK PTARMIGAN Photo: NHS

COCK SVALBARD ROCK PTARMIGAN Photo: NHS

THE SVALBARD ROCK PTARMIGAN

The Svalbard rock ptarmigan is the only terrestrial bird over-wintering in Svalbard and is widespread in most of the archipelago. Greatest densities are found in central areas of Spitsbergen where plant production is highest. The Svalbard rock ptarmigan is an endemic sub-species of rock ptarmigan and is also quite similar to this in both behaviour and appearance. The male (cock) establishes a territory in March–April, which it protects through creating a diversion and making a burping sound.

BLACK GUILLEMOT

Photo: Thor Severin Larsen/Norwegian Polar Institute

Photo: Palle Uhd Jepsen/Norwegian Polar Institute

BLACK GUILLEMOT

The black guillemot is a medium sized auk with a distinctive summer plumage in black with a large white patch on each wing. The bill is black, and the gape and feet are bright red. The winter plumage is predominantly white on the head, neck and under-parts, while there are black and white bars across the crown, neck, back and flank . The call of the black guillemot is a light, wailing whistle. The one or two (usually two) eggs are laid directly onto the ground, in a rocky crevice, under stones or in screes. Black guillemots can be found in the Svalbard area all year round where there is open water.

ATLANTIC PUFFIN

Photo: Odd Harald Selboskar/Norwegian Polar Institute

ATLANTIC PUFFIN

The Atlantic puffin is also kn wn as the sea parrot because of its colourful bill. Svalbard is the northernmost distribution area for the Atlantic puffin and the umbers here are low (uncertain estimates indicate approximately 10 000 pairs). It appears from Bjørnøya in the south, along the west coast of Spitsbergen, and north to the islands of Sjuøyane. Atlantic puffins b eed in crevasses and cavities between rocks.

LITTLE AUK
Photo: Odd Harald Selboskar/Norwegian Polar Institute

LITTLE AUKS in flight
Photo: Bjørn Frantzen, Norwegian Polar Institute

LITTLE AUK
The little auk is the smallest of the European auks. The little auk makes lots of noise and this accounts for the popular name «tromsøværing» – meaning a native Tromsø resident. The little auk is the most numerous bird in Svalbard, widespread across the archipelago, but more numerous in the south-western and north-western parts of Spitsbergen.

BRÜNNICH'S GUILLEMOT Photo: NHS

Group of BRÜNNICH'S GUILLEMOTS Photo: NHS

COMMON GUILLEMOT AND BRÜNNICH'S GUILLEMOT
Large bird cliffs often house one of these species, which are strikingly similar and may easily be confused. The common guillemot has a longer and thinner bill, lacking the white line at the base of the upper bill that characterizes the Brünnich's guillemot. Common guillemots also have dark mottling on the white part of their flank . Bjørnøya is the most important breeding area for the common guillemot, which has a more southerly distribution than its relative. Capelin is the main prey item. The Brünnich's guillemot is pure black and white in colouration.

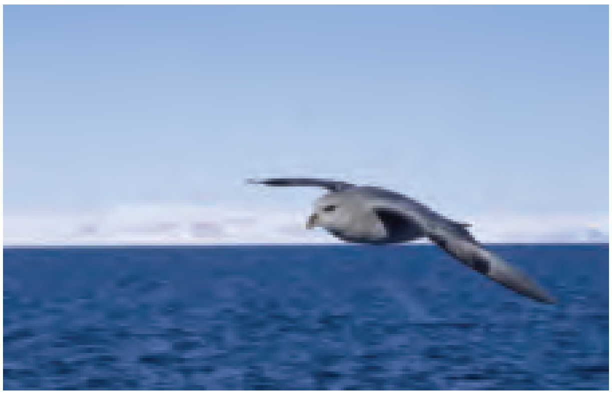
BLACK-LEGGED KITTIWAKE
Photo: Kim Holmén, Norwegian Polar Institute

BLACK-LEGGED KITTIWAKE
The black-legged kittiwake is the most numerous of all gull species in Svalbard (also worldwide), with a population in the archipelago estimated to comprise approximately 270 000 pairs. While searching for food they often occur in flocks and are easily recognizable by their miaowing call: «kitt-i-waaik, kitt-i-waaik».

GLAUCOUS GULL Photo: Eiliv Leren

GLAUCOUS GULL
The glaucous gull is the largest of the gulls in Svalbard, and is quickly on the spot where carrions can be found. The glaucous gull nests throughout Svalbard. It acts as a predator, easily catching adult little auks in flight and chicks of Brünnich's guillemot and common guillemot when the young jump off the cliffs for the first time. At the top of the food chain, the glaucous gull is strongly affected by pollutants, for instance PCBs.

NORTHERN FULMAR Photo: NHS



NORTHERN FULMAR in flight
Photo: Tor Ivan Karlsen, Norwegian Polar Institute

NORTHERN FULMAR
There are two colour morphs of northern fulmar in Svalbard, the dark grey, which is the predominant type, and the light morph, which is most common further south in the Atlantic Ocean. The northern fulmar is an excellent flier as it glides on almost immovable wings over land, the ocean surface or along the ship railing. Fulmars nest in numerous bird cliffs in Svalbard. Most of the cliffs are located along the coasts and in the fjords.

IVORY GULL
Photo: Cecilie Miljeteig , Norwegian Polar Institute

IVORY GULL in flight
Photo: Bjørn Frantzen, Norwegian Polar Institute

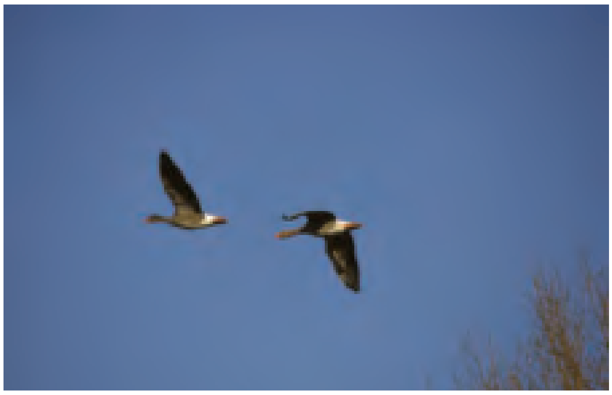
IVORY GULL
The ivory gull is primarily a carrion feeder, often observed in the ice on top of remains from polar bear meals. Its status is highly uncertain in Svalbard, as there is great concern that the population might have declined considerably. Ivory gulls nest scattered in colonies in inland Spitsbergen, on Nordaustlandet and in the Kong Karls Land islands. A joint Russian–Norwegian effort to register the breeding population was carried out in 2006. Approximately 200-250 pairs were estimated to be breeding in Svalbard.

ARCTIC TERN
Photo:Bjørn Frantzen, Norwegian Polar Institute

ARCTIC TERN in flight Photo: Eiliv Leren

ARCTIC TERN
Most tourists visiting Svalbard will encounter the Arctic tern when it is dive-bombing intruders approaching nests and chicks. The Arctic tern arrives in the north in early summer, having migrated all the way from Antarctica to reproduce during the short Arctic summer. Arctic terns occur throughout Svalbard, but are most numerous in western and northern Spitsbergen. They usually nest in colonies of up to several hundred pairs.

PINK-FOOTED GEESE Photo: NHS



PINK-FOOTED GEESE in flight
Photo: Bjørn Frantzen, Norwegian Polar Institute

PINK-FOOTED GOOSE
This is the largest and most numerous of the three goose species in Svalbard. Breeding is mainly restricted to Spitsbergen. They are few in number in the east. The pink-footed geese arrive in Svalbard in mid-May, migrating from their winter grounds in Belgium, the Netherlands and Denmark. They leave Svalbard in September–October. Pink-footed geese breed on islands and islets, but also at the base of slopes beneath bird cliffs or at river ravines. The Svalbard population of pink-footed geese has increased. At their winter grounds, 64 000 geese were counted in 2008/09.

A gaggle of BRENT GEESE
Photo: Øystein Overrein, Norwegian Polar Institute

BRENT GOOSE
This is the smallest and fewest in number of the goose species in Svalbard – actually of all migrating goose populations in the world! Originally, the brent goose was the most numerous goose species in Svalbard, with an estimated population of approximately 500 000 geese. Excessive exploitation in the early 1900s dramatically reduced the population. In 2005 the popu-lation was down to an estimated number of 7000–7500 geese in their wintering areas in England and Denmark. The brent geese arrive in Spitsbergen in the transition between May and June. Most of the brent geese in Svalbard breed on the islands of Tusenøyane, but some also breed in northern Spitsbergen.

BARNACLE GEESE Photo: NHS

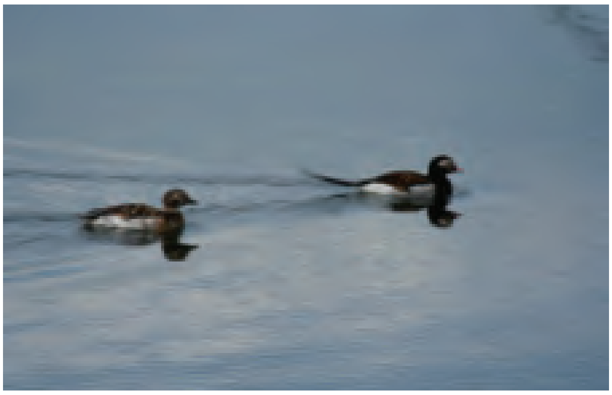
BARNACLE GEESE in flight
Photo: Tore Nordstad, Norwegian Polar Institute

BARNACLE GOOSE
After being reduced to only approximately 300 individuals after World War II, this species has increased greatly through protection and preservation of breeding grounds in Svalbard and wintering grounds in Scotland. In 2008/09 the Svalbard population was estimated at 30 000 geese. Barnacle geese arrive in Svalbard in early May, after stopping in Helgeland (northern Norway), and breed on islands and islets and on steep scree slopes on the west coast of Spitsbergen and in the archipelago of Tusenøyane. In August–September they leave Svalbard.

COMMON EIDERS Photo: NHS

COMMON EIDERS and KING EIDERS
Photo: Eiliv Leren

COMMON EIDER
The eggs and down of the common eider were heavily exploited in earlier times, resulting in reduction in the population and subsequent protection in 1963. In Svalbard today, the breeding population is estimated to be approximately 17 000 pairs. The common eider nests in dense colonies on islands and islets on the west coast, in the north of Svalbard and on Tusenøyane. They are also found breeding scattered across the whole archipelago.



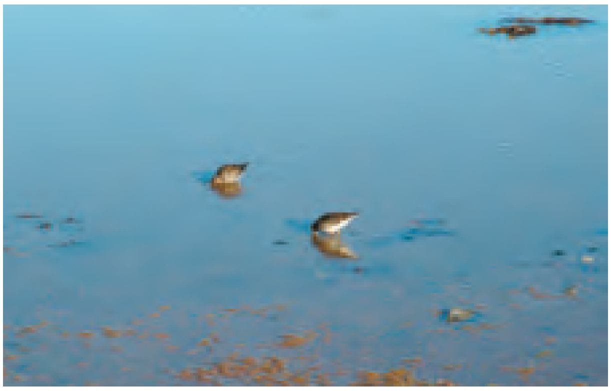
LONG-TAILED DUCK
Photo: Kim Holmén, Norwegian Polar Institute

LONG-TAILED DUCK
The long-tailed duck is a small diving duck with plumage in white, gray, brown and black. It has a short, pink bill and rela-tively small head. It has a circumpolar distribution and nests both in mountainous regions and in lowlands, often far from the coast, close to freshwater ponds. Observations suggest that some individuals from the Svalbard population winter in ice-free waters off the west coast of Svalbard, mainly along Nor-denskiöldkysten and Prins Karls Forland. The long-tailed duck is vulnerable to oil spills at sea.

GREY PHALAROPE Photo: Eiliv Leren

GREY PHALAROPE AND OTHER WADERS
With its colourful plumage, the grey phalarope is a fascinating wader. The female is the largest and most colourful of the sexes. The male incubates the eggs and rears the young. In Svalbard the grey phalarope breeds in pairs or in small colonies throughout most of the archipelago. They migrate south starting in mid-July.

Other waders that can be seen in Svalbard are: Ringed plover, sanderling, dunlin and ruddy turnstone.



PURPLE SANDPIPER Photo: NHS

THE PURPLE SANDPIPER
The purple sandpiper is the most common wader in Svalbard. It is modest in colouration, speckled in brown, black and greyish yellow. In Svalbard the purple sandpiper nests on dry tundra throughout most of the archipelago. The total number is estimated to lie between 2000 and 10 000 pairs. This is a migratory species arriving in the middle of May and leaving in August–September to overwinter in flocks along the Norwegian coast from Tromsø in the north and all the way to the western coast of Sweden in south.

RUDDY TURNSTONE Photo: Eiliv Leren

RUDDY TURNSTONE
Ruddy turnstone is a medium sized wader with pointed bill. It weighs between 100-200 g and are 20-25 cm high. It breeds in northern latitudes, usually no more than a few kilometres from the sea.

SNOW BUNTING
Photo: Thor Severin Larsen, Norwegian Polar Institutet

SNOW BUNTING
The snow bunting is the only song bird in Svalbard and the most northerly passerine bird in the world. It nests in most areas of Svalbard, and its main food is insects. In August/September it leaves Svalbard and migrates south to the Russian steppes north of the Caspian Sea and Kazakhstan for overwintering.

ARCTIC SKUA
Photo: Fredrik Broms, Norwegian Polar Institute

ARCTIC SKUA Photo: Eiliv Leren

GREAT SKUA Photo: NHS

ARCTIC SKUA AND GREAT SKUA

Both the Arctic skua and its larger relative, the great skua, are master flier , specializing in stealing food from other seabirds, black-legged kittiwakes and Brünnich's guillemots in particular. The Arctic skua occurs in a light and a dark morph. The light morph is most common in Svalbard. The Arctic skua breeds all over Svalbard in single pairs. The great skua is considerably larger than its relative and is a new species in Svalbard. Great skuas were first registered breeding on Spitsbergen in 1976, and they are now increasing in numbers both in Svalbard and on mainland Norway. Fish and seabirds are the main prey items. It is most common on Bjørnøya and along the western Spitsbergen coast. Two more species of skuas may be seen in Svalbard – the long-tailed skua and the pomarine skua. All skuas are migratory.

Svalbard's geology

Text taken from Cruise Handbook for Svalbard, Polar Handbook no. 14, Norwegian Polar Institute

For more than a hundred years, Svalbard has fascinated people with a special interest in the geological history of the Earth. Many who have visited Svalbard have been taken with the wide, cold wilderness of the archipelago with its stunning mountains and rock diversity. The landscapes appear very different if you sail into Hornsund with its bizarre, jagged mountain ridges, while the east coast of Spitsbergen is characterized by fl t-topped nunataks, and Woodfjorden with its unreal, reddish coloured mountains. No other place in northern Europe displays such diversity in geological formations and no other place has so many geological eras exposed in outcrops.

In Svalbard mountains are mostly naked, lacking significan amounts of soil and vegetation. The bedrock exposures can therefore be studied unimpeded over large distances. Even if most of Svalbard is covered by glaciers, it is one of the few places on Earth where you can get an easy look into most of the planet's geological history. All of these factors make Svalbard a unique place for studying geology; a natural geological archive and a laboratory where the past and the present geological processes are being clearly demonstrated.

The often heard statement that Svalbard once was located near the Equator is only partly correct. In Svalbard – as in Norway and the rest of the world – there are rocks that were formed in other climate zones, for instance in the tropical zone during the Devonian. There are many factors to consider when explaining how these rocks ended up in the Arctic. Continental displacement (driven by convection currents in the lower part of the Earth's mantle) and displacements of the Earth's surface with respect to its rotational axis (and consequently the North and South Pole) are the most important factors.

Svalbard's geological succession is usually subdivided into three main units: the old basement (Precambrian and lower Palaeozoic); unaltered sedimentary rocks (late Palaeozoic to Tertiary); and young unconsolidated deposits (Quaternary).

Basement rocks (Precambrian and Palaeozoic up to Silurian)

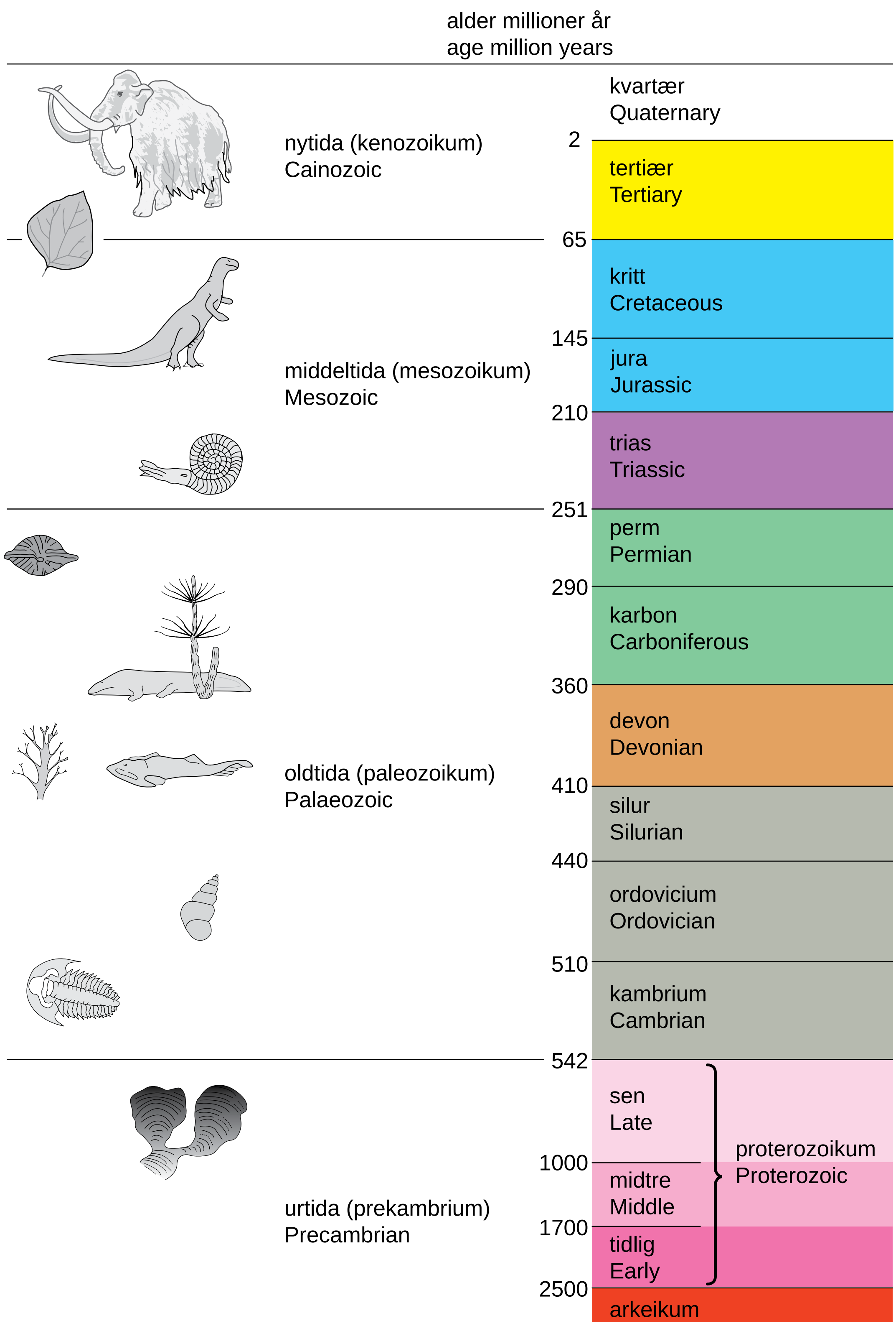
The basement rocks make up the oldest bedrock. The term «basement» is used differently in various countries. In Svalbard we use «basement» for those rocks which were present when the Caledonian orogeny ceased, about 410 million years ago.

The last widespreadorogenic phase occurred during the Silurian and gave rise to the Caledonian mountain chain, which reaches from Svalbard through Scandinavia to Scotland.

These basement rocks have normally suffered strong movements and alterations. They were folded, displaced along faults, and partly chemically altered under high pressure and temperature at depth. Those which lie at the surface today may have lain as deep as 20 km below the surface at that time. During the Silurian and Devonian, when the Caledonian mountain chain was uplifted, large portions of the basement came to the surface, while overlying rocks were removed by erosion.

FOSSILS Photo: Eiliv Leren

GEOLOGISK TIDSSKALA • GEOLOGICAL TIME SCALE



Development through the ages.

Source: Norwegian Polar Institute

A bare rock face of migmatite in the inner part of Duvefjorden on Nordaustlandet. The migmatite in the picture consists of gneiss (dark rock) penetrated by granitic veins and dikes (light rock). Photo: Synnøve Elvevold, Norwegian Polar Institute

The basement consists mostly of metamorphic rocks like gneiss, crystalline schist, quartzite and marble. Igneous rocks also form part of it, for instance, granite, which intruded the upper Earth's crust during the uplift of the mountain chain. The highest mountain of Svalbard, Newtontoppen, consists of such resistant granite.

Sedimentary rocks from Devonian to Tertiary

The eroded parts of the mountains ended up as sand, gravel and mud that were deposited during the Devonian, about 410–360 million years ago, on river plains and in the sea. The red and greenish-grey sandstones of Andrée Land in northern Spitsbergen are built up of such deposits.

The landscape surrounding Woodfjorden is characterized by red sandstones of Devonian age. Moraine material is deposited in front of a glacier. Photo: Winfried Dallmann, Norwegian Polar Institute

The darker horizontal layers are igneous rocks, dolerites, which have penetrated horizontal layers of limestone. Lomfjorden.
Photo: Synnøve Elvevold, Norwegian Polar Institute

The distinctly layered, fossil-rich limestones and dolomites with intercalated layers of gypsum and anhydrite of Carboniferous and Permian age (360–245 million years old) in northern and eastern parts of Isfjorden are especially beautiful. These layers were deposited on a continental shelf that formed across most parts of Svalbard after much of the Caledonian mountain chain was eroded. The white gypsum and anhydrite layers, for instance, are derived from temporarily existing salt water lagoons that dried up in the still warm and dry climate, forcing the dissolved sulfates to crystallize out of the sea water.

Deposits of Mesozoic age (251–65 million years old) recorded a more moderate climate. Climate and vegetation were initially comparable to the Mediterranean of today and became gradually boreal (northern). Most of Svalbard was still covered by the sea, apart from short interruptions. However, no orogenies did occur. Sand, gravel and mud accumulated on the seabed and can now be seen in the Mesozoic sandstones and shales, exposed on land today in central and eastern Svalbard. Islands, where dinosaurs like iguanadons lived, existed temporarily in the sea. The sea was inhabited by marine reptiles.

During the Cretaceous period the Earth's crust cracked. A rift system formed all the way from the southern to the northern Hemisphere. This was the beginning of the formation of the Atlantic Ocean. Magma intruded fissu es in the crust. Magma forms a resistant, igneous rock type called dolerite, which can be seen in many places in Svalbard, often forming a ragged edge of mountain plateaus and ridges. During the early Tertiary (65-40 million years ago) the ocean-spreading began seriously. The north-western corner of the European continent, with the Barents Shelf and Svalbard, was slowly cut off from north-eastern Greenland along an enormous transform fault line. During this process the western part of Spitsbergen was folded to form a new mountain chain.

East of the new mountain chain, from the Isfjorden area and southward, the land surface subsided and formed a large, north-south directed bay or strait. It accumulated eroded material, now preserved as Tertiary sandstones and shales. At times during this period, conditions were favourable for the formation of coal deposits, when the tectonic movements resulted in slow, periodical flooding and egression of the sea.

A fossil leave of a ginkgo tree from Tertiary sandstone layers in Central Spitsbergen. The leave indicates that there was probably a moderately warm climate at the latitude where Svalbard was situated about 40 million years ago. Ginkgo occurs today in Japan and China
Photo: Winfried Dallmann, Norwegian Polar Institute

The mountain Sverrefjellet at Bockfjorden is the remain of a volcano that was active 100 000–250 000 years ago.
Photo: Winfried Dallmann, Norwegian Polar Institute

Unconsolidated deposits (Quaternary)

The youngest deposits are those of Quaternary age, which started about 2 million years ago and extends to the present time. The bulk of these deposits is unconsolidated and was formed during and after the last ice age: moraines, river deposits, coastal deposits, rock fall deposits, landslides and block field . During the entire Quaternary period Svalbard has been situated within the polar zone and was subject to glaciations many times. Present geological processes in Svalbard are strongly characterized by the permafrost and the presence of glaciers. Much of the deposition that occurs today is related to the transportation of eroded material in glacial rivers, and is characterized by the seasonal fluctu tions in ice melting.

During a period of the Quaternary there was active volcanism in north-western Spitsbergen. The most prominent volcano, Sverrefjellet, is between 100 000 and 250 000 years old. The thermal springs by Bockfjorden indicate that the geothermal gradient is still high in the area.

Weather forecasts for the Arctic Ocean area

The weather Service for Norway

The public weather forecasting service is delivered by Met. no. (regional offices) and is vailable without charge:

- Forecasting Division, Eastern Norway, Oslo.
- Forecasting Division, Western Norway, Bergen.
- Forecasting Division, Northern Norway, Tromsø.
- The forecasts include weather, visibility and in some areas, also wave height.
- Ice reports are transmitted from some coastal radio stations in the north.
- Wind strength on the Beaufort scale and in m/sec.

Good visibility is over 10 km.
Moderate visibility is 4–10 km
Poor visibility is 1–4 km
Fog is visibility less than 1 km
Meteorological Institute (MI).
Internet: www.met.no.yr.no

Special services

In addition to the «ordinary» weather forecasting service the Meteorological Institute's regional offices provide a number of forecasts and consultation services. These services must be paid for by the client. Examples of the services are special forecasts for the oil industry and sailing forecasts for shipping.

Enquiries and ordering maritime related forecasts should be directed to:

Met.no Vervarslinga på Vestlandet, Allegaten 70, 5007 Bergen. Telephone +47 55 23 66 00, Fax +47 55 23 67 03.

Teletorget

Weather forecasts for part of the coast is now available on the Teletorget, telephone +47 820 73 015.

Here are updated weather forecasts for the area. Price is 13.09 NOK per minute (2011). If more information is required it can be obtained by calling the meteorology watch direct (PRICE 25.91 NOK per minute):

Oslo +47 820 90 001
Bergen +47 802 90 002
Tromsø +47 820 90 003

The Ice Service

The Meteorological Institute (met.no) provides daily charts for sea ice concentration, sea- and water temperature. The charts can be ordered individually or by subscription. Contact one of the met.no offices y telephone:

Tromsø +47 77 62 13 00
Bergen +47 55 62 13 00
Oslo +47 22 96 31 16
E-mail : met.nord@met.no.
http://retro.met/kyst_og_hav/iskart.html

Weather forecasts for our coastal and sea areas

The coast radio broadcasts weather forecasts from MI for the coastal areas from the Swedish border to the border with Russia and for the sea areas in the North Atlantic Ocean. The forecasts are transmitted over maritime MF telephony channels and on NAVTEX. The forecasts are transmitted in English and Norwegian by MF telephony, while NAVTEX is in English only.

Transmissions by MF telephony cover the A2-area along the Norwegian coast and around Jan Mayen (about 300 nautical miles) while NAVTEX covers about 400 NM.

Transmissions are in Coordinated Universal Time (UTC). To find local time add 2 hours to summer time and one hour for the rest of the year.

The transmission channels and times via telephony are as follows:

- Jan Mayen (channel 277) UTC: 1203, 2303
- Svalbard (channel 273) UTC: 1203, 2303
- Svalbard (channel 401) UTC: 1203, 2303

Forecasts are transmitted by NAVTEX at the following times:

- Svalbard (A) UTC: 00.00, 12.00, 08.00 (ice reports daily)

Telephony in Norwegian and English over Bjørnøya Meteo radio

Weather forecasts in Norwegian are read in plain language repeated in English on 1757 kHz and VHF channel 12 following announcements on 2182 kHz and VHF channel 16 at 1005 UTC and 2205 UTC. The forecasts are valid for 24 hours and apply to the areas A3 A4, B4, C4, C5 and C6 all year, in addition to the areas A5, A6, B5 and B6 during the months of July, August, September and October.

Telephony in Norwegian and English over Hopen Meteo Radio

Weather forecasts in Norwegian are read in clear text (with some repeated in English plain language) on 1750 kHz and VHF channel 12 following announcements on 2182 kHz and VHF channel 16 every day at 1103 hours UTC.

The forecasts are valid for 24 hours and apply to the areas «the fishing grounds off Nord Spitsbergen» A5, A6, B5, B6, C5, C6 (see chart) all year and also when required for the area «fishing grounds northeast of Svalbard» (80–82N and 23–36E).

Bodø Radio remotely controls Jan Mayen Radio via satellite and covers the areas around the island for radio telephone speech and weather reports on MF and VHF.

Local Weather reports

In addition to storm and gale forecasts the MI issues local weather forecasts which Coast Radio transmits over selected maritime radio channels following announcements on channel 16.

Times are expressed in UTC. To find local time, add 2 hours in summer time and 1 hour for the rest of the year:

Svalbard Radio 0633 hrs and 1633 hrs during the period 10. June to 1. October.

NRK Radio within and outside Norway's boundaries

Internet – Internet radio

Where ever you are in the world NRK P1 can be received direct and always on the same frequency via the internet and NRK's nettradio. On the nettradio you can select which direct transmission you wish to hear.

Land waves

In the northern area NRK P1 can be received on land wave via Ingøy on 153 kHz and Svalbard on 1458 kHz – both places with NRK Troms as direct transmission. The 362 metres high land wave mast on Ingøy in Finnmark is Scandinavia's highest structure. The mast is a single large antenna that enables the fishing fleet to listen to NRK P1. The radio signal from Ingøy covers the whole of the Barents Sea to Svalbard in the north to Smutthullet in the east.

Satellite

All NRKs radio programme radio channels are also available via satellite. Since the 1st June 2006 NRK transmits all television and radio channels via the Thor 2-satellite.

Radio channels on the Thor 2-satellite can be found as follows:

NRK	P1	1503
NRK	P2	1504
NRK	P3	1505
NRK	Mp3	1515
NRK	Always News	511
NRK	Always Classic	1507
NRK	Always folk music	3501
NRK	Weather at sea	1514
NRK	Sámi Radio	1510

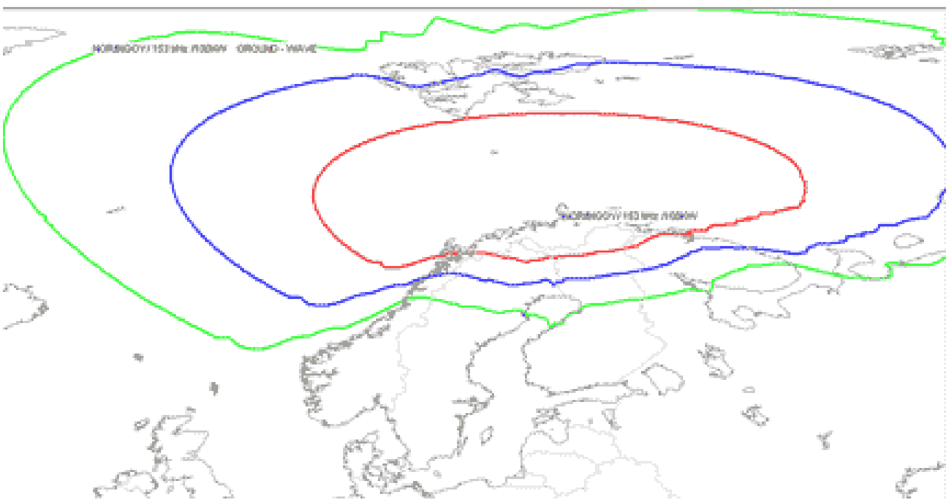
NRK's radio channels will from June transmit unencrypted on a new transponder Thor 6 (another transponder, different frequency, the same position). The broadcasts on Thor 2 will be phased out by the end of September 2016.

DAB radio

It will be launched digital radio (DAB +) in Svalbard. Theoretical calculations show that the whole Isfjorden and Billefjorden area should be well covered and in addition a number of places of refuge. Coverage is scheduled verified in August 2016

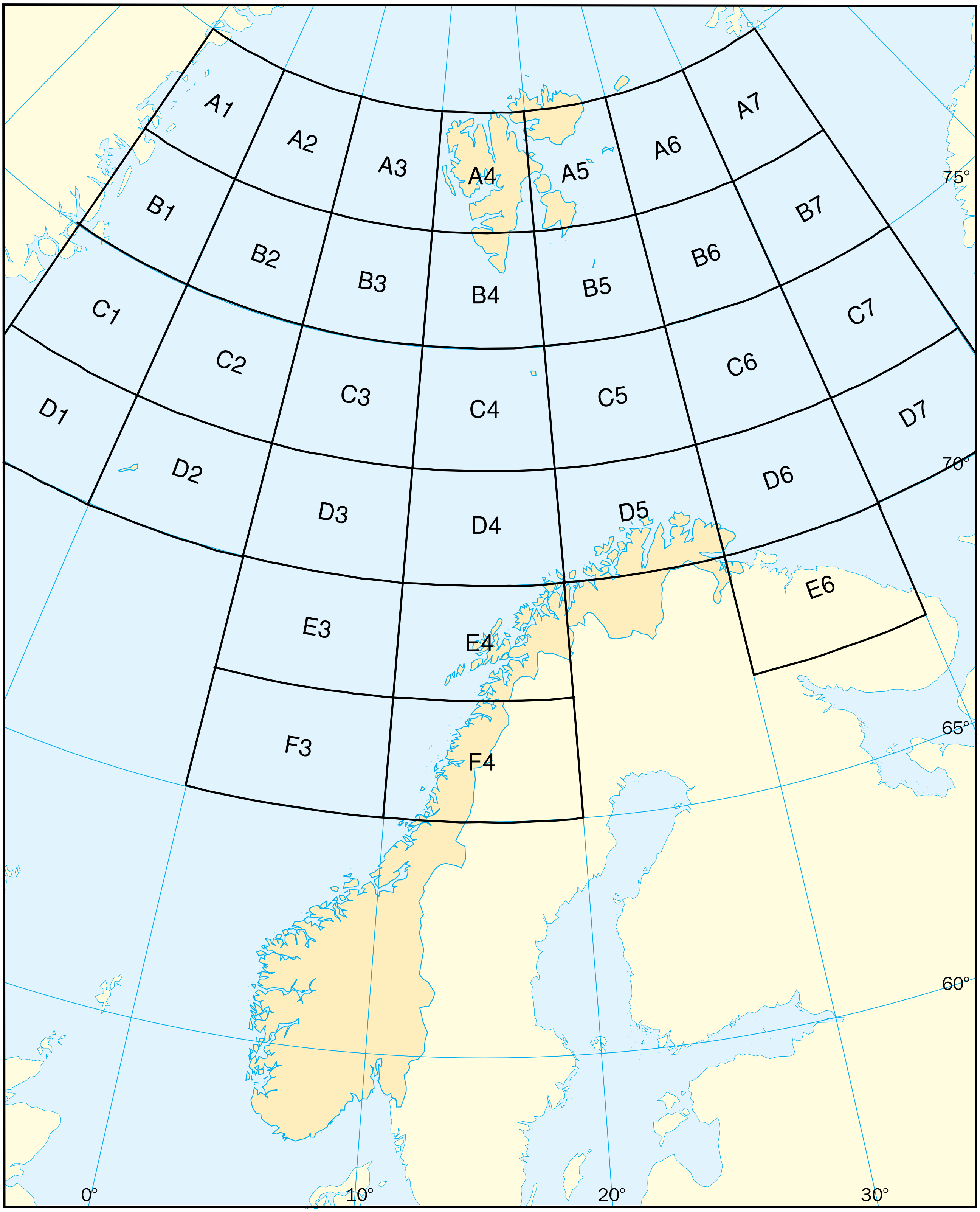
For more detailed information telephone the duty watch, meteorolog direkte, Oslo on +47 82 09 00 01 – Bergen on +47 82 09 00 02 – Tromsø +47 82 09 00 03.

Enquiries on ice conditions should be made directly to Weather-Forecasts for Nord Norge:
Postboks 6314, 9293 Tromsø
Tel. +47 77 62 13 00
Fax: +47 77 62 14 01
E-mail: met.nord@met.no



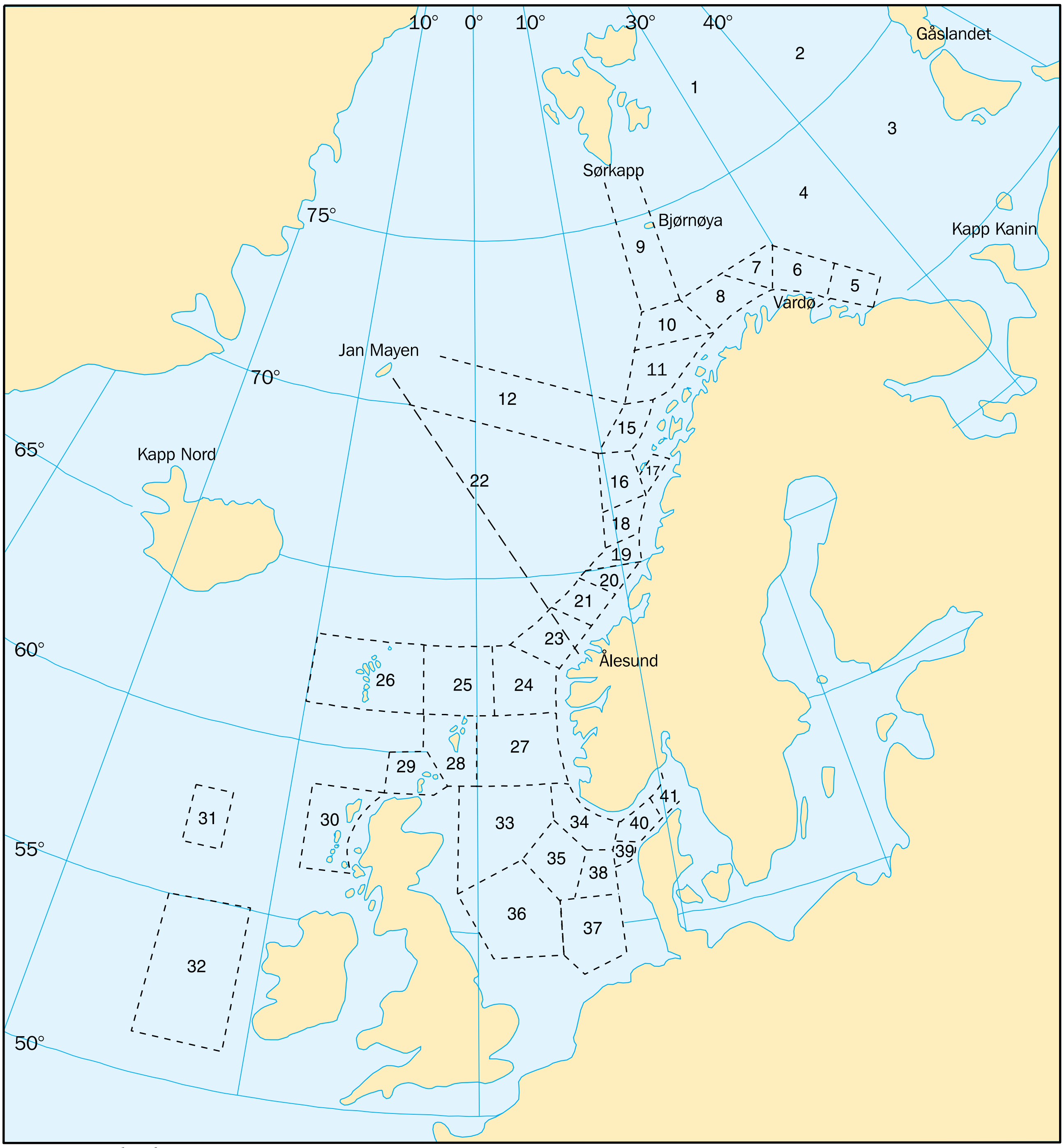
The illustration shows the coverage area of the Ingøy transmitter

Source: Meteorological Institute



Maritime weather forecast areas

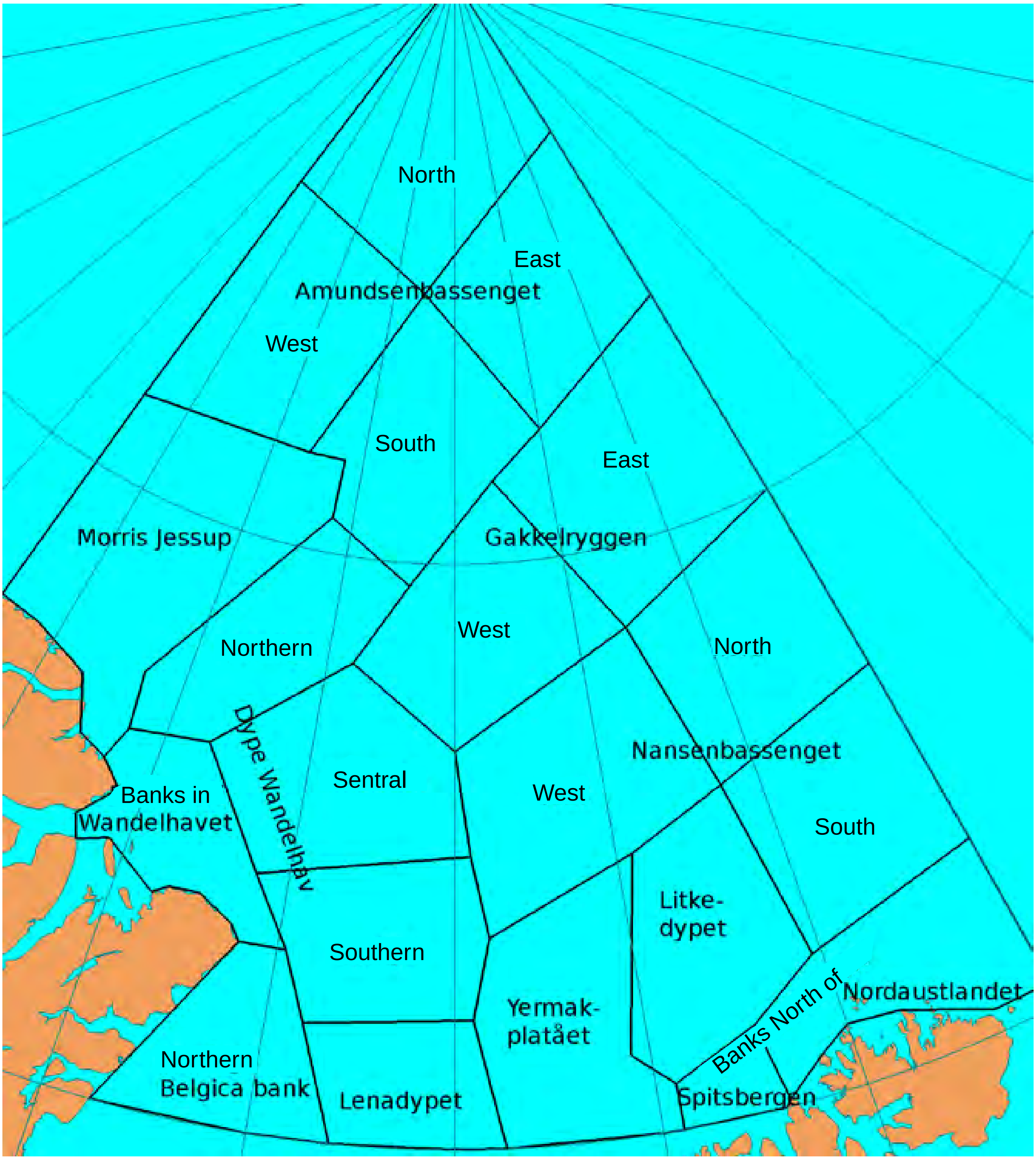
Source: The Norwegian Meteorological Institute



Maritime weather forecast areas

Source: The Norwegian Meteorological Institute

01 Northwestern part of Barents Sea
02 Northeastern part of Barents Sea
03 Southeastern part of Barents Sea
04 Souhtwestern part of Barents Sea
05 Kildinbanken
06 Nordbanken
07 Nordkappbanken. The banks outside Finnmark
08 Hjelmsøybanken
09 The crossing Tromsøyfla et–Bjørn øya–Sørkapp
10 Tromsøyfla et
11 The banks outside Troms
12 The crossing Vesterålsbanken–Jan Mayen
15 Vesterålsbankene
16 Røstbanken
17 Ytre Vestfjorden. The banks outside Nordland
18 Trænabanken
19 Sklinnabanken
20 Haltenbanken
21 Frøyabanken
22 The crossing Ålesund–Jan Mayen
23 Storegga
24 Aust-Tampen
25 Vest-Tampen
26 Færøybankene
27 Vikingbanken
28 Shetlandsbankene
29 Orknøyane
30 Hebridene
31 Rockall
32 Fishing ground west of Irland
33 Fladengrunn
34 Revet Lindesnes–Jæren
35 Store Fiskebank
36 Doggerbank
37 Kvitbanken
38 Lille Fiskebank
39 Jyske Rev
40 Outer Skagerrak
41 Inner Skagerrak



The illustration shows the limits of METAREA XIX (19)

Source: The Norwegian Meteorological Institute

The limits of METAREA XIX
From the position on the Norwegian coast at 65°N to 65°N, 005°W, 75°N 005°W, and westwards to the Greenland coast.

From the boundary between Norway and Russia to 69°47'68"N 030°49'16"E, 69°58'48"N 031°06'24"E, 70°22'00"N 031°43' 00"E, 71°00'00"N 030°00'00"E.

From the geographic position (71°00'00"N 030°00'00"E) then northwards along the 030°00'00"E meridian to: 90°00'00"N 030°00'00"E, 90°00'00"N 035°00'00"W, southwards to the Greenland coast along the 035°00'00"W meridian.

Forecast for METAREA 19 on Inmarsat (Safety NET)
Forecasts for METAREA 19 on Inmarsat (Safety NET) METAREA XIX (or 19) are Norway's responsibility and the MI has the allotted role of issuing and transmitting twice daily forecasts of weather in the open sea and of ice limits. The precise description of the areas is given below.

Transmission (in English only) is via the AOR-E satellite at 1100 hrs UTC and 2300hrs UTC, and on NAVTEX under the following list:

Weather reports in Norwegian and English (UTC times)
See page 121 for the area limits.

1215 and 2315

Farsund channel	291
Bergen channel	272
Florø channel	256
Ørlandet channel	290

1203 and 2303

Sandnessjøen channel	266
Andenes channel	249
Jan Mayen channel	277
Hammerfest channel	241
Berlevåg channel	261
Vardø channel	267
Svalbard channel	273
Svalbard channel	401

Climate conditions

General
Just a glance at the chart suggests that the weather conditions in the Svalbard area must be rather different from those found in other parts of the Arctic. The regions between Greenland and Scandinavia, where Svalbard occupies a northerly position, form the only large gap in the land masses around the polar basin. Through this «portal» a relatively direct exchange of both water and air masses takes place between middle and high latitudes.

During the course of the year both sea and air currents give a net transport of heat to the north. This causes the relatively high temperatures in this part of the Arctic. The annual amount of heat the earth's surface receives from the sun in these regions is in fact far less than that lost to space by radiation. The transport of heat from the south covers the deficienc .

In the area under consideration the weather situation may generally be divided into two main types. When low pressure dominates the weather picture, and passes over or near the islands mild, maritime air is drawn northwards. Such a situation is shown on the simplified weather map in figu e 6. In figu e 7 the other main type is illustrated.

Here the main high pressure area over the Polar basin or Greenland is recorded and Svalbard is invaded by the cold polar air masses from the direction between north and east. The annual amount of heat the earth's surface receives from the sun in this region is in fact far less than that lost in space by radiation, even though global warming is expected to increase in the future.

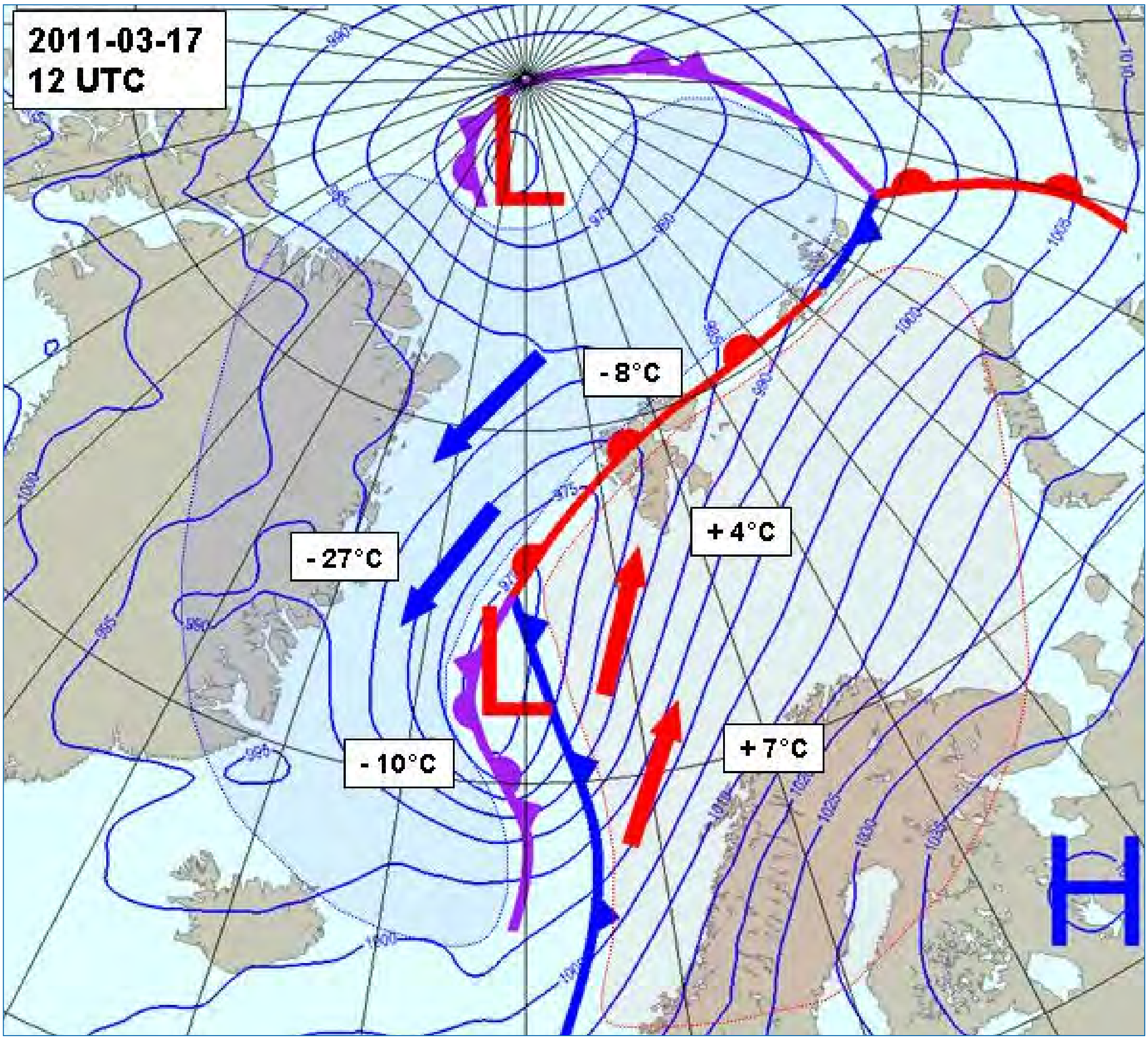


Figure 6 Source: The Norwegian Meteorological Institute

This weather map shows the situation on the 17 March 2011. It shows a low pressure system on its way north-eastwards, accompanied by a strong transport of mild, maritime air towards the Svalbard area. The red and blue shaded areas indicate warm and cold air masses, and the arrows indicate the direction of air mass transport. The maximum temperature at Svalbard airport on this day was 4.2 °C. Note the considerably lower temperatures on the east coast of Greenland.

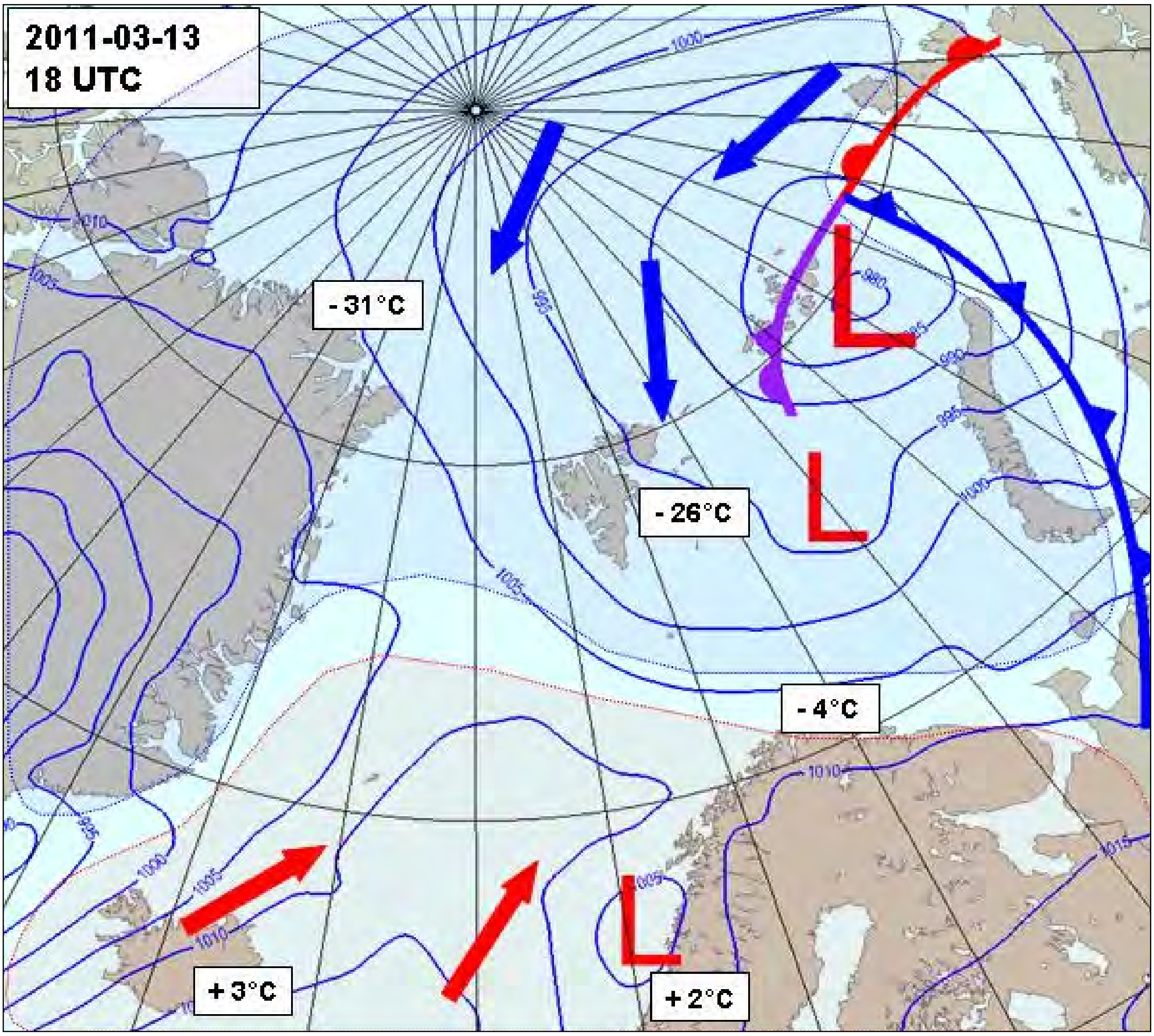


Figure 7 Surce: The Norwegian Meteorological Institute

This chart illustrates the situation 4 days prior to the situation shown in figure 6. Very cold, polar air flows across Svalbard, due to low pressure over Franz Josef Land. In the south a high pressure ridge leads warm air over Iceland and Scandinavia. The minimum temperature at Sveagruva on this day was -35.0 °C, while Svalbard airport measured -26.9 °C. The temperature at Sveagruva is the lowest temperature measured here during the winter of 2010/2011.

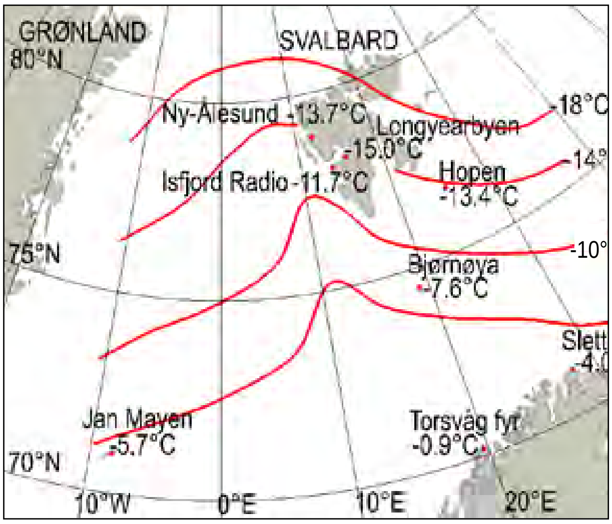
On the whole, the Svalbard area is often a meeting place between cold and mild air masses, or perhaps a zone of conflict. An encounter between air masses with very different temperatures means in reality an energy laden collision which in turn gives strength to our foremost «weather producers», the travelling low pressures. It also means that the weather becomes unstable and stormy, particularly in winter when the temperature contrasts, making the energy concentration greatest.

In connection with the relatively frequent passages of strong low pressures in winter, mild air streams northwards. Considering the latitude this leads to high mean temperatures. In addition, there is a northwards drift of temperate Atlantic Ocean water west of Spitsbergen which serves to keep the temperature in the air currents high. The western parts of Spitsbergen are especially favoured, as is apparent from figu e 8 (Isfjord Radio) (78° 04' N) has the coldest months, January to March, with mean temperatures of about minus 2 °C. By comparison it can be mentioned that at the station Isachsen in almost the same latitude in the west, in the Canadian polar archipelago, the mean temperature for the same months is more than 20 °C lower.

The low pressure's warming effect is also noticeable in the north-eastern parts of the Barents Sea. At the Buchta Tichaja station (80°19'N) on Zemlya Frantsa Iosifa (Franz Josef Land) the winter temperature is thus only 4–5° lower than at Isfjord Radio. Going still further eastwards, however, to Mys (Cape) Tsjeljuskin (77°43'N) on the coast of Siberia, it is as much as 15 °C lower. The cold winter climate of the continent makes itself felt here.

In summer the variations along the latitudes are far less. The heat from the sun has a levelling effect. The mean temperature for July at Isfjord Radio (4.8 °C) is only a couple of degrees higher than for the other stations mentioned above.

The temperature in summer is generally stable, and mostly stays between 0 and 10 °C. Readings over 15 °C are not very common and do not occur every summer. On the other hand, summer temperatures below 0 °C are not completely unknown, even in the lowlands. The highest temperature read on an «offi-



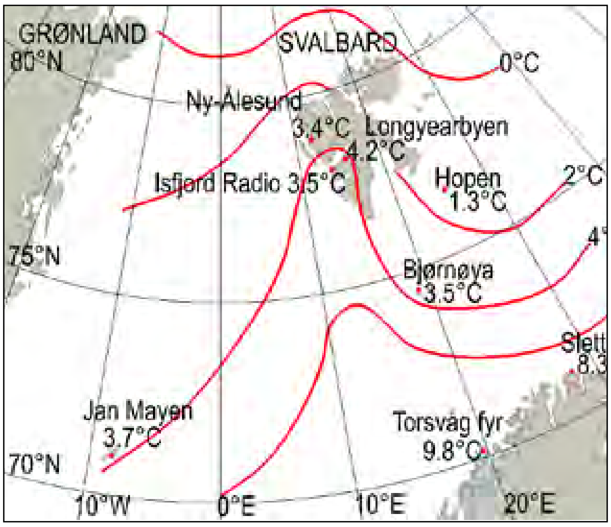


Figure 8 and 9 Source: The Norwegian Meteorological Institute

These figures show the mean air temperature over Svalbard and adjacent areas for the time period 1961–1990, which is a widely used climate averaged period. As figure 8 shows, the temperature in winter (December – February) is relatively high along the west coast of Spitsbergen and over the off-lying sea. It becomes colder both to the west and east. The comparatively high temperatures at Spitsbergen are caused by the frequent transport of mild air from the south, linked with low pressure systems crossing Svalbard and the Barents Sea, together with transportation of warm water masses through the West Spitsbergen Current. In the east towards Greenland there is cold, partly ice-covered sea. The low temperatures here are due to the substantial ice current from the north and the fact that the low pressures do not make themselves particularly felt here. In addition, because of persistent high pressure situations, the heat loss by radiation will often produce strong continental winter cold over Greenland and the off-lying ice masses. As would be expected, there is also a considerable fall in temperature northwards over Svalbard. The winter means temperatures fall approximately 15 °C from Bjørnøya to Phippsøya, or about 2.5 °C per degree of latitude. Figure 9 shows the mean temperatures in summer (June – August). Here the same pattern in temperature distribution as in winter is recognized, but the variations are considerably less. The fall in temperature from Bjørnøya to Phippsøya is thus only approximately 4 °C.

cial» thermometer is 21.3 °C. The record was set at Svalbard Airport 16th July 1979, while Bjørnøya is higher with 23.6 °C on 22nd June 1953.

The winter is much more variable. When mild «low pressure weather» and cold polar air change dominance it can cause large temperature variations. Changes of 30 °C and more in the course of a few hours have occurred on several occasions. The months of January–March are normally the coldest. On the west coast of Spitsbergen the average temperature for these months is usually somewhere between minus 8 °C and minus 16 °C. Minimum temperatures below minus 30 °C are not usual in the outer coastal region. It is also worth noting that for shorter periods the temperature may creep above freezing point even in midwinter. The absolute lowest temperature so far measured in Svalbard, minus 49.4 °C, was recorded on 28th March 1917 at a station in Green Harbour (Grønfjorden).

Moving from the outer coastal region in the west, and inwards in the fjords and valleys in Spitsbergen, the climate becomes more continental. This means in this case that the average temperature in winter is 2–4 degrees lower and returning to a few degrees higher in summer.

By taking a larger geographical leap, the temperature contrasts become more marked. Compared to the west coast of Spitsbergen the winter temperatures are considerably lower both in the northern and eastern parts of the archipelago. On the west coast of Nordaustlandet we can assume that the winter averages are about 5° lower (see temperature chart, figu e 8). There the same tendencies in the summer even though the differences are more modest. The main reasons for the colder climate in the east and north are no doubt the far greater infl ence of the sea ice and the cold air from the Polar basin.

Svalbard has previously been identified as a favourite meeting place for air masses with widely differing properties – mild maritime air from the south and cold polar air from the north. This creates changeable and frequently stormy weather, especially in the winter. The climate in the area can best be described with the aid of the tables and graphs for the following stations: Bjørnøya, Svalbard Airport, Ny-Ålesund, Hopen and Jan Mayen. The normal period used is 1971–2000. Most of the stations have been in use during the whole of the quoted period. In addition to these there are older records from Isfjord Radio (1934–1976) and Green Harbour (1911–1930) and they are referred to above in respect of extremes.

Wave heights

Significant wave heights are mean values of the greatest third of all wave heights in a twenty minute period. Individual wave heights can be twice as high as the significant ave height.

The values in the tables from page 129 and onwards are based on model calculations. The starting point is the analysis of a pressure field every six hours in a grid that covers the area with a maximum size of 75x75km. By using the pressure fields a modelled wind field can then be used in a wave model to calculate the wave heights. Significant wave heights are determined for every six hours at all the points in the grid. This type of data is available from and including 1955.

A hyphen «–» in the table means that there are no occurrences of wave that height. A «0» means that this wave height may occur but the incidence is less than 0.5 %.

The points represented in the calculations are:

Bjørnøya (1135)	73°55' N 17°16'E
Storfjorden (1190)	77°19' N 18°46'E
Hinlopen (1142)	78°20' N 24°01'E
Sørkapp (1188)	76°02' N 17°00'E
Hinlopen (1294)	80°18' N 16°10'E
The mouth of Isfjorden (1294)	77°01' N 12°06'E
Jan Mayen (1679)	70°22' N 08°03'E
Hopen (1090)	76°50' N 24°22'E

Visibility

«**Good visibility**» means visibility that is more than 10 km. There are some differences between the stations regarding which periods have fewest occurrences of good visibility. Both Bjørnøya and Hopen have a minimum of approximately 50 % of the time in the months of July to August. For the rest of the year the percentage for these two stations is approximately 60 %. The stations Svalbard (Svalbard Airport) and Ny-Ålesund II have the lowest occurrences of good visibility in winter months. The percentage is generally in excess of 80 % of the time. The observations from Jan Mayen show that the months December to March have fewer occasions with good visibility and percentages are about 50. In the summer months the percentage here is at 60–65, with a small exception for July when there is good visibility approximately 55 % percent of the time.

«**Moderate visibility**» means visibility between 4 km and 10 km. Bjørnøya and Hopen have approximately the same incidence of good visibility and the percentage is in the range 12–19 through the year and is highest in winter. Svalbard (Svalbard Airport) has fewer observations of moderate visibility and the percentage varies in the range 2–10 with the greatest variation in the winter. Ny-Ålesund II shows the same picture but here the percentages are in the 9–14 range. Jan Mayen also shows the same annual number of cases with moderate visibility. Here the percentage varies within the range of 11–20.

«**Poor visibility**» means that visibility is in the range of 1–4 km. For Bjørnøya and Hopen the frequency of poor visibility is about the same as for moderate visibility. For Bjørnøya the interval varies within the range of 10–19 throughout the year and for Hopen the range is 11–17. The largest percentages occur in winter months. Svalbard (Svalbard Airport) has the lowest frequency of poor visibility and here it varies within the range of 1–6, again with the highest values during the winter months. Ny-Ålesund II has a rather higher frequency of poor visibility than Svalbard (Svalbard Airport) and this percentage varies in the range of 6–13, with the highest percentages in the winter. Jan Mayen is the station with the most frequent occurrences of poor visibility. This percentage varies within the range of 10–21, with the largest percentages in the winter months.

Fog, etc. Both ordinary fog and precipitation may reduce visibility to less than 1 km. Svalbard (Svalbard Airport) has the lowest rate of fog and this percentage varies within the range of 0–2 throughout the year. The largest percentages occur in summer months, while there are no occurrences from 1971 to 2000 for the months of October, November, December and April. At the Ny-Ålesund II station the frequency of fog is higher and the percentage varies within the range of 5–7 and there is no distinct difference between months. For Bjørnøya, Hopen and Jan Mayen the frequency of fog is significant y higher. On Bjørnøya and Hopen the percentage is highest in the months of June to September where it varies within the range 11–27. The rest of the year it lies within the range of 4–8 percent at these stations. Jan Mayen is similar to Bjørnøya and Hopen with the greatest frequency of fog in the summer months but here the frequency is also relatively high in the winter months. The percentage is in the range of 13 to 20 for May–August while the rest of the year it is in the range of 8–13.

Mean cloud cover in %

«Mean cloud cover in %» gives the mean (average) cloud cover during the period 1971–2000. The cloud cover scale by which observatories report ranges from 0–8, where 0 is the clear sky and 8 is completely overcast. These codes are related to the percentage of sky covered by clouds.

Mean values of cloud cover conditions are largely adjusted between the stations. The period from November to April has the lowest percentage. The values of Svalbard (Svalbard Airport), Ny-Ålesund II and Hopen are slightly below the corresponding values for Bjørnøya and Jan Mayen. During the other months Hopen is the same as Bjørnøya and Jan Mayen, while Svalbard (Svalbard Airport) and Ny-Ålesund II are less than 1 %, also in this period.

The number of days with clear weather, overcast weather, fog and precipitation

Clear weather. Clear weather is when the sum of three observations of cloud cover during the day is nine or less, and that cloud cover at each observation time point is four or less. As mentioned above, given cloud cover is divided into eight parts, where eight is completely covered and clear sky is zero.

From the figu es it can be seen that the period November–April has the majority of days with clear weather at all the stations, with exception of Jan Mayen which does not show any marked annual rate. The data from Jan Mayen shows that the numbers of days with clear weather are more evenly distributed during the year with a slightly higher maximum in April–May. Ny-Ålesund II has an average of 11 days of clear weather in January and December, while the corresponding figu e for Svalbard (Svalbard Airport) is 9. Jan Mayen has fewest (12) days of clear weather when the year is seen as a whole, while Ny-Ålesund II has more days with clear weather than all the stations (74) followed by Svalbard (Svalbard Airport) with 65 days.

Overcast Weather. Completely overcast weather throughout the whole day with code number eight is allotted a sum of 24. Our definition of overcast means a sum on 20 or more during the course of a day.

From the figu es it can be seen that December–April have the fewest days with overcast weather at the stations but these are less distinct for the rest of the year on Jan Mayen. The months of July–September has the most days with overcast weather but there is little variation in the months which have the greatest number at the different stations.

Jan Mayen and Bjørnøya have the highest number of overcast days annually with, respectively, 240 and 231 days. Svalbard (Svalbard Airport) has the fewest overcast days with158, followed by Ny-Ålesund II with 164 days.

Fog. The definition of fog is when visibility is less than 1 km. Jan Mayen with 83 days has on average most days with fog of the stations during the year, while Svalbard Airport has the fewest (13 days). Of the other stations, coastal stations Hopen (76) and Bjørnøya (64) have most number of fog days, while Ny-Ålesund II is in line with Svalbard (Svalbard Airport) with 19 days in the course of the year. For Hopen, Bjørnøya and Jan Mayen the most days with fog are in July or August. On Svalbard (Svalbard Airport) and Ny-Ålesund II, however, the few cases with fog are more evenly distributed throughout the year.

Days with precipitation. On an annual basis there is quite a big difference between the stations of Svalbard (Svalbard Airport) and Ny-Ålesund II on the one hand, and Jan Mayen, Bjørnøya and Hopen on the other, relating to days with precipitation ≥0.1 mm. Ny-Ålesund II has the fewest number with 111 days, while Jan Mayen has most with 258 days.

Bjørnøya has 239 days, Hopen 234 days and Svalbard (Svalbard Airport) 120 days. Of the stations with most days of precipitation the highest numbers are in the autumn and winter months. Jan Mayen has, for all the months from September to March, on average 22–25 days with precipitation ≥0.1mm, while for the other month's the average is 17–21. For Svalbard (Svalbard Airport) and Ny-Ålesund II, the average number of days with precipitation is more evenly distributed throughout the year, although here also the number is lowest in spring and summer. The variation of the number of days with precipitation for the year is within the range of 7–11.

Precipitation

The area that includes Jan Mayen, Bjørnøya and Svalbard is large and when precipitation is considered, the differences are great. Jan Mayen has significant y more precipitation than the other stations. The annual average based on the period 1971–2000 is 706 mm while the equivalent for Hopen is 463 mm, Ny-Ålesund II 401mm, Bjørnøya 396 mm and Svalbard (Svalbard Airport) 192 mm. Most precipitation has occurs in the autumn and winter months while the period May–June has least. On Jan Mayen October is the wettest with 76 mm closely followed by September with 75 mm, while June is the driest with 35 mm. At Svalbard Airport, which has the least rainfall of all the stations, August is the wettest with a mean of 26 mm and May the driest with 7 mm.

Temperature

Air temperature. The presentation of the table and graphs is based on four daily observations of the air temperature (at 01, 07.13, and 19 NMT). For all the stations the months' averages based on the period 1971–2000 are under 0 °C from October to May, except for October on Jan Mayen, which has a mean of 0.3 °C. In addition, the monthly average for the most northerly station, Hopen, is below 0 °C in June. The months with the lowest average temperature on the stations varies between January and February. The lowest mean temperature is minus15.3 °C in February for Svalbard (Svalbard Airport). July has the highest monthly average at Svalbard (Svalbard Airport) and Ny-Ålesund II stations, while for the more maritime stations of Jan Mayen, Bjørnøya and Hopen August has the highest. Svalbard Airport is the highest of the stations with 6.1 °C in July.

None of the stations can be considered as having a summer in the climatological sense, when «summer» is defined as the period when the diurnal mean temperature is higher than 10 °C. None of the stations attain normal diurnal mean temperatures above10 °C. It does not mean, however, that it cannot be relatively warm on the stations but there will be some days or relatively short periods, when there is «summer weather».

The sea temperature has been recorded on Bjørnøya, Hopen and Jan Mayen since 1972, but the records are not complete for some of the stations during the period 1972–2000, which have been used as the basis for the table. The data was obtained by collating the averages available within this period over a number of years. The omissions are caused by freezing sea temperature. This is especially true for Hopen where the sea temperature records are missing for the period December–May and that the data covering June and November is poor.

On average the sea temperature on Hopen is only above 0 °C during the months of July to September. The warmest is August with 2.9 °C. Both on Bjørnøya and Jan Mayen there is a slightly longer period of sea temperatures on the plus side when the mean temperature rises above freezing point in June, October and November. Also on these stations August is typically warmest with an average of 3.6 °C for Bjørnøya and 4.6 °C of Jan Mayen. On Bjørnøya the months of January to March appear to be as cold while on Jan Mayen the months of February to April are about as cold.

The highest sea temperature from the Hopen records is 6.4 °C on 2nd August of 2009. Similarly, on Bjørnøya it is 6.7 °C 21st and 26th July 1973 and on Jan Mayen 7.4 °C, both recorded on 14th September 2003 and 4th September 2004.

Wind Conditions

The air components move in all directions. The horizontal movement is called wind. This movement is characterised by wind speed (e.g. knots, m/s or Beaufort) and wind direction, the direction from which the air is blowing.

Charting the wind will show that the direction and strength can vary considerably during a short time. If anything meaningful is to be said about wind conditions, average values must be used. Average wind speed and direction are observed during period's of 10 minutes. The same applies when winds are described in a weather report. When a weather report warns of a gale, it means that the wind will vary around an average value. Instances of stronger gusts and calmer wind conditions may occur. Close to islands and islets the variation in wind strength will be high, especially if there are high mountains on the islands.

The wind can be measured with different instruments and given in different units. In the days of the sailing ship the British Admiral Beaufort developed a scale of how different wind speeds affected the surface of the sea and sailing ships. When «High wind – 7» is reported, it means that the average wind in a 10-minute period is «stiff breeze» or 13.9 m/s–17.1m/s. The figu e 7 shows the Beaufort wind scale goes from 0–12 where 0 is no wind and 12 is hurricane.

When comments for each month are expressed as «strong winds», the winds have a strength of «strong gale» (Beaufort 8) or higher on the scale. When the wind direction is said to be southwest (SW) that means the wind is blowing from the southwest. Of the stations used in this volume, Jan Mayen and Bjørnøya head the list with the largest number of strong winds observations. Svalbard (Svalbard Airport) and Ny-Ålesund II has about the same frequency while Hopen has fewest occurrences.

January

On Svalbard (Svalbard Airport) and Ny-Ålesund the main wind directions are in the SE and E sectors. The largest percentage of strong winds is also in these sectors. For Bjørnøya the main wind directions are NE, E and N, with the greatest percentage of strong winds from NE. Hopen has NE as the main wind direction, while Jan Mayen has N as the very pronounced main direction. These directions also have the largest percentage of strong winds.

February

February is mainly very similar to January. Only Bjørnøya is significant y different where the frequency of winds from E has increased while the frequency of winds from NE has decreased.

March

Winds from the south-eastern sector continue to dominate Svalbard (Svalbard Airport) and Ny-Ålesund but here the greatest frequency of strong winds is easterly in Ny-Ålesund, while they are south-easterly at Svalbard Airport. On Bjørnøya it is now the E, NE and S directions which also have the highest frequency of strong winds. The most frequent winds on Hopen are from NE, while on Jan Mayen N is the main direction. The main directions are also those which have the greatest proportion of strong winds.

April
From March to April there are small changes in the prevailing wind directions at all the stations. However, the frequency of strong wind decreases at all stations.

May
On Svalbard (Svalbard Airport) the main wind direction changes from SE to W at the transition of April to May. In Ny-Ålesund the wind is now from the SE and S with approximately the same frequency. On the other stations there are small changes in the direction distribution. There is a reduction in the occurrence of strong winds at all the stations.

June
On Svalbard (Svalbard Airport) the tendency from May is reinforced as W is an even more dominant wind direction with incidence of 40 % of the time. In Ny-Ålesund the occurrence of wind from the NW and W increases while that of wind from SE is reduced. The change in the directional distribution is less on Bjørnøya. Most significant here is a reduction in the frequency of wind from E while there is an increase in the frequency of westerly winds. The main wind direction on Hopen is NW but the frequency is reduced while at the same time the frequency of winds from W and SW are increased. On Jan Mayen the frequency of wind from N decreases while it increases from S, so that the occurrences of those directions are approximately as frequent. The presences of strong winds are further reduced and occur only in the records from Bjørnøya and Jan Mayen.

July
Wind from the W dominates this month completely on Svalbard (Svalbard Airport) and the percentage of wind from this direction is over 55 %. The direction which has the second greatest proportion is the SW with approximately 14 %. In Ny-Ålesund the main wind direction is E with a share of almost 25 % of the time. Here the occurrence of wind from the NW is reduced. Also on Bjørnøya, the proportion of winds is from the W in October while the proportion from N and NE is reduced. This tendency is also indicated for Hopen. On Jan Mayen, the percentage of winds from the S has increased while the equivalent of wind from the N has decreased. In July only Jan Mayen has an occurrence of strong winds and then from the directions of NW and N.

August
For the Svalbard (Svalbard Airport) W is still the main wind direction but the frequency is reduced compared to July. Of the other wind directions the frequency of wind from SE and SW has increased. In Ny-Ålesund, the percentage of wind from the E increases and continues to be the main wind direction, together with SE. On Bjørnøya the occurrence of wind from E increases while the corresponding W is reduced so that E is now the most frequently occurring wind direction with almost 20 % of the time, while the equivalent for S and W directions is about. 15 %. On Hopen the percentage of wind from the NW increases and is the main wind direction. On Jan Mayen the biggest change is in the proportion of wind from S. SW and N are still the main directions. In this month also it is only Jan Mayen that has occurrences of strong winds.

September
On Svalbard (Svalbard Airport) the main direction is now SE as the contribution of wind from W is greatly reduced. On Ny-Ålesund the main wind direction is also SE, but here the proportion from the E has been greatly reduced. There are no major changes in the directional distribution on Bjørnøya but the percentage of wind from N has increased slightly. The main wind direction is E and S. On Hopen the main direction is still NE while on Jan Mayen there is a marked increase in the proportion of wind from N, which is again the main wind direction. Strong winds occur this month both on Bjørnøya, Hopen and Jan Mayen.

October
The trend from September continues with an increase in the main percentage of wind direction from SE at both Svalbard (Svalbard Airport) and Ny-Ålesund. On Bjørnøya E is the main direction with an increase in the proportion of wind from the NE and N. Hopen now has NE and N as the main direction while the wind from N is noticeably more frequent on Jan Mayen. Strong winds occurred on the all the stations except on Svalbard (Svalbard Airport).

November
For the Svalbard (Svalbard Airport) and Ny-Ålesund SE is the dominant wind direction while E and NE are most frequent on Bjørnøya. On Hopen the proportion of wind from NE increases powerfully and is the dominant direction. On Jan Mayen the wind from N approximates 30 % of the time. Strong winds occur on all the stations.

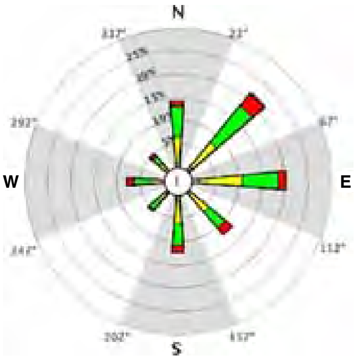
December
There are small changes in the distribution of wind direction from November to December for Svalbard (Svalbard Airport), Ny-Ålesund and Bjørnøya. On Hopen the proportion of wind direction from NE and N increases and becomes the main wind direction. On Jan Mayen, the percentage of wind from the N increases and is now about 40 %. Strong winds occur at all the stations this month.

The Beaufort wind scale

The Beaufort Scale	Wind speed at a height of 10 m above the sea or flat terrain		Condition	Effect on land (L) and sea (S)
	Knots	M/sec		
0	Less than 1	0.0–0.2	Calm	L: smoke rises straight up S: mirror-like
1	1–3	0.3–1.5	Light air	L: smoke follows wind direction S: ripples formed on the surface
2	4–6	1.6–3.3	Light breeze	L: noticeable; stirs tree leaves, lifts pennants. S: Small wavelets; still short but more pronounced; crests have a glassy appearance that do not break
3	7–10	3.4–5.4	Gentle breeze	L: foliage and twigs move; wind slightly opens flags and pennants S: Small waves begin to break; foam with glassy appearance; perhaps scattered white horses
4	11–16	5.5–7.9	Moderate breeze	L: lifts dust and loose paper; moves twigs and small branches; unfurls larger flags and pennants S: Small waves, becoming longer, fairly frequent white horses
5	17–21	8.0–10.7	Fresh breeze	L: small trees with leaves begin to sway; small waves appear on water S: Moderate waves, taking more pronounced long form; many white horses formed. (possibility of spray)
6	22–27	10.8–13.8	Strong breeze	L: large branches and minor trunks move; wind whines in telephone lines; use of umbrellas is difficult; noticeable when walking S: Large waves begin to form; white foam crests are extensive everywhere (probably some spray)
7	28–33	13.9–17.1	Near gale	L: whole tree move; tiring to walk against the wind. S: Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind
8	34–40	17.2–20.7	Gale	L: tree branches break; heavy-going walking against the wind S: Moderately high waves of greater length; edges of crests begin to break into spindrift; foam is blown into well marked streaks along the direction of the wind
9	41–47	20.8–24.4	Strong gale	L: large trees sway and heave; roof tiles dislodged S: high waves; dense streaks of foam along the direction of the wind; wave crests begin to topple, tumble and roll over; spray may affect visibility
10	48–55	24.5–28.4	Storm	L: seldom inland; trees uprooted; heavy damage to dwellings S: very high waves with long overhanging crests; the resulting foam, in great patches, is blown in dense white streaks along the direction of the wind; on the whole, the surface of the sea takes on a white appearance; the tumbling of the sea becomes heavy and shock-like; visibility affected
11	56–63	28.5–32.6	Violent storm	L: very seldom; followed by much destruction S: exceptionally high waves (small and medium sizes ships may be lost for a time behind the waves); the sea becomes completely covered by long white patches of foam lying along the direction of the wind; everywhere the edges of the wave crests are blown into froth; visibility affected
12	64 and over	32.7 and over	Hurricane	L: very uncommon occurrence; unusually high destruction S: The air is filled with foam and spray; sea completely white with driving spray; visibility seriously affected

BJØRNØYA (1971–2000)

4 obs/day						Beaufort							%
Sect.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,0	0,3	0,6	1,3	0,8	0,9	0,4	0,3	0,1	0,1	-	-	4,8
NE	0,2	0,6	1,7	4,7	3,1	2,9	0,8	0,2	0,0	0,1	-	-	14,3
E	0,3	0,9	2,6	5,2	5,0	4,5	2,1	0,8	0,1	0,0	-	-	21,5
SE	0,4	1,3	3,8	6,3	4,0	3,1	1,0	0,4	-	-	-	-	20,3
S	0,2	0.6	2,3	3,1	2,4	1,9	1,0	0,6	-	-	-	-	12,1
SW	0,3	0,9	1,6	4,1	2,8	1,5	0,9	0,4	0,1	-	-	-	12,6
W	0,0	0,3	0,9	1,7	1,2	0,9	0,2	0,1	0,0	-	-	-	5,4
NW	0,1	0,3	0,6	2,0	1,6	2,0	1,1	0,4	0,0	0,1	-	-	8,1
Calm	0,8												0,8
Sum	2,3	5,2	14,1	28,4	20,9	17,7	7,5	3,2	0,3	0,3	-	-	100,0



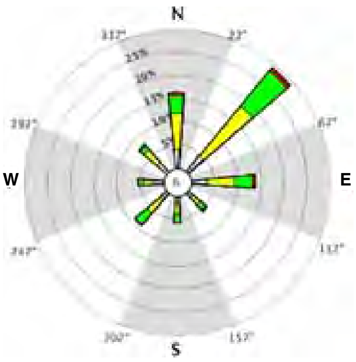
Wind forces:

- ■ >8
- ■ 7-8
- ■ 5-6
- ■ 3-4
- □ 1-2

①: Calm (%)

HOPEN (1971–2000)

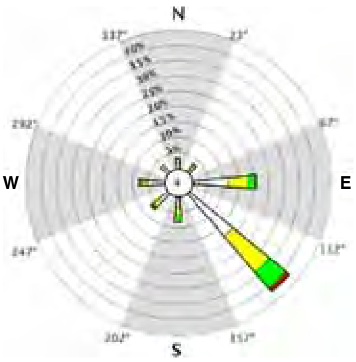
4 obs/day						Beaufort							%
Sect.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,2	2,8	4,0	4,3	2,3	1,2	0,3	0,2	0,0	-	-	-	7,7
NE	1,4	2,8	4,0	4,3	2,3	1,2	0,3	0,2	0,0	-	-	-	16,5
E	1,3	3,1	6,5	9,0	5,2	3,3	0,8	0,0	-	-	-	-	29,2
SE	1,2	2,4	2,9	3,7	2,0	1,5	0,5	0,0	-	-	-	-	14,0
S	0,8	0,8	1,0	1,3	0,6	0,5	0,3	0,1	0,0	-	-	-	5,4
SW	0,6	0,8	1,0	1,7	1,2	0,4	0,2	-	-	-	-	-	5,9
W	0,6	1,0	2,1	2,7	1,9	0,8	0,1	0,1	0,0	-	-	-	9,2
NW	0,6	1,1	1,4	1,4	0,4	0,3	0,2	0,2	-	-	-	-	5,7
Calm	6,4												6,4
Sum	14,1	14,8	22,9	28,4	15,9	9,2	2,7	0,8	0,0	-	-	-	100,0



⑥: Calm (%)

LONGYEARBYEN (1971–2000)

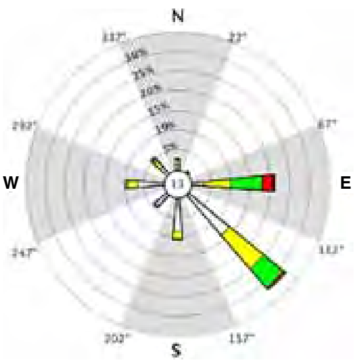
4 obs/day						Beaufort							%
Sect.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,6	0,5	0,6	0,8	0,2	0,1	0,0	-	-	-	-	-	2,9
NE	0,5	0,7	0,8	1,0	0,1	0,1	-	-	-	-	-	-	3,3
E	0,2	0,3	0,5	0,8	1,0	0,4	0,0	-	-	-	-	-	3,2
SE	3,3	4,5	4,3	4,9	2,3	1,2	0,4	0,0	-	-	-	-	20,9
S	4,3	5,7	8,5	11,2	6,2	4,1	1,7	0,5	0,0	-	-	-	42,2
SW	2,0	1,1	0,7	1,8	1,4	1,2	0,2	0,2	-	-	-	-	8,5
W	1,8	1,0	1,0	1,2	0,9	0,6	0,4	0,0	-	-	-	-	6,9
NW	1,8	2,3	1,4	0,9	0,8	0,7	0,3	-	-	-	-	-	8,2
Calm	3,9												3,9
Sum	18,4	16,1	17,8	22,6	12,9	8,4	3,0	0,7	0,0	-	-	-	100,0



④: Calm (%)

NY-ÅLESUND (1971–2000)

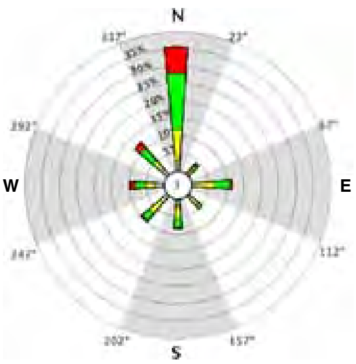
4 obs/day						Beaufort							%
Sect.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,8	0,8	1,0	1,8	0,4	0,3	0,2	0,1	-	-	-	-	5,4
NE	0,4	0,9	0,6	0,9	0,3	-	-	-	-	-	-	-	3,0
E	0,3	0,2	0,0	0,2	-	-	-	-	-	-	-	-	0,6
SE	1,7	1,7	2,4	5,1	4,5	2,9	1,8	0,7	0,3	0,1	0,0	-	21,2
S	5,9	7,7	6,7	5,8	3,3	1,9	0,6	0,1	-	-	-	-	31,9
SW	5,3	3,3	1,2	0,7	0,2	0,1	-	-	-	-	-	-	10,8
W	2,2	1,1	0,3	0,5	0,2	0,1	0,1	0,0	-	-	-	-	4,5
NW	3,6	2,9	1,4	1,0	0,5	0,1	0,1	-	-	-	-	-	9,7
Calm	12,9												12,9
Sum	33,1	18,6	13,6	16,0	9,4	5,4	2,8	0,9	0,3	0,1	0,0	-	100,0



⑬: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day						Beaufort							%
Sect.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,9	0,9	1,1	2,8	2,3	2,2	0,9	0,8	0,1	-	-	-	12,0
NE	1,2	1,5	3,3	7,3	7,9	7,6	4,7	1,9	0,2	-	-	-	35,7
E	0,3	0,6	0,7	0,8	0,6	0,5	0,4	0,2	0,2	0,2	-	-	4,3
SE	0,4	0,7	2,1	4,1	2,3	1,6	0,6	0,1	-	-	-	-	11,8
S	0,3	0,7	1,2	1,7	1,0	0,3	-	0,0	-	-	-	-	5,3
SW	0,6	1,3	1,7	2,4	1,6	0,8	0,2	0,0	-	0,0	-	-	8,7
W	1,0	1,6	2,0	2,5	1,5	0,8	0,2	0,1	0,0	-	-	-	9,7
NW	1,0	1,3	1,2	1,9	1,3	1,5	1,1	0,3	0,1	-	-	-	9,7
Calm	2,8												2,8
Sum	8,5	8,6	13,3	23,5	18,5	15,3	8,1	3,4	0,6	0,2	-	-	100,0

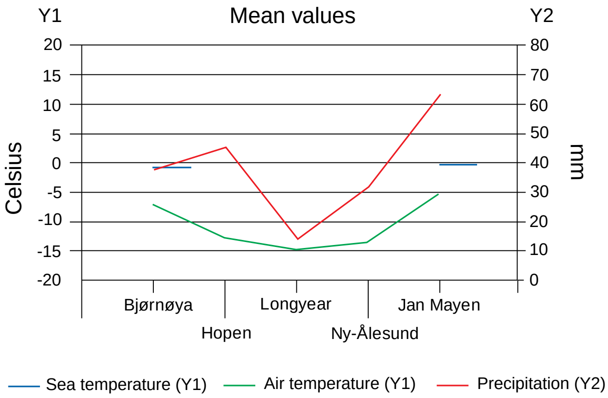


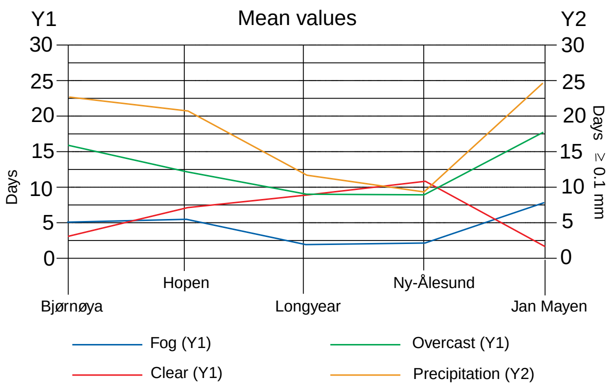
③: Calm (%)

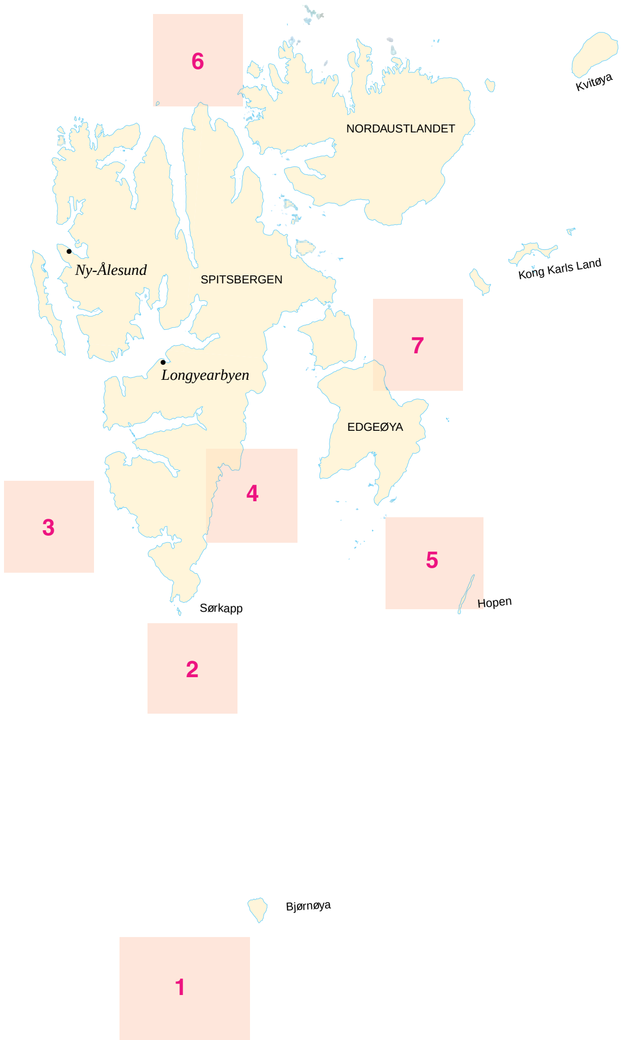
Shows wind from

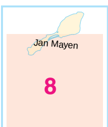
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m										
	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	5	13	24	22	15	11	5	3	2	0	0
2. Sørkapp	71	7	7	5	4	3	1	1	0	0	0
3. Bellsundbanken	46	16	15	9	7	4	2	1	0	-	-
4. Storfjorden	99	1	1	0	0	0	-	-	-	-	-
5. Hopen NW	96	1	1	1	1	0	0	0	-	-	-
6. Barentsøya E	99	1	0	0	0	-	-	-	-	-	
7. Hinlopenrenna	82	10	7	1	0	0	-	-	-	-	-
8. Jan Mayen S	9	14	23	23	15	8	4	2	1	0	0

Percentage of observations	Bjørnøya	Hopen	Longyear	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	80	80	84	80	84	1971–00
Moderate visibility: 4–10 km	16	14	8	11	9	
Poor visibility: 1–4 km	3	4	6	5	5	
Fog, etc: < 1 km	1	2	3	4	2	
Mean cloud cover in %	72	72	73	70	66	









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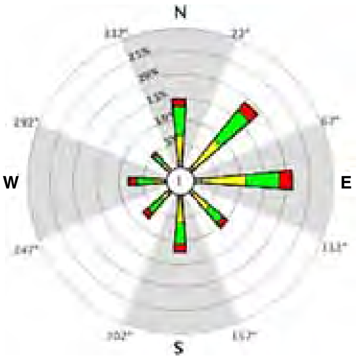
BJØRNØYA (1971–2000)

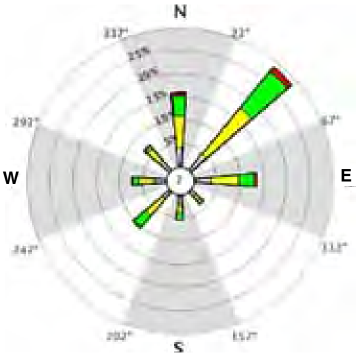
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,1	0,4	0,6	1,1	1,0	1,1	0,4	0,2	0,1	0,0	-	-	5,2
NE	0,2	1,1	2,1	4,2	3,1	2,4	1,1	0,3	0,1	-	-	-	14,7
E	0,2	0,7	2,4	6,4	4,2	3,2	1,5	0,5	0,0	-	-	-	19,1
SE	0,4	1,4	4,1	6,4	3,4	3,1	1,7	1,0	0,0	-	-	-	21,4
S	0,3	0,7	1,9	2,9	1,7	1,6	0,9	0,3	0,1	-	-	-	10,4
SW	0,2	0,7	2,0	4,0	2,4	1,5	1,3	0,4	0,1	-	-	-	12,6
W	-	0,4	0,9	1,5	1,8	1,6	0,9	0,2	0,1	-	-	-	7,5
NW	0,0	0,1	0,9	2,1	1,9	1,7	0,8	0,5	0,2	0,0	-	-	8,2
Calm	0,9												0,9
Sum	2,3	5,5	14,9	28,6	19,5	16,2	8,6	3,4	0,7	0,0	-	-	100,0



①: Calm (%)

HOPEN (1971–2000)

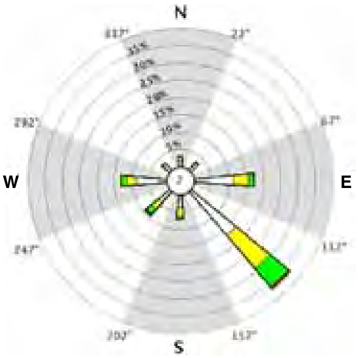
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,0	1,7	1,9	1,6	0,5	0,1	0,1	0,0	-	0,0	-	-	7,1
NE	1,8	2,5	3,3	4,4	2,2	1,3	0,5	0,1	0,1	-	-	-	16,1
E	1,7	2,7	5,7	8,7	5,6	3,3	0,9	0,1	-	-	-	-	28,7
SE	1,4	2,4	3,2	3,3	2,0	0,9	0,4	-	-	-	-	-	13,7
S	0,6	0,8	0,8	0,7	0,6	0,3	-	-	-	-	-	-	3,8
SW	1,0	1,0	1,0	1,4	0,8	0,3	0,1	-	-	-	-	-	5,6
W	0,8	1,0	2,2	3,4	1,9	0,8	0,2	0,1	-	-	-	-	10,4
NW	0,6	1,6	2,4	1,5	0,6	0,4	0,3	-	-	-	-	-	7,4
Calm	7,2												7,2
Sum	16,1	13,7	20,5	25,0	14,2	7,4	2,5	0,3	0,1	0,0	-	-	100,0



⑦: Calm (%)

LONGYEARBYEN (1971–2000)

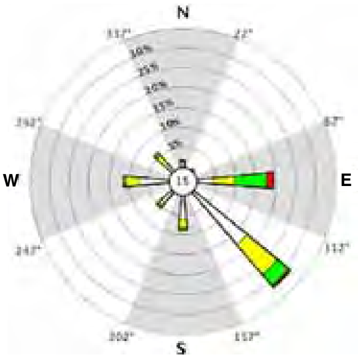
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,5	0,7	0,8	0,5	0,2	-	-	-	-	-	-	-	2,8
NE	1,0	0,6	0,5	0,8	0,2	0,1	-	-	-	-	-	-	3,2
E	0,4	0,5	0,4	0,8	0,5	0,4	-	-	-	-	-	-	3,0
SE	3,6	4,1	3,6	3,2	1,7	1,0	0,2	0,0	-	-	-	-	17,4
S	5,3	5,3	6,3	8,8	6,3	4,0	1,0	0,1	-	-	-	-	37,1
SW	2,1	0,6	1,0	2,1	0,9	0,4	0,1	-	-	-	-	-	7,2
W	1,7	1,4	1,0	1,9	1,2	1,4	0,5	0,2	0,0	-	-	-	9,3
NW	3,3	3,5	2,1	2,3	0,9	0,8	0,2	0,1	0,0	-	-	-	13,2
Calm	6,8												6,8
Sum	24,7	16,7	15,7	20,4	11,9	8,1	2,0	0,4	0,0	-	-	-	100,0



⑦: Calm (%)

NY-ÅLESUND (1971–2000)

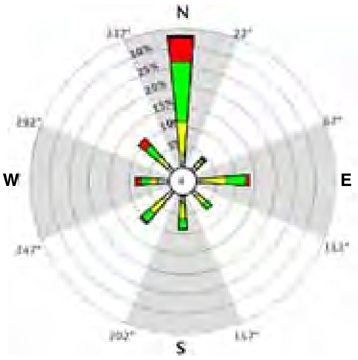
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,8	0,9	1,6	1,9	0,6	0,3	-	-	-	-	-	-	6,0
NE	0,4	0,7	0,3	0,3	0,1	-	-	-	-	-	-	-	1,8
E	0,2	0,1	0,1	-	-	-	-	-	-	-	-	-	0,4
SE	2,3	2,0	2,2	4,3	4,7	2,4	1,4	0,2	0,1	0,0	-	-	19,6
S	9,0	8,6	6,2	4,2	2,3	0,7	0,6	0,1	0,0	-	-	-	31,8
SW	4,0	2,0	1,3	1,0	0,3	0,2	-	-	-	-	-	-	8,9
W	2,5	1,0	0,5	0,7	0,2	0,3	0,0	0,0	-	-	-	-	5,2
NW	4,0	3,1	2,1	1,4	0,5	0,1	0,1	-	-	-	-	-	11,4
Calm	14,9												14,9
Sum	38,1	18,4	14,3	13,8	8,7	4,0	2,1	0,3	0,1	0,0	-	-	100,0



⑮: Calm (%)

JAN MAYEN (1971–2000)

4 obs/ day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,5	0,7	1,6	2,4	1,7	1,9	1,4	0,6	0,0	-	-	-	10,8
NE	1,2	1,9	3,1	6,6	7,7	6,7	4,0	1,3	0,4	0,1	-	-	33,1
E	0,4	0,7	0,7	0,9	0,6	0,5	0,4	0,2	0,0	-	-	-	4,5
SE	0,4	0,7	2,4	4,6	2,3	2,3	0,4	0,2	0,1	-	-	-	13,5
S	0,5	1,2	1,5	1,7	1,0	0,3	0,1		-	-	-	-	6,1
SW	0,7	1,4	1,9	2,4	1,5	0,7	0,2	0,1	-	-	-	-	8,9
W	0,8	2,2	2,1	2,5	1,4	1,3	0,3	0,0	-	0,0	-	-	10,7
NW	1,0	1,6	1,2	1,2	0,9	1,1	0,8	0,2	0,0	0,0	-	-	8,2
Calm	4,2												4,2
Sum	9,7	10,4	14,5	22,3	17,1	14,8	7,6	2,6	0,5	0,1	-	-	100,0

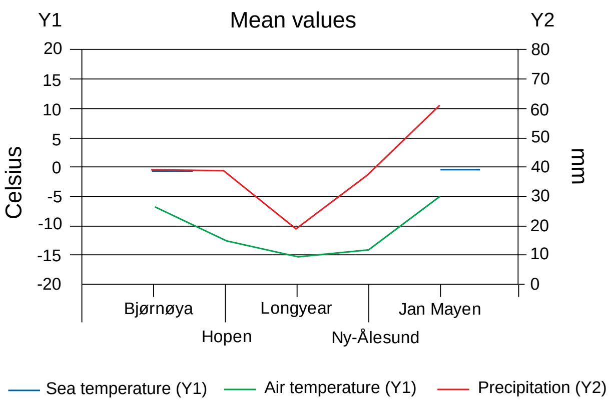


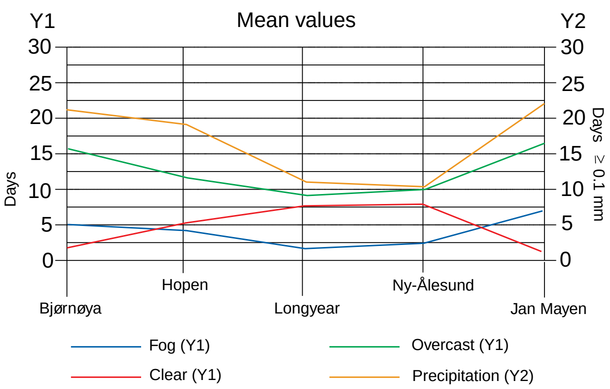
④: Calm (%)

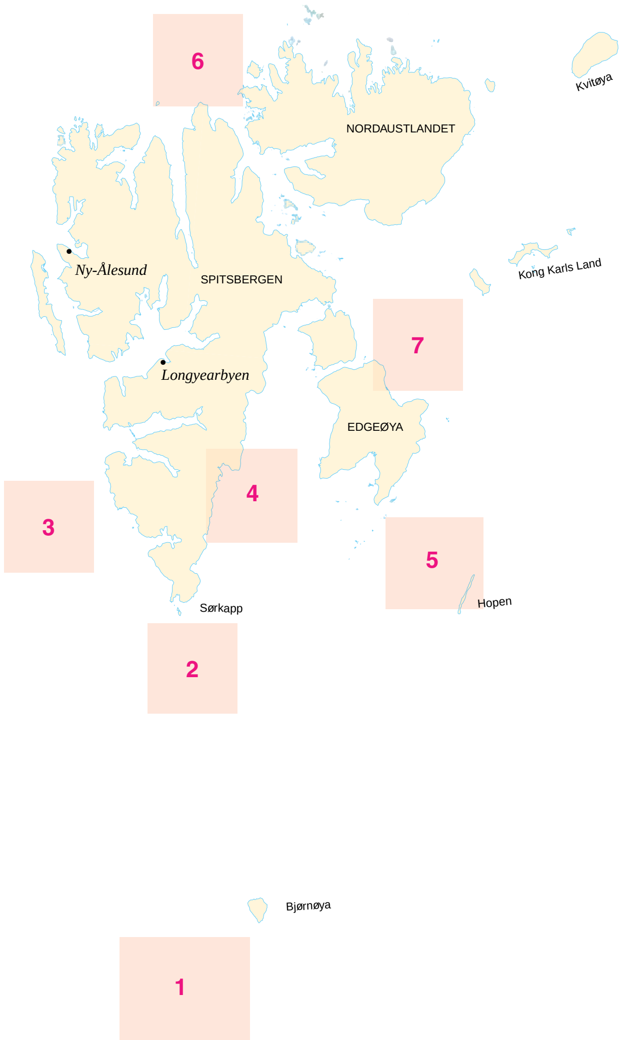
Shows wind from

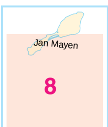
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m 0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	7	14	23	21	15	10	6	3	1	0	0
2. Sørkapp	82	4	4	3	3	2	1	0	0	0	-
3. Bellsundbanken	51	15	13	8	6	3	2	1	0	0	0
4. Storfjorden	100	-	-	-	-	-	-	-	-	-	-
5. Hopen NW	98	1	0	0	0	0	-	-	-	-	-
6. Barentsøya E	99	0	0	0	0	-	-	-	-	-	-
7. Hinlopenrenna	86	8	4	2	0	0	-	-	-	-	
8. Jan Mayen S	12	13	21	20	14	10	5	2	1	1	0

Percentage of observations	Bjørnøya	Hopen	Longyear	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	58	62	85	78	47	1971–00
Moderate visibility: 4–10 km	17	18	9	14	20	
Poor visibility: 1–4 km	16	14	6	13	20	
Fog, etc: < 1 km	8	7	1	7	13	
Mean cloud cover in %	78	65	58	58	81	









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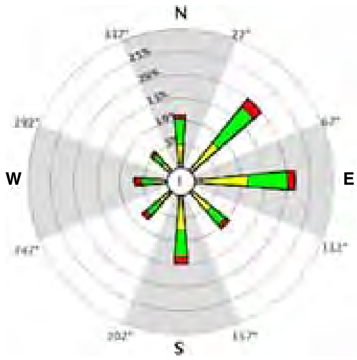
BJØRNØYA (1971–2000)

4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,1	0,4	0,7	1,3	1,4	0,9	0,2	0,3	0,0	-	-	-	5,3
NE	0,4	0,7	1,3	3,4	2,9	1,9	0,6	0,2	-	-	-	-	11,4
E	0,4	0,6	2,5	5,5	5,4	3,8	1,5	0,4	0,0	-	-	-	20,0
SE	0,2	1,6	4,5	6,7	4,6	2,9	1,0	0,5	0,0	-	-	-	21,9
S	0,1	0,6	2,0	3,4	2,2	1,5	0,6	0,2	0,1	0,0	-	-	10,7
SW	0,2	1,0	2,7	4,7	3,1	2,0	0,9	0,3	0,1	-	-	-	15,0
W	0,0	0,3	0,9	2,3	1,8	1,7	0,7	0,1	0,0	-	-	-	8,0
NW	0,1	0,2	0,6	2,0	1,4	1,4	0,7	0,5	0,1	-	-	-	6,9
Calm	0,8												0,8
Sum	2,3	5,4	15,2	29,3	22,8	16,1	6,2	2,5	0,3	0,0	-	-	100,0



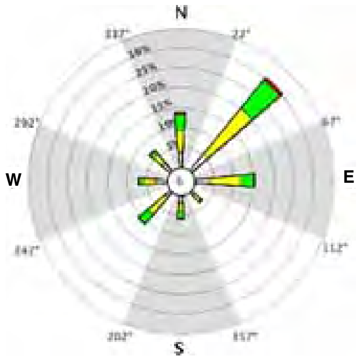
Wind forces:

■ >8
■ 7-8
■ 5-6
■ 3-4
□ 1-2

①: Calm (%)

HOPEN (1971–2000)

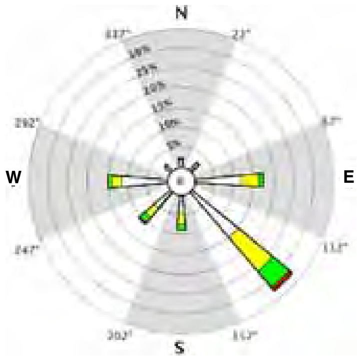
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,9	1,5	1,9	1,3	0,6	0,2	0,2	0,0	-	-	-	-	6,7
NE	1,8	1,9	3,0	3,4	2,2	1,2	0,3	0,1	-	-	-	-	13,9
E	1,8	3,8	6,5	9,5	5,3	2,7	0,6	0,1	-	-	-	-	30,3
SE	1,3	2,8	3,3	5,0	1,8	1,0	0,2	-	-	-	-	-	15,3
S	0,6	0,7	0,9	1,1	0,3	0,1	-	-	-	-	-	-	3,7
SW	0,6	1,2	1,0	1,7	0,9	0,5	0,1	0,1	-	-	-	-	6,0
W	0,5	1,1	2,5	3,7	2,0	0,5	0,1	-	-	-	-	-	10,6
NW	0,8	1,7	1,7	1,8	0,8	0,2	0,1	0,0	-	-	-	-	7,1
Calm	6,4												6,4
Sum	14,7	14,7	20,8	27,5	13,9	6,4	1,6	0,3	-	-	-	-	100,0



⑥: Calm (%)

LONGYEARBYEN (1971–2000)

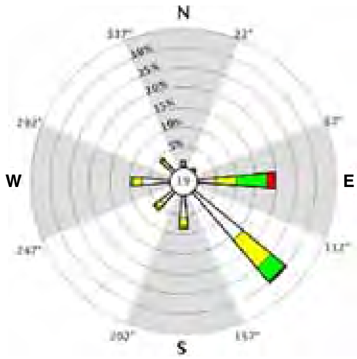
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,9	0,5	0,3	0,2	0,0	-	-	-	-	-	-	-	1,9
NE	0,8	0,6	0,5	0,4	0,1	0,0	-	-	-	-	-	-	2,4
E	0,5	0,4	0,4	0,7	0,5	0,3	0,0	-	-	-	-	-	2,8
SE	5,0	3,8	3,2	3,5	1,2	0,6	0,1	0,1	0,0	-	-	-	17,4
S	5,2	5,0	5,2	7,8	5,3	3,0	1,1	0,4	-	0,0	-	-	33,0
SW	2,5	0,9	1,4	2,2	1,2	0,8	0,1	0,0	-	-	-	-	9,1
W	2,4	1,8	1,3	2,2	1,4	0,8	0,5	0,2	-	-	-	-	10,6
NW	4,2	4,7	2,5	1,8	0,9	0,5	0,2	-	-	-	-	-	15,0
Calm	7,8												7,8
Sum	29,3	17,7	14,8	18,8	10,6	6,0	2,0	0,7	0,0	0,0	-	-	100,0



⑧: Calm (%)

NY-ÅLESUND (1971–2000)

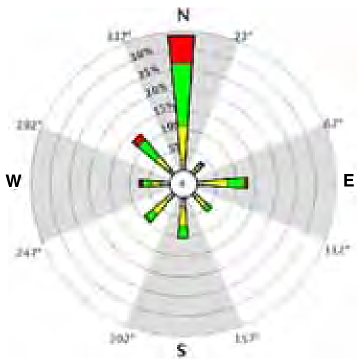
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,6	0,6	0,9	1,3	0,6	0,1	0,0	-	-	-	-	-	4,1
NE	0,3	0,3	0,5	0,4	0,0	-	0,0	-	-	-	-	-	1,6
E	0,3	0,3	0,2	-	-	-	-	-	-	-	-	-	0,8
SE	2,6	2,2	1,8	4,6	4,1	2,8	1,0	0,7	0,0	0,0	-	-	19,8
S	7,7	8,3	6,1	4,1	2,1	1,6	0,3	0,1	-	-	-	-	30,4
SW	3,6	2,1	1,2	1,1	0,4	0,3	0,0	-	-	-	-	-	8,7
W	3,1	1,1	0,8	0,7	0,2	0,2	0,1	-	-	-	-	-	6,2
NW	4,0	3,0	1,1	1,1	0,4	0,1	-	0,0	-	-	-	-	9,7
Calm	18,7												18,7
Sum	40,9	17,9	12,6	13,3	7,8	5,1	1,4	0,8	0,0	0,0	-	-	100,0



⑲: Calm (%)

JAN MAYEN (1971–2000)

4 obs/ day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,6	0,9	1,5	3,0	2,6	2,9	1,0	0,3	0,1		-	-	12,9
NE	1,0	1,3	2,8	7,6	7,4	8,0	3,9	1,6	0,2	0,0	-	-	33,9
E	0,5	0,6	0,5	0,6	0,5	0,3	0,4	0,0	0,1	0,0	-	-	3,5
SE	0,6	0,9	2,5	4,5	2,4	1,4	0,5	0,1	-	-	-	-	13,0
S	0,6	0,8	1,2	2,2	0,8	0,3	0,1		-	-	-	-	5,9
SW	0,5	1,8	2,5	3,0	1,9	0,6	0,1	0,0	-	-	-	-	10,5
W	0,8	1,5	2,0	2,4	1,5	0,8	0,2	0,1	-	-	-	-	9,3
NW	0,9	1,0	1,1	1,4	1,1	0,9	0,6	0,2	0,1	0,0	-	-	7,4
Calm	3,6												3,6
Sum	9,1	8,8	14,1	24,7	18,2	15,2	6,8	2,3	0,5	0,0	-	-	100,0

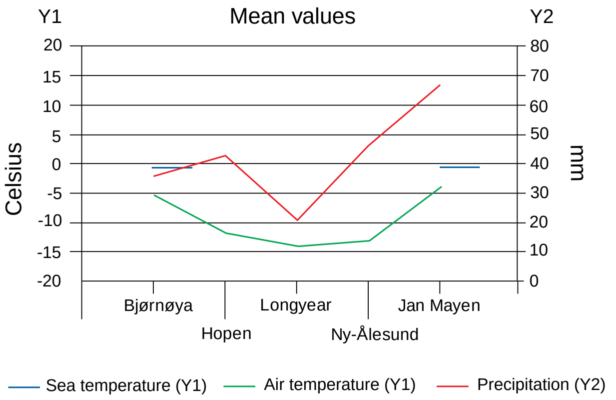


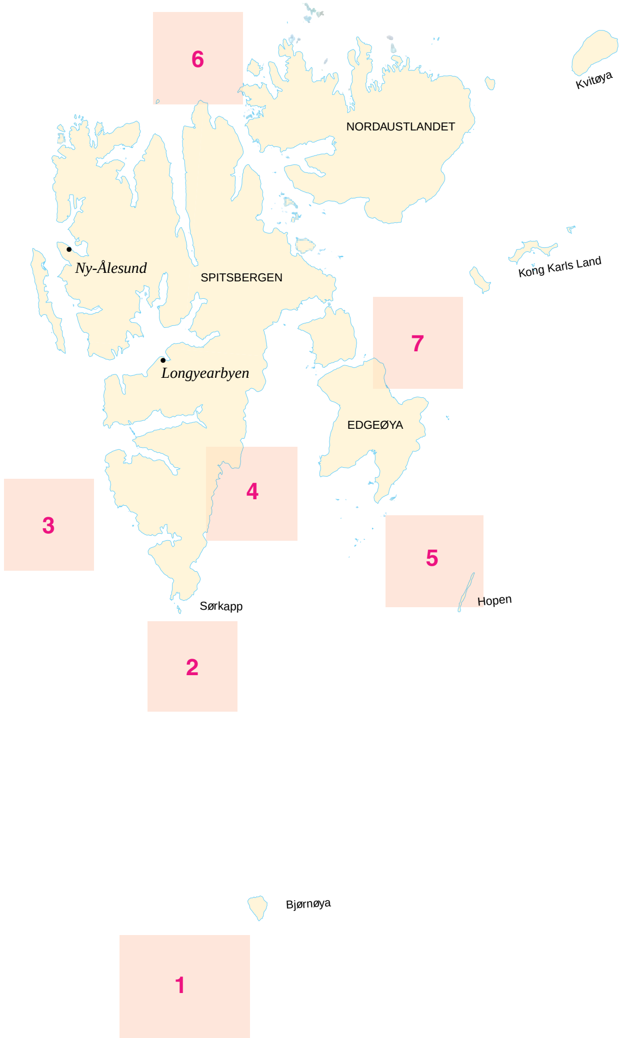
④: Calm (%)

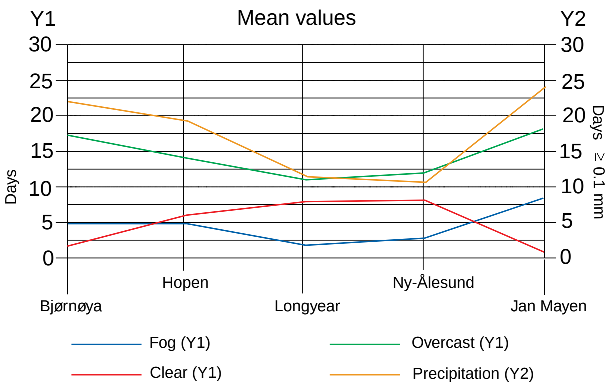
Shows wind from

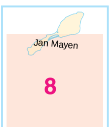
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m 0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	2	17	26	24	15	9	5	2	1	0	0
2. Sørkapp	81	5	5	4	3	1	0	0	0	0	-
3. Bellsundbanken	44	18	16	11	6	3	1	0	0	0	-
4. Storfjorden	100	-	-	-	-	-	-	-	-	-	-
5. Hopen NW	99	1	1	0	-	-	-	-	-	-	-
6. Barentsøya E	99	1	0	0	0	-	-	-	-	-	-
7. Hinlopenrenna	92	5	2	1	0	0	0	-	-	-	-
8. Jan Mayen S	10	19	23	21	14	6	3	2	1	0	0

Percentage of observations	Bjørnøya	Hopen	Longyearbyen	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	55	59	85	81	48	1971–00
Moderate visibility: 4–10 km	20	17	9	12	20	
Poor visibility: 1–4 km	19	17	5	12	19	
Fog, etc: < 1 km	6	8	1	6	13	
Mean cloud cover in %	78	67	60	61	81	







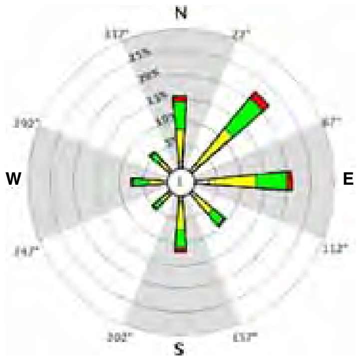


Wind forces:

- ■ >8
- ■ 7-8
- ■ 5-6
- ■ 3-4
- □ 1-2

BJØRNØYA (1971–2000)

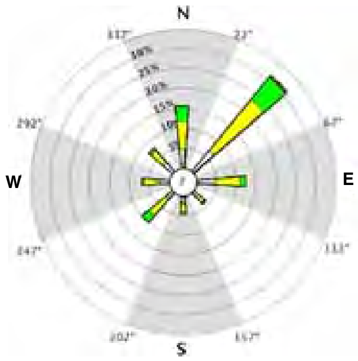
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,1	0,4	1,0	1,8	1,2	0,9	0,2	-	-	-	-	-	5,6
NE	0,4	1,1	2,8	5,0	3,0	2,3	0,7	0,2	-	0,0	-	-	15,4
E	0,4	1,4	3,8	7,3	4,6	3,2	1,1	0,2	0,1	-	-	-	22,2
SE	0,6	2,5	4,1	7,2	3,6	2,2	0,8	0,1		-	-	-	21,1
S	0,3	1,2	2,1	2,9	1,9	0,9	0,3	0,0	-	-	-	-	9,7
SW	0,4	1,0	2,6	4,3	2,0	1,2	0,6	0,1	-	-	-	-	12,3
W	0,2	0,3	1,2	1,8	1,0	0,3	0,2	0,1	-	-	-	-	5,0
NW	0,2	0,4	1,2	2,1	2,1	1,1	0,4	0,2	0,0	-	-	-	7,8
Calm	0,9												0,9
Sum	3,5	8,3	18,8	32,4	19,4	12,1	4,3	0,9	0,1	0,0	-	-	100,0



①: Calm (%)

HOPEN (1971–2000)

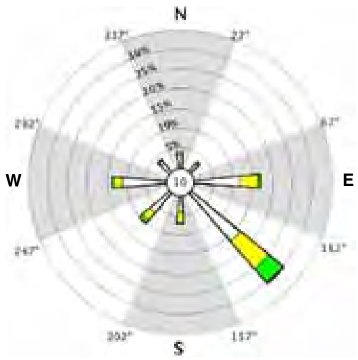
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,0	1,9	2,2	1,8	0,5	0,1	0,1	-	-	-	-	-	7,7
NE	1,7	3,2	3,8	4,0	1,9	1,2	0,1	-	-	-	-	-	15,8
E	2,2	4,7	8,6	9,5	4,2	1,7	0,2	0,1	-	-	-	-	31,3
SE	1,9	3,0	3,4	3,1	0,8	0,3	0,1	-	-	-	-	-	12,6
S	0,8	1,1	1,0	0,9	0,3	0,0	-	-	-	-	-	-	4,1
SW	0,9	1,1	0,9	1,3	0,3	0,1	-	-	-	-	-	-	4,6
W	0,9	1,0	2,4	3,8	1,6	0,2	0,1	-	-	-	-	-	9,9
NW	0,9	1,5	2,2	1,7	0,3	0,1	0,0	-	-	-	-	-	6,8
Calm	7,2												7,2
Sum	17,5	17,5	24,5	26,1	9,9	3,7	0,6	0,1	-	-	-	-	100,0



⑦: Calm (%)

LONGYEARBYEN (1971–2000)

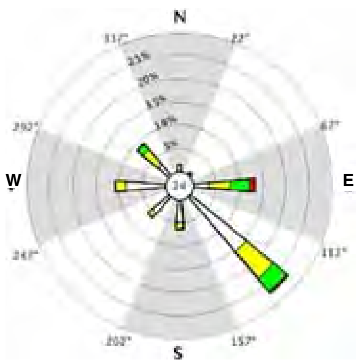
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,3	1,1	0,5	0,7	0,3	0,1	-	-	-	-	-	-	3,9
NE	1,4	0,8	1,3	0,4	0,1	0,1	-	-	-	-	-	-	4,2
E	0,9	0,6	0,6	0,6	0,3	0,3	0,0	-	-	-	-	-	3,3
SE	4,3	4,0	3,6	3,5	1,2	0,3	0,2	-	-	-	-	-	17,1
S	5,6	5,4	5,3	6,7	4,0	2,7	0,7	0,1	-	-	-	-	30,5
SW	2,4	0,8	0,7	2,0	1,0	0,3	0,0	-	-	-	-	-	7,4
W	3,4	2,0	1,1	2,0	0,8	0,8	0,1	0,0	-	-	-	-	10,2
NW	4,2	4,8	2,3	1,6	0,6	0,4	0,1	-	-	-	-	-	13,9
Calm	9,5												9,5
Sum	33,0	19,5	15,4	17,5	8,3	5,0	1,1	0,1	-	-	-	-	100,0



⑩: Calm (%)

NY-ÅLESUND (1971–2000)

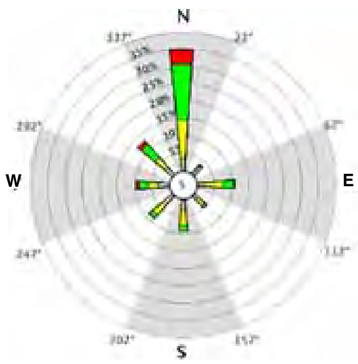
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,0	2,0	2,0	2,6	0,9	0,3	0,1	-	-	-	-	-	8,8
NE	0,5	0,6	0,3	0,3	0,1	-	-	-	-	-	-	-	1,9
E	0,5	0,2	0,0	-	-	-	-	-	-	-	-	-	0,7
SE	2,1	1,4	1,8	3,4	1,9	1,9	0,9	0,1	-	-	-	-	13,5
S	8,7	7,0	4,8	3,3	1,9	1,4	0,3	0,1	-	-	-	-	27,4
SW	3,2	1,8	1,0	0,3	0,2	0,0	0,1	-	-	-	-	-	6,6
W	3,6	1,2	0,7	0,4	0,1	-	-	-	-	-	-	-	6,1
NW	5,1	3,5	1,2	0,8	0,2	0,1	-	-	-	-	-	-	11,0
Calm	24,0												24,0
Sum	48,7	17,7	11,8	11,1	5,3	3,7	1,4	0,2	-	-	-	-	100,0



㉔: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,0	1,2	1,4	3,4	2,4	2,2	0,8	0,2	-	-	-	-	12,7
NE	1,4	1,9	4,0	9,0	8,1	7,0	2,9	0,6	0,1	-	-	-	35,0
E	0,8	0,8	0,7	0,4	0,4	0,4	0,1	0,1	0,0	-	-	-	3,6
SE	0,7	1,1	2,4	3,6	2,0	0,9	0,2	0,1	0,0	-	-	-	11,0
S	0,6	1,1	1,6	1,0	0,4	0,1	-	-	-	-	-	-	4,9
SW	1,7	1,7	2,6	2,3	0,8	0,2	0,1	0,1	-	-	-	-	9,5
W	1,4	2,1	2,2	1,8	0,6	0,5	0,1	-	-	-	-	-	8,7
NW	1,5	1,7	1,7	1,6	1,2	0,9	0,4	0,3	0,0	0,0	-	-	9,3
Calm	5,3												5,3
Sum	14,4	11,6	16,6	23,1	15,9	12,2	4,6	1,4	0,1	0,0	-	-	100,0

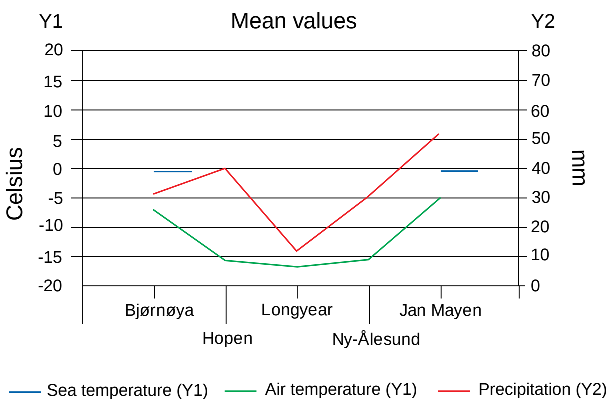


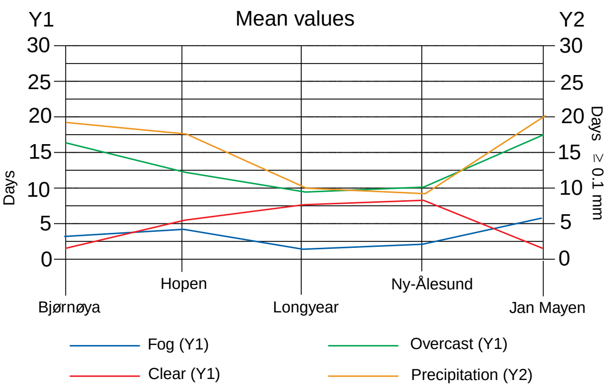
⑤: Calm (%)

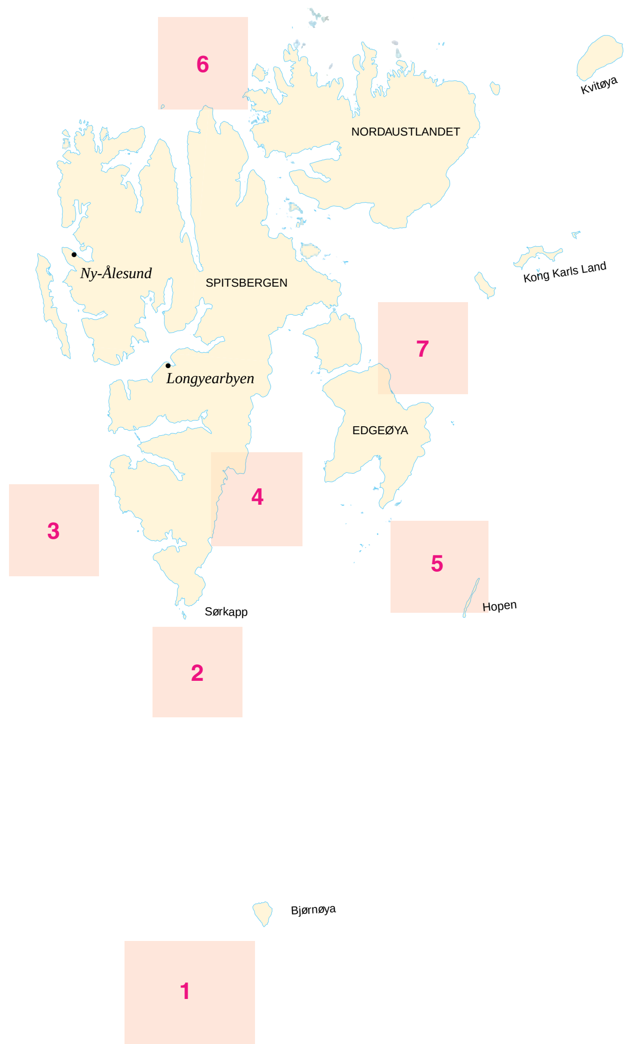
Shows wind from

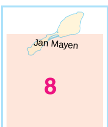
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m										
	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	7	30	28	20	9	4	1	1	0	0	-
2. Sørkapp	80	7	6	4	2	1	1	0	0	-	-
3. Bellsundbanken	45	28	15	8	3	1	0	-	-	-	-
4. Storfjorden	98	1	0	0	0	0	-	-	-	-	-
5. Hopen NW	99	1	0	0	0	0	-	-	-	-	-
6. Barentsøya E	100	-	-	-	-	-	-	-	-	-	-
7. Hinlopenrenna	92	6	2	1	-	-	-	-	-	-	
8. Jan Mayen S	16	30	27	14	7	3	2	0	0	0	-

Percentage of observations	Bjørnøya	Hopen	Longyear	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	60	66	88	82	60	1971–00
Moderate visibility: 4–10 km	19	14	7	11	16	
Poor visibility: 1–4 km	17	14	4	12	15	
Fog, etc: 4 < 1 km	7	0	6	9		
Mean cloud cover in %	78	65	56	57	79	









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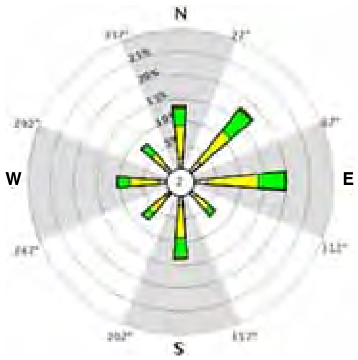
BJØRNØYA (1971–2000)

4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,4	1,0	1,4	2,7	1,5	0,8	0,1	0,1	-	-	-	-	7,9
NE	0,6	1,4	3,4	4,3	2,3	0,9	0,4	0,1	0,0	-	-	-	13,4
E	0,8	2,0	3,2	6,2	3,7	1,5	0,2	0,1	-	-	-	-	17,7
SE	0,6	2,3	4,8	7,4	3,5	1,2	0,2	0,1	-	-	-	-	20,0
S	0,3	1,1	2,0	2,2	0,9	0,3	0,1	-	-	-	-	-	6,9
SW	0,5	1,9	3,7	4,0	2,6	1,0	0,3	-	-	-	-	-	13,9
W	0,3	1,0	2,2	2,9	0,9	0,5	0,0	0,0	-	0,0	-	-	7,7
NW	0,4	1,3	2,7	3,8	1,6	0,6	0,2	0,1	-	-	-	-	10,6
Calm	1,9												1,9
Sum	5,8	12,0	23,4	33,5	17,0	6,8	1,5	0,5	0,0	0,0	-	-	100,0



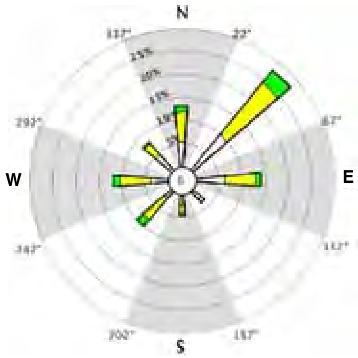
Wind forces:

- ■ >8
- ■ 7-8
- ■ 5-6
- ■ 3-4
- □ 1-2

②: Calm (%)

HOPEN (1971–2000)

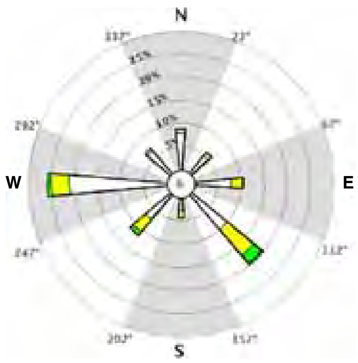
4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,6	2,5	2,3	1,2	0,3	-	-	-	-	-	-	-	8,0
NE	1,9	3,5	3,9	2,9	0,8	0,2	0,0	-	-	-	-	-	13,3
E	3,2	6,7	8,9	6,7	1,8	0,7	0,1	0,0	-	-	-	-	28,1
SE	2,3	4,2	4,4	2,5	0,5	0,3	0,1	-	-	-	-	-	14,2
S	1,2	1,1	0,8	0,4	0,0	-	-	-	-	-	-	-	3,5
SW	0,9	1,3	1,3	0,7	0,3	0,0	0,0	-	-	-	-	-	4,6
W	0,6	1,4	2,8	3,8	1,2	0,1	-	-	-	-	-	-	9,9
NW	1,3	2,5	4,0	3,0	0,9	0,2	0,0	-	-	-	-	-	12,0
Calm	6,4												6,4
Sum	19,4	23,2	28,4	21,2	5,8	1,5	0,2	0,0	-	-	-	-	100,0



⑥: Calm (%)

LONGYEARBYEN (1971–2000)

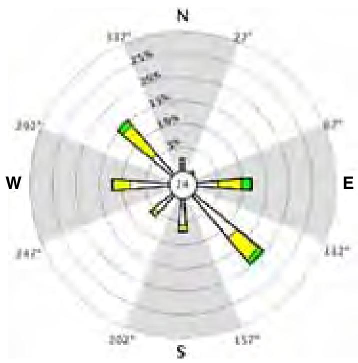
4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	2,9	2,4	1,1	0,7	-	-	-	-	-	-	-	-	7,0
NE	2,8	3,3	2,0	0,8	0,0	-	-	-	-	-	-	-	8,9
E	1,7	1,7	1,5	0,9	0,0	-	0,0	-	-	-	-	-	5,8
SE	1,9	3,0	3,1	2,2	0,3	0,1	-	-	-	-	-	-	10,6
S	2,3	3,4	4,5	5,7	2,5	1,2	0,4	0,0	-	-	-	-	20,0
SW	1,1	0,5	1,3	1,1	0,4	0,1	0,0	-	-	-	-	-	4,5
W	2,1	2,3	2,6	2,8	1,3	0,3	0,1	0,0	-	-	-	-	11,6
NW	5,5	8,7	6,8	3,4	1,0	0,3	0,0	-	-	-	-	-	25,9
Calm	5,7												5,7
Sum	26,0	25,3	22,9	17,6	5,5	2,0	0,5	0,0	-	-	-	-	100,0



⑥: Calm (%)

NY-ÅLESUND (1971–2000)

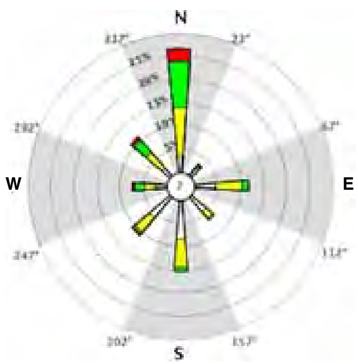
4 obs/ day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	2,2	3,4	4,3	4,4	0,7	0,2	-	-	-	-	-	-	15,2
NE	0,8	0,6	0,8	0,3	-	-	-	-	-	-	-	-	2,5
E	0,3	0,2	-	-	-	-	-	-	-	-	-	-	0,5
SE	2,7	1,9	2,5	3,0	1,1	0,7	0,3	0,1	-	-	-	-	12,3
S	6,3	6,0	3,7	2,6	0,6	0,2	0,0	-	-	-	-	-	19,6
SW	3,7	2,1	0,9	0,4	0,1	-	-	-	-	-	-	-	7,3
W	3,5	1,4	0,8	0,4	0,1	-	-	-	-	-	-	-	6,2
NW	4,5	3,8	2,4	1,1	0,2	0,1	-	-	-	-	-	-	12,1
Calm	24,3												24,3
Sum	48,3	19,4	15,4	12,2	2,8	1,2	0,3	0,1	-	-	-	-	100,0



㉔: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1	1,1	1,9	3	2,1	1,2	0,5	0,1	-	-	-	-	10,9
NE	1,2	2,3	4,7	7,5	5,1	3,7	1,9	0,3	-	-	-	-	26,8
E	1,2	0,7	0,4	0,4	0,2	0,1	0,1	0,1	-	-	-	-	3,2
SE	2,3	2,3	3,2	3,1	0,9	0,2	0,1	-	-	-	-	-	12,0
S	2,3	1,9	1,5	0,7	0,1	0,0	-	-	-	-	-	-	6,5
SW	3,2	5,2	4,2	2,2	0,6	0,0	-	-	-	-	-	-	15,5
W	2,4	3,5	2,7	1,5	0,3	0,2	0,1	-	-	-	-	-	10,8
NW	1	1,3	1,3	1,3	0,9	0,8	0,5	0,1	0,1	-	-	-	7,4
Calm	6,9												6,9
Sum	21,5	18,3	19,9	19,7	10,2	6,2	3,2	0,6	0,1	-	-	-	100,0

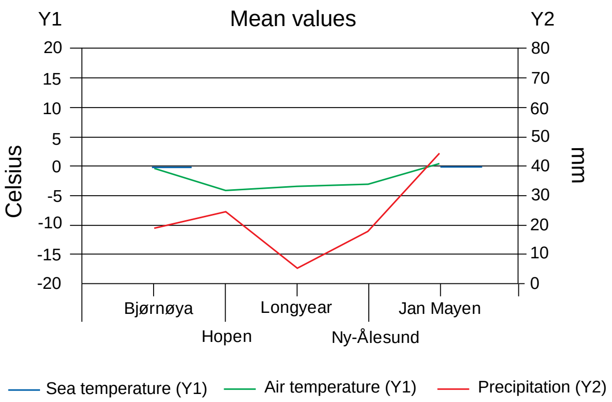


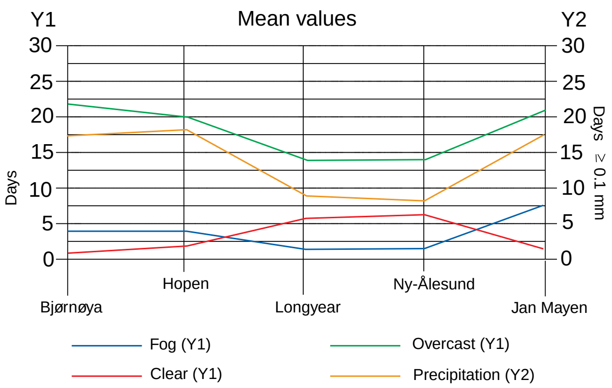
⑦: Calm (%)

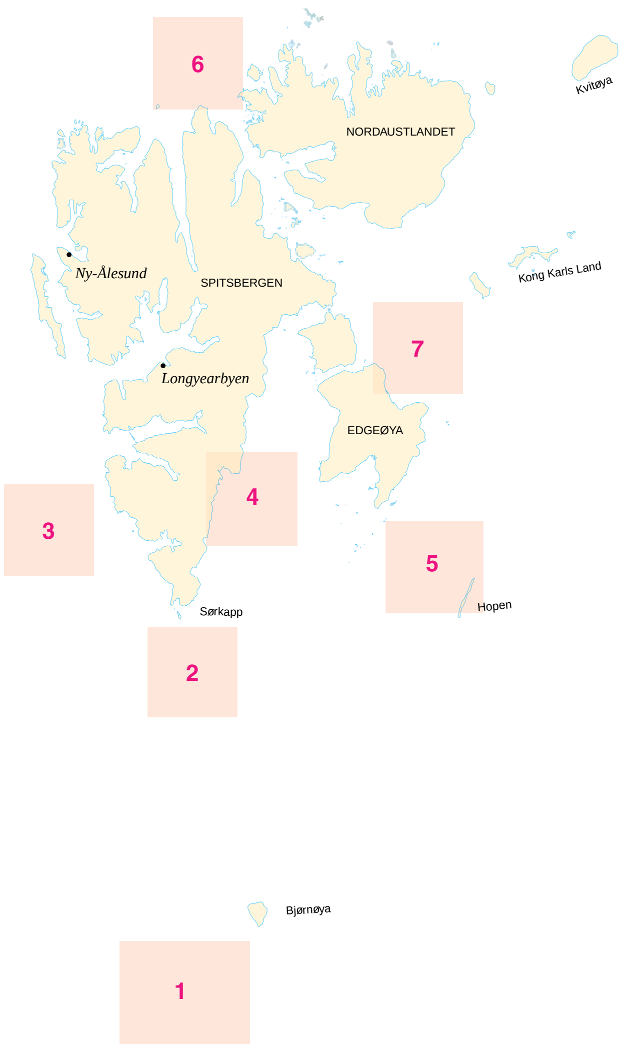
Shows wind from

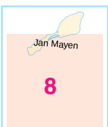
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m 0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	14	41	26	12	5	2	0	0	0	0	-
2. Sørkapp	71	17	8	3	1	0	0	-	-	-	-
3. Bellsundbanken	45	34	15	4	1	0	0	-	-	-	-
4. Storfjorden	99	1	0	-	-	-	-	-	-	-	-
5. Hopen NW	100	-	-	-	-	-	-	-	-	-	-
6. Barentsøya E	100	-	-	-	-	-	-	-	-	-	-
7. Hinlopenrenna	94	5	1	0	-	-	-	-	-	-	-
8. Jan Mayen S	21	38	25	11	3	1	0	0	-	-	-

Percentage of observations	Bjørnøya	Hopen	Longyear	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	68	70	92	87	64	1971–00
Moderate visibility: 4–10 km	14	14	5	11	11	
Poor visibility: 1–4 km	12	10	3	8	10	
Fog, etc: < 1 km	6	6	1	5	14	
Mean cloud cover in %	85	80	65	66	83	









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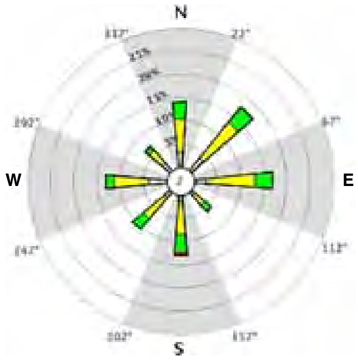
Wind forces:

- ■ >8
- ■ 7-8
- ■ 5-6
- ■ 3-4
- □ 1-2

BJØRNØYA (1971–2000)

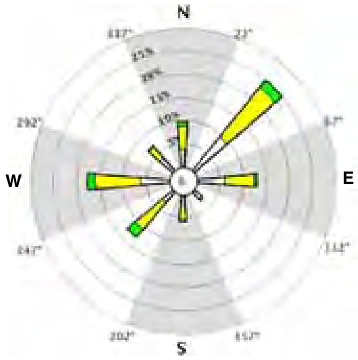
4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,1	0,9	2,4	1,6	0,7	0,2	0,1	0,0	-	-	-	-	7,0
NE	1,0	2,3	3,2	4,6	1,9	0,9	0,1	0,1	-	-	-	-	14,2
E	0,6	2,9	4,5	6,4	2,4	0,7	0,1	-	-	-	-	-	17,6
SE	0,8	1,9	4,7	6,5	2,3	0,8	0,1	-	-	-	-	-	17,1
S	0,3	0,7	1,4	1,7	0,9	0,5	0,2	0,0	-	-	-	-	5,8
SW	0,4	1,0	2,8	5,2	2,1	1,1	0,4	0,1	-	-	-	-	13,0
W	0,3	1,1	3,2	3,6	1,6	0,8	-	-	-	-	-	-	10,6
NW	0,9	2,9	3,8	4,0	0,9	0,6	0,0		-	-	-	-	13,2
Calm	1,5												1,5
Sum	6,9	13,7	26,0	33,6	12,8	5,6	1,0	0,2	-	-	-	-	100,0



②: Calm (%)

HOPEN (1971–2000)

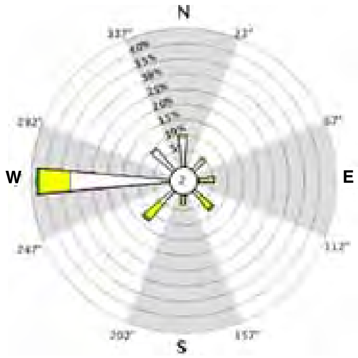
4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,8	2,7	2,3	1,0	0,2	0,0	-	-	-	-	-	-	7,0
NE	1,3	2,4	3,1	2,2	0,4	0,1	-	-	-	-	-	-	9,6
E	2,5	6,8	8,0	6,5	1,0	0,2	0,0	-	-	-	-	-	25,1
SE	2,5	3,8	4,1	2,4	0,3	0,0	-	-	-	-	-	-	13,0
S	1,3	0,8	0,4	0,2	0,1	-	-	-	-	-	-	-	2,8
SW	1,5	1,2	1,5	1,1	0,3	0,1	-	-	-	-	-	-	5,8
W	0,8	2,1	3,2	5,0	1,6	0,2	-	-	-	-	-	-	12,8
NW	1,5	4,7	6,5	3,6	1,1	0,2	-	-	-	-	-	-	17,7
Calm	6,2												6,2
Sum	18,4	24,5	29,1	22,0	5,0	0,8	0,0	-	-	-	-	-	100,0



⑥: Calm (%)

LONGYEARBYEN (1971–2000)

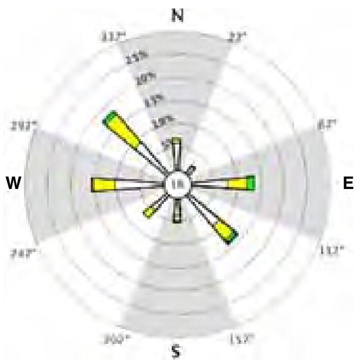
4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	3,9	3,4	1,3	0,5	0,1	-	-	-	-	-	-	-	9,2
NE	3,1	3,7	2,3	0,8	0,1	-	-	-	-	-	-	-	9,9
E	1,6	1,2	1,6	0,7	-	-	-	-	-	-	-	-	5,1
SE	1,0	1,0	1,7	1,7	0,4	0,0	0,0	-	-	-	-	-	5,7
S	0,3	0,7	2,2	3,4	1,4	0,6	0,2	-	-	-	-	-	8,6
SW	0,3	0,7	1,0	1,0	0,4	0,1	-	-	-	-	-	-	3,6
W	0,7	1,3	3,6	5,3	1,5	0,4	0,1	-	-	-	-	-	13,0
NW	5,1	14,0	13,3	9,1	1,2	0,3	0,1	-	-	-	-	-	43,1
Calm	1,8												1,8
Sum	17,8	26,0	27,0	22,5	5,1	1,4	0,4	-	-	-	-	-	100,0



②: Calm (%)

NY-ÅLESUND (1971–2000)

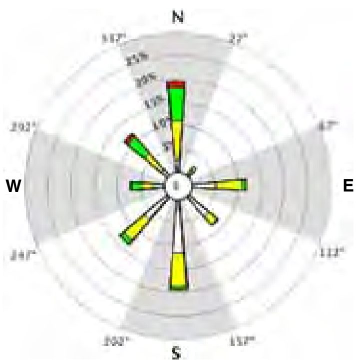
4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	2,9	5,9	4,6	3,9	0,6	-	-	-	-	-	-	-	17,9
NE	3,2	2,6	0,9	0,1	-	-	-	-	-	-	-	-	6,8
E	1,8	0,1	0,2	-	-	-	-	-	-	-	-	-	2,1
SE	5,5	2,6	2,6	1,7	0,8	0,5	-	-	-	-	-	-	13,7
S	5,0	3,8	2,7	1,7	0,5	0,2	0,1	0,0	-	-	-	-	14,0
SW	2,3	1,5	0,9	0,4	0,1	-	-	-	-	-	-	-	5,2
W	3,0	1,4	1,8	0,2	-	-	-	-	-	-	-	-	6,5
NW	6,3	4,1	3,3	1,5	0,2	-	-	-	-	-	-	-	15,4
Calm	18,4												18,4
Sum	48,4	22,0	17,0	9,5	2,2	0,7	0,1	0,0	-	-	-	-	100,0



⑱: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,7	0,7	1,7	4,0	2,4	1,8	0,6	0,0	-	-	-	-	12,0
NE	0,8	1,8	3,8	5,3	3,8	2,7	1,1	0,2	0,1	-	-	-	19,5
E	0,5	0,8	0,6	0,3	0,1	0,0	-	-	-	-	-	-	2,3
SE	2,4	2,9	2,8	3,1	0,6	0,1	0,0	-	-	-	-	-	12,0
S	3,0	2,9	1,8	0,7	0,1	-	-	-	-	-	-	-	8,4
SW	4,4	7,3	5,2	2,0	0,3	0,1	-	-	-	-	-	-	19,3
W	2,6	4,0	3,6	2,3	0,8	0,2	0,1	-	-	-	-	-	13,5
NW	0,9	1,1	1,2	1,9	0,9	0,6	0,4	0,1	0,0	0,0	-	-	7,2
Calm	5,8												5,8
Sum	21,1	21,5	20,7	19,6	9,0	5,5	2,2	0,3	0,1	0,0	-	-	100,0

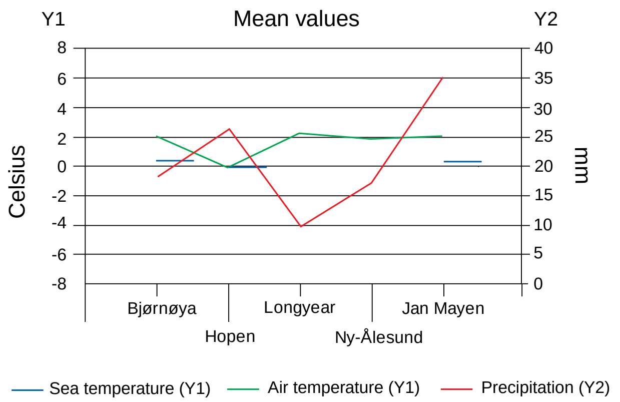


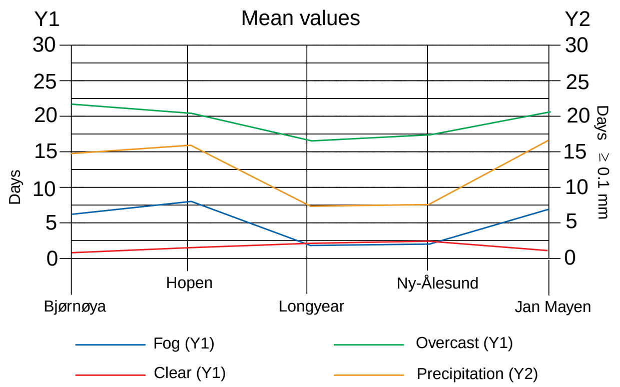
⑥: Calm (%)

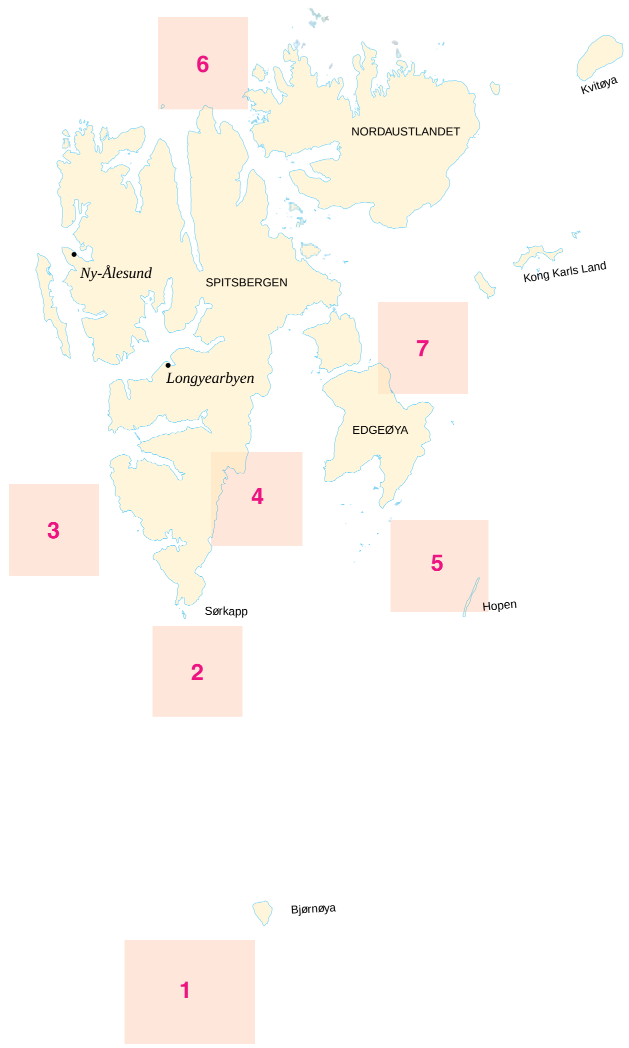
Shows wind from

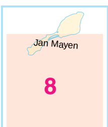
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m										
	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	15	45	28	8	2	1	0	-	-	-	-
2. Sørkapp	49	32	13	4	1	0	0	-	-	-	-
3. Bellsundbanken	42	40	13	4	1	0	-	-	-	-	-
4. Storfjorden	91	6	2	1	0	0	-	-	-	-	-
5. Hopen NW	94	4	2	1	0	0	-	-	-	-	
6. Barentsøya E	99	0	0	0	-	-	-	-	-	-	-
7. Hinlopenrenna	93	6	1	-	-	-	-	-	-	-	-
8. Jan Mayen S	19	43	27	8	3	1	0	0	-	-	-

Percentage of observations	Bjørnøya	Hopen	Longyear	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	64	62	94	90	64	1971–00
Moderate visibility: 4–10 km	15	12	2	9	12	
Poor visibility: 1–4 km	11	12	2	7	10	
Fog, etc: < 1 km	11	14	2	6	13	
Mean cloud cover in %	85	83	75	77	84	









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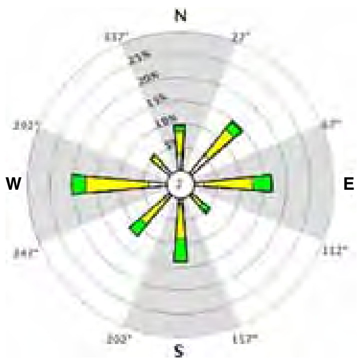
BJØRNØYA (1971–2000)

4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,0	1,5	1,6	1,0	0,2	-	-	-	-	-	-	-	5,4
NE	1,6	2,0	2,1	3,0	0,7	0,2	0,1	-	-	-	-	-	9,8
E	1,6	3,6	3,6	4,2	0,9	0,5	0,1	-	-	-	-	-	14,6
SE	0,5	1,9	5,2	6,0	2,1	1,1	0,0	-	-	-	-	-	16,9
S	0,1	0,7	1,1	1,7	1,3	0,4	0,1	-	-	-	-	-	5,4
SW	0,2	1,1	3,1	5,4	2,6	1,3	0,2	-	-	-	-	-	13,9
W	0,1	1,2	2,6	5,3	1,7	0,4	-	-	-	-	-	-	11,4
NW	1,0	2,8	7,0	7,6	1,7	0,3	-	-	-	-	-	-	20,4
Calm	2,2												2,2
Sum	8,3	14,8	26,3	34,2	11,2	4,2	0,5	-	-	-	-	-	100,0



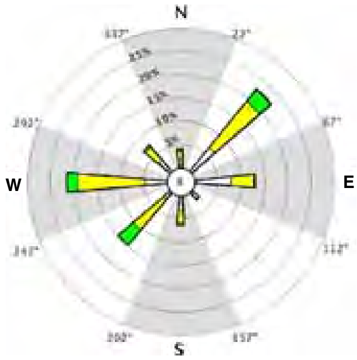
Wind forces:

■ >8
■ 7-8
■ 5-6
■ 3-4
□ 1-2

②: Calm (%)

HOPEN (1971–2000)

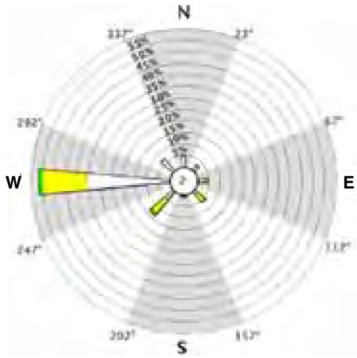
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,1	2,1	2,4	1,5	0,2	0,0	-	-	-	-	-	-	7,3
NE	0,7	0,9	1,1	1,0	0,3	0,2	0,0	-	-	-	-	-	4,3
E	2,5	4,0	6,9	6,6	2,0	0,6	-	-	-	-	-	-	22,7
SE	3,8	4,2	3,8	1,1	0,1	0,0	-	-	-	-	-	-	13,0
S	1,4	0,7	0,2	-	-	-	-	-	-	-	-	-	2,4
SW	1,7	1,6	1,8	0,9	0,3	0,1	-	-	-	-	-	-	6,3
W	0,7	1,1	3,6	6,0	2,8	0,5	0,0	-	-	-	-	-	14,7
NW	1,1	3,5	8,2	7,1	1,5	0,2	-	-	-	-	-	-	21,6
Calm	7,7												7,7
Sum	20,7	18,1	28,0	24,2	7,2	1,6	0,0	-	-	-	-	-	100,0



⑧: Calm (%)

LONGYEARBYEN (1971–2000)

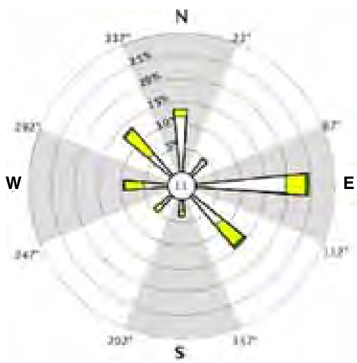
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	2,5	2,7	0,9	0,3	0,0	-	-	-	-	-	-	-	6,5
NE	1,6	2,0	1,1	0,5	0,1	-	-	-	-	-	-	-	5,3
E	1,1	0,9	0,7	0,4	0,0	-	-	-	-	-	-	-	3,0
SE	0,9	0,8	1,3	1,3	0,3	0,2	-	-	-	-	-	-	4,8
S	0,3	0,7	1,2	3,3	1,0	0,3	-	-	-	-	-	-	6,6
SW	0,2	0,4	0,5	0,5	0,1	0,0	-	-	-	-	-	-	1,7
W	0,7	1,0	3,0	5,8	2,3	0,7	0,1	-	-	-	-	-	13,6
NW	5,3	12,5	17,8	16,7	3,5	0,8	0,0	-	-	-	-	-	56,6
Calm	1,9												1,9
Sum	14,5	21,0	26,5	28,8	7,3	2,0	0,1	-	-	-	-	-	100,0



②: Calm (%)

NY-ÅLESUND (1971–2000)

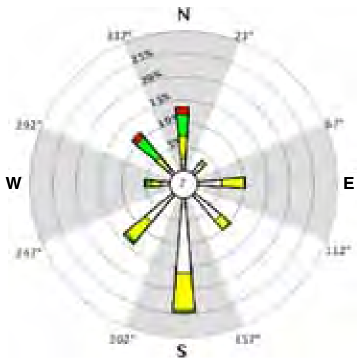
4 obs/ day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	2,5	3,5	4,3	2,6	0,3	-	-	-	-	-	-	-	13,2
NE	6,8	5,3	1,4	0,2	-	-	-	-	-	-	-	-	13,7
E	3,5	0,9	0,0	-	-	-	-	-	-	-	-	-	4,4
SE	12,1	7,6	3,0	1,3	0,4	0,1	-	-	-	-	-	-	24,6
S	4,5	3,9	3,4	2,5	0,4	0,2	-	-	-	-	-	-	14,9
SW	1,0	1,6	0,9	0,3	0,0	0,0	-	-	-	-	-	-	3,8
W	1,2	1,6	1,5	0,3	0,0	0,0	-	-	-	-	-	-	4,7
NW	2,0	3,2	3,1	1,0	0,2	0,0	-	-	-	-	-	-	9,4
Calm	11,3												11,3
Sum	44,9	27,6	17,6	8,2	1,3	0,3	-	-	-	-	-	-	100,0



⑪: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,5	0,5	1,1	3,3	2,7	2,2	0,8	0,2	0,0	-	-	-	11,3
NE	1,0	1,1	2,4	2,8	2,7	1,9	0,9	0,4	0,0	-	-	-	13,4
E	1,3	1,3	0,7	0,1	0,0	0,0	-	-	-	-	-	-	3,4
SE	3,0	2,4	2,7	2,2	0,2	-	-	-	-	-	-	-	10,5
S	3,8	3,7	1,6	1,0	0,2	-	-	-	-	-	-	-	10,3
SW	6,9	9,5	5,8	2,2	0,2	0,1	-	-	-	-	-	-	24,8
W	2,9	4,8	3,7	2,0	0,2	0,1	0,1	-	-	-	-	-	13,8
NW	0,5	1,0	1,2	1,3	0,7	0,3	0,1	0,0	-	-	-	-	5,3
Calm	7,2												7,2
Sum	27,1	24,3	19,2	14,9	6,9	4,6	1,9	0,6	0,0	-	-	-	100,0

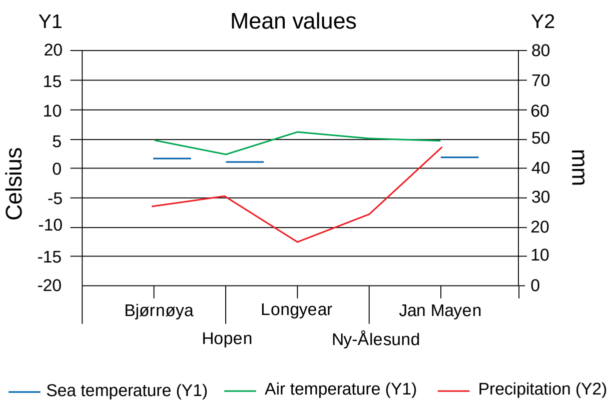


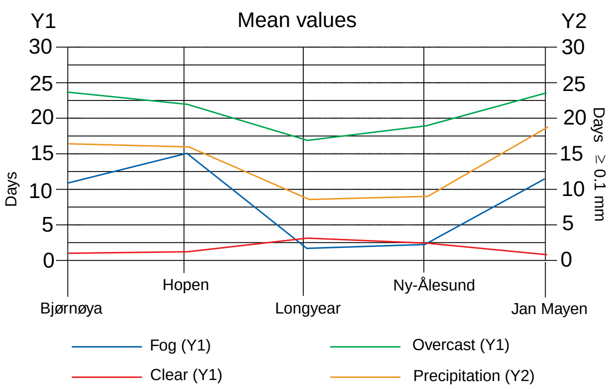
⑦: Calm (%)

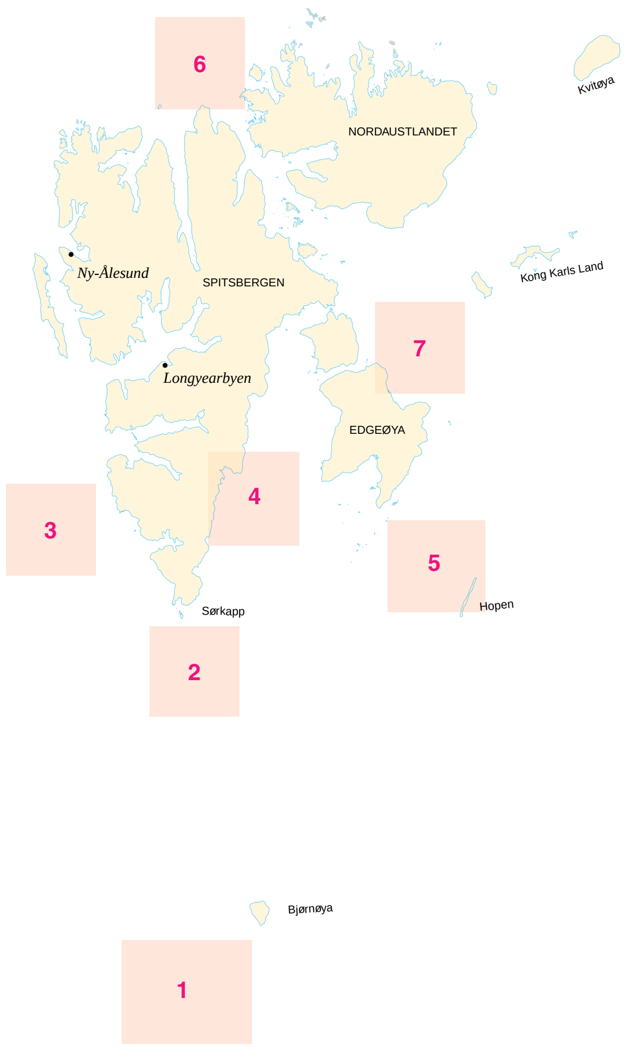
Shows wind from

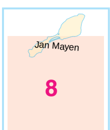
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m										
	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	12	52	28	6	1	0	0	0	-	-	-
2. Sørkapp	26	51	19	4	0	0	-	-	-	-	-
3. Bellsundbanken	29	51	16	3	0	0	-	-	-	-	-
4. Storfjorden	66	27	6	1	0	-	-	-	-	-	-
5. Hopen NW	64	25	9	1	0	-	-	-	-	-	-
6. Barentsøya E	92	7	1	-	-	-	-	-	-	-	-
7. Hinlopenrenna	91	8	1	0	-	-	-	-	-	-	-
8. Jan Mayen S	17	51	25	6	1	0	0	-	-	-	-

Percentage of observations	Bjørnøya	Hopen	Longyear	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	48	46	96	89	54	1971–00
Moderate visibility: 4–10 km	16	14	2	11	13	
Poor visibility: 1–4 km	16	13	1	6	13	
Fog, etc: < 1 km	20	27	1	6	20	
Mean cloud cover in %	87	84	74	79	87	



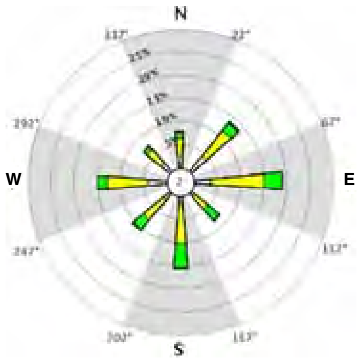






BJØRNØYA (1971–2000)

4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,8	1,5	2,2	2,0	0,6	0,2	0,1	0,0	-	-	-	-	7,3
NE	1,0	1,6	2,2	2,0	0,6	0,4	0,2	0,0	-	-	-	-	8,0
E	1,0	3,2	3,6	4,2	1,0	0,5	0,2	0,1	-	-	-	-	13,8
SE	0,9	2,5	5,6	7,0	2,6	0,5	0,1		-	-	-	-	19,2
S	0,2	0,8	1,5	2,6	1,9	1,0	0,1		-	-	-	-	8,1
SW	0,5	1,0	3,5	6,3	2,6	1,6	0,2	0,0	-	-	-	-	15,8
W	0,3	1,4	2,5	4,0	1,5	0,7	0,1	0,0	0,1	-	-	-	10,5
NW	1,0	2,9	4,9	4,4	1,0	0,6			-	-	-	-	14,9
Calm	2,4												2,4
Sum	8,1	14,9	26,0	32,5	11,8	5,5	1,0	0,1	0,1	-	-	-	100,0



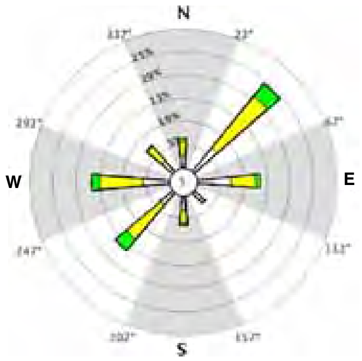
Wind forces:

- >8
- 7-8
- 5-6
- 3-4
- 1-2

②: Calm (%)

HOPEN (1971–2000)

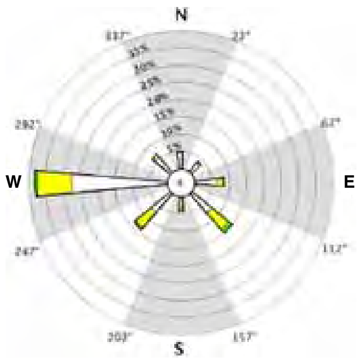
4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,1	1,8	2,8	1,4	0,2	0,1	-	-	-	-	-	-	7,4
NE	1,0	1,6	1,9	1,4	0,6	0,1	0,0	-	-	-	-	-	6,5
E	2,7	4,0	8,2	7,1	2,1	0,4	0,1	-	-	-	-	-	24,4
SE	3,5	3,9	3,6	1,9	0,6	0,1	-	-	-	-	-	-	13,6
S	1,3	0,9	0,6	0,3	0,1	0,0	-	-	-	-	-	-	3,3
SW	1,5	1,8	1,7	1,0	0,4	0,2	0,0	-	-	-	-	-	6,6
W	1,4	2,0	4,7	5,6	2,1	0,4	0,0	-	-	-	-	-	16,2
NW	2,0	3,6	5,4	4,7	0.9	0,3	0,0	-	-	-	-	-	16,7
Calm	5,3												5,3
Sum	19,8	19,6	28,9	23,4	6,1	1,6	0,1	-	-	-	-	-	100,0



⑤: Calm (%)

LONGYEARBYEN (1971–2000)

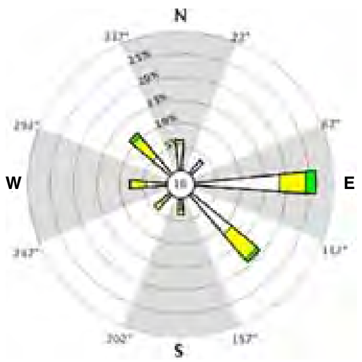
4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	2,7	1,6	1,3	0,8	0,3	-	-	-	-	-	-	-	6,7
NE	2,2	1,6	0,9	0,4	0,1	-	-	-	-	-	-	-	5,2
E	1,2	1,1	1,0	0,4	0,1	0,0	-	-	-	-	-	-	3,8
SE	2,5	2,2	2,1	1,4	0,4	0,2	0,1	-	-	-	-	-	8,8
S	1,4	2,1	4,3	5,3	1,7	0,7	0,2	-	-	-	-	-	15,7
SW	1,1	0,7	1,4	0,8	0,4	0,1	-	-	-	-	-	-	4,5
W	1,4	2,2	3,6	4,4	1,5	0,3	0,1	-	-	-	-	-	13,5
NW	5,1	11,0	11,6	8,2	1,7	0,4	-	-	-	-	-	-	37,9
Calm	3,9												3,9
Sum	21,5	22,5	26,2	21,7	6,2	1,7	0,4	-	-	-	-	-	100,0



④: Calm (%)

NY-ÅLESUND (1971–2000)

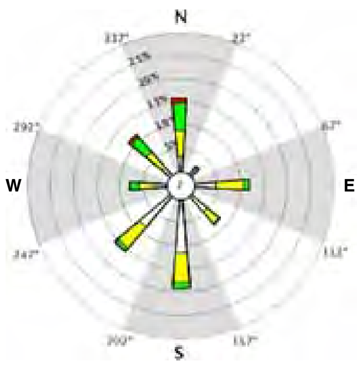
4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,9	2,5	3,5	2,8	0,6	0,1	0,0	-	-	-	-	-	11,3
NE	3,5	2,4	0,7	0,2	0,0	-	-	-	-	-	-	-	6,7
E	3,1	0,5	0,1	-	-	-	-	-	-	-	-	-	3,6
SE	12,1	7,1	3,7	2,2	1,3	0,4	0,2	0,0	-	-	-	-	27,1
S	5,3	6,2	4,9	2,5	0,5	0,2	0,1	-	-	-	-	-	19,7
SW	1,8	1,0	0,9	0,3	0,0	-	-	-	-	-	-	-	4,0
W	0,9	1,7	1,0	0,4	-	0,0	-	-	-	-	-	-	4,1
NW	2,1	2,4	2,5	1,1	0,1	-	-	-	-	-	-	-	8,2
Calm	15,3												15,3
Sum	44,1	21,3	13,8	6,7	1,9	0,6	0,3	0,0	-	-	-	-	100,0



⑯: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day							Beaufort						%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,9	1,0	1,9	3,2	2,2	1,5	0,5	0,1	0,0	-	-	-	11,5
NE	1,7	1,4	2,5	4,0	3,0	2,3	0,9	0,1	-	-	-	-	15,9
E	1,0	0,8	0,3	0,2	0,1	0,0	0,0	-	-	-	-	-	2,3
SE	2,2	2,6	3,3	2,9	0,9	0,2	-	-	-	-	-	-	12,0
S	2,7	2,0	2,0	1,2	0,2	-	-	-	-	-	-	-	8,1
SW	5,9	5,7	4,4	2,4	0,7	0,1	-	-	-	-	-	-	19,3
W	3,5	5,0	3,9	2,4	0,4	0,2	0,1	-	-	-	-	-	15,6
NW	1,3	1,4	1,9	1,7	1,2	0,4	0,1	0,1	-	-	-	-	8,0
Calm	7,3												7,3
Sum	26,5	19,9	20,2	18,0	8,7	4,7	1,6	0,3	0,0	-	-	-	100,0

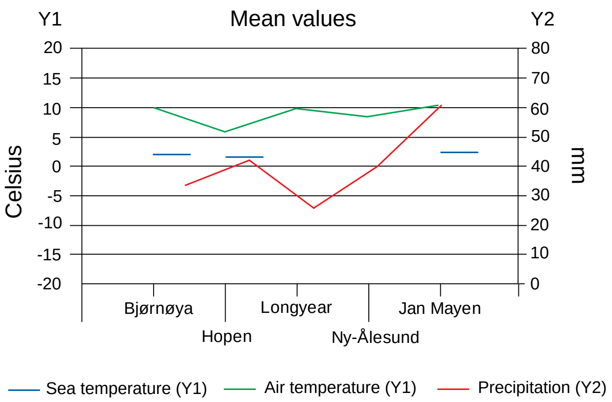


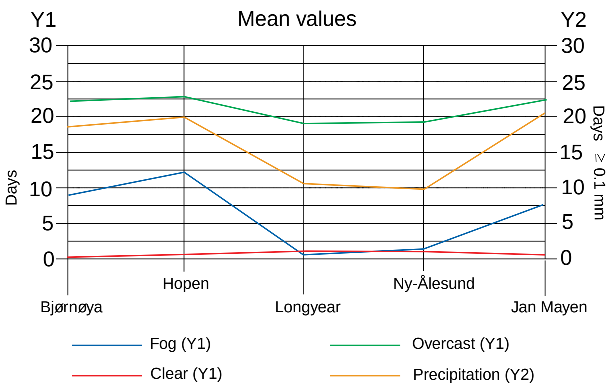
⑦: Calm (%)

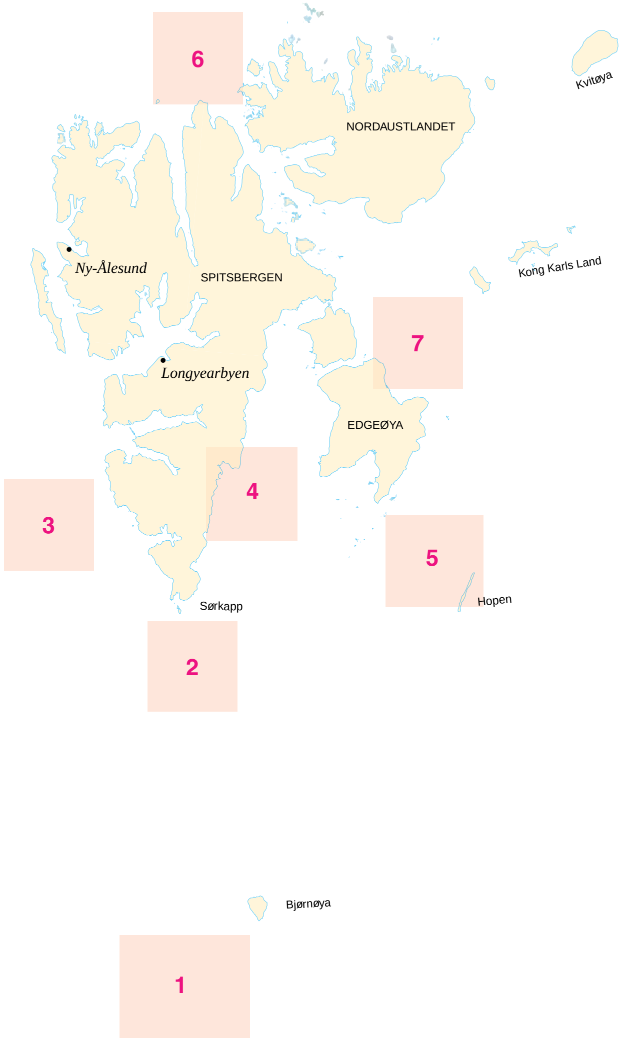
Shows wind from

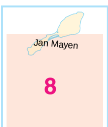
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m 0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	10	51	28	8	2	1	0	0	-	-	-
2. Sørkapp	26	51	19	4	0	0	-	-	-	-	-
3. Bellsundbanken	20	50	22	6	1	0	0	-	-	-	-
4. Storfjorden	39	41	15	4	1	0	-	-	-	-	-
5. Hopen NW	30	45	18	5	1	0	0	-	-	-	-
6. Barentsøya E	75	20	4	1	0	0	-	-	-	-	-
7. Hinlopenrenna	81	16	2	0	-	-	-	-	-	-	-
8. Jan Mayen S	15	46	27	10	2	0	0	0	-	-	-

Percentage of observations	Bjørnøya	Hopen	Longyearbyen	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	55	51	96	89	61	1971–00
Moderate visibility: 4–10 km	16	14	2	10	14	
Poor visibility: 1–4 km	13	12	1	8	11	
Fog, etc: < 1 km	16	23	1	7	14	
Mean cloud cover in %	86	86	78	80	85	







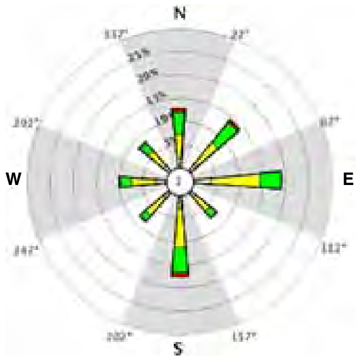


Wind forces:

■ >8
■ 7-8
■ 5-6
■ 3-4
□ 1-2

BJØRNØYA (1971–2000)

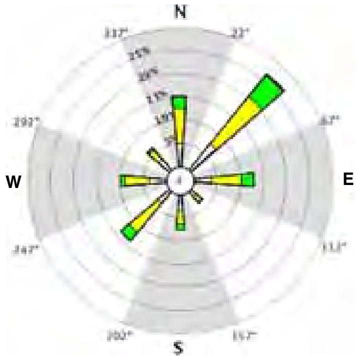
4 obs/day	Beaufort												%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,5	1,1	2,0	2,4	1,2	0,9	0,2	-	-	-	-	-	8,3
NE	0,4	1,5	2,2	3,5	2,4	2,0	0,5	0,1	0,1	-	-	-	12,7
E	0,4	1,5	2,5	4,4	3,2	1,4	0,6	0,1	-	-	-	-	14,3
SE	0,9	2,8	5,3	6,6	2,8	0,8	0,0	-	-	-	-	-	19,2
S	0,3	1,1	2,0	2,4	1,0	0,5	0,1	0,0	-	-	-	-	7,5
SW	0,6	2,1	4,6	4,7	2,9	1,9	0,8	0,0	-	-	-	-	17,6
W	0,4	1,0	2,8	2,7	0,9	0,4	0,2	0,0	-	-	-	-	8,4
NW	0,6	1,6	2,4	3,4	1,0	0,6	0,3	0,1	-	-	-	-	10,1
Calm	1,9												1,9
Sum	6,0	12,7	23,8	30,1	15,4	8,5	2,7	0,3	0,1	-	-	-	100,0



②: Calm (%)

HOPEN (1971–2000)

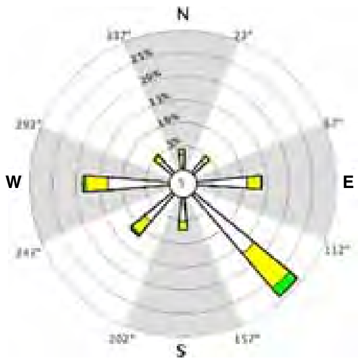
4 obs/day	Beaufort												%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,5	1,5	1,7	1,0	0,4	0,1	0,0	-	-	-	-	-	6,2
NE	1,9	3,1	4,4	3,8	1,2	0,6	0,1	-	-	-	-	-	15,1
E	2,8	4,5	6,1	8,2	3,4	1,3	0,3	-	-	-	-	-	26,6
SE	1,8	2,0	3,5	3,8	1,7	0,3	0,0	-	-	-	-	-	13,2
S	0,7	0,9	0,9	0,8	0,2	0,1	-	-	-	-	-	-	3,4
SW	1,3	2,1	2,1	1,4	0,6	0,2	-	-	-	-	-	-	7,6
W	1,1	2,3	4,4	4,2	1,5	0,3	0,0	-	-	-	-	-	13,8
NW	1,5	1,9	3,1	2,4	0,6	0,1	0,0	-	-	-	-	-	9,8
Calm	4,3												4,3
Sum	16,9	18,3	26,2	25,6	9,6	3,0	0,4	-	-	-	-	-	100,0



④: Calm (%)

LONGYEARBYEN (1971–2000)

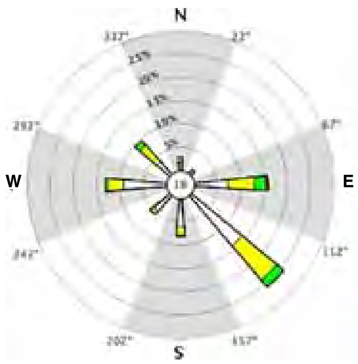
4 obs/day	Beaufort												%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,1	1,0	1,2	1,3	0,4	0,1	-	-	-	-	-	-	5,1
NE	1,3	1,1	1,2	0,8	0,2	0,1	-	-	-	-	-	-	4,7
E	0,9	1,1	1,4	1,3	0,2	0,0	-	-	-	-	-	-	4,9
SE	2,8	3,8	4,3	2,4	0,5	0,1	-	-	-	-	-	-	13,9
S	3,9	5,9	7,6	7,6	3,0	0,8	0,1	-	-	-	-	-	28,9
SW	2,3	1,3	1,7	1,6	0,2	0,0	0,0	-	-	-	-	-	7,2
W	2,1	2,4	3,3	3,0	0,7	0,3	0,1	0,0	-	-	-	-	11,9
NW	3,8	5,7	3,7	3,9	1,0	3,0	0,2	-	-	-	-	-	18,6
Calm	4,8												4,8
Sum	23,0	22,3	24,4	21,9	6,2	4,4	0,4	0,0	-	-	-	-	100,0



⑤: Calm (%)

NY-ÅLESUND (1971–2000)

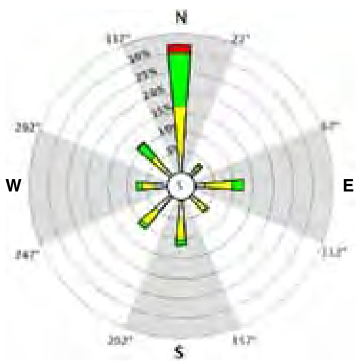
4 obs/day	Beaufort												%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	1,5	2,0	2,5	2,8	0,8	0,3	-	-	-	-	-	-	9,9
NE	1,0	0,7	0,9	0,4	0,0	0,0	-	-	-	-	-	-	3,1
E	0,7	0,4	0,2	0,0	-	-	-	-	-	-	-	-	1,3
SE	4,8	2,5	2,8	3,7	1,3	0,5	0,2	0,2	-	-	-	-	16,0
S	7,8	7,0	5,7	4,3	1,1	0,5	0,1	-	-	-	-	-	26,6
SW	4,1	2,3	1,2	0,5	0,2	0,0	-	-	-	-	-	-	8,4
W	3,3	1,3	0,8	0,1	0,0	-	-	-	-	-	-	-	5,5
NW	5,5	3,7	2,4	1,1	0,3	0,1	-	-	-	-	-	-	13,1
Calm	16,1												16,1
Sum	44,8	19,9	16,5	12,9	3,7	1,4	0,3	0,2	-	-	-	-	100,0



⑱: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day	Beaufort												%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,8	1,1	1,6	3,4	2,4	1,4	0,3	0,0	0,0	-	-	-	11,0
NE	1,4	2,8	5,0	9,4	7,0	4,7	1,6	0,3	-	-	-	-	32,2
E	1,0	0,7	0,7	0,6	0,4	0,2	0,2	-	-	-	-	-	3,7
SE	1,2	1,4	2,8	4,8	1,8	0,6	0,1	-	-	-	-	-	12,6
S	1,2	1,1	1,6	1,3	0,4	0,1	-	-	-	-	-	-	5,6
SW	2,4	2,6	3,1	2,4	0,9	0,2	0,0	-	-	-	-	-	11,6
W	2,1	2,9	2,9	1,9	0,7	0,2	0,0	0,0	-	-	-	-	10,7
NW	1,7	1,5	1,6	1,7	0,8	0,3	0,2	-	-	-	-	-	7,7
Calm	4,9												4,9
Sum	16,7	14,1	19,3	25,5	14,4	7,7	2,4	0,3	0,0	-	-	-	100,0

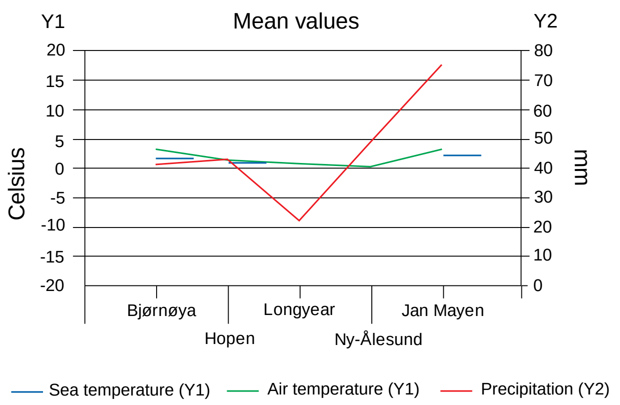


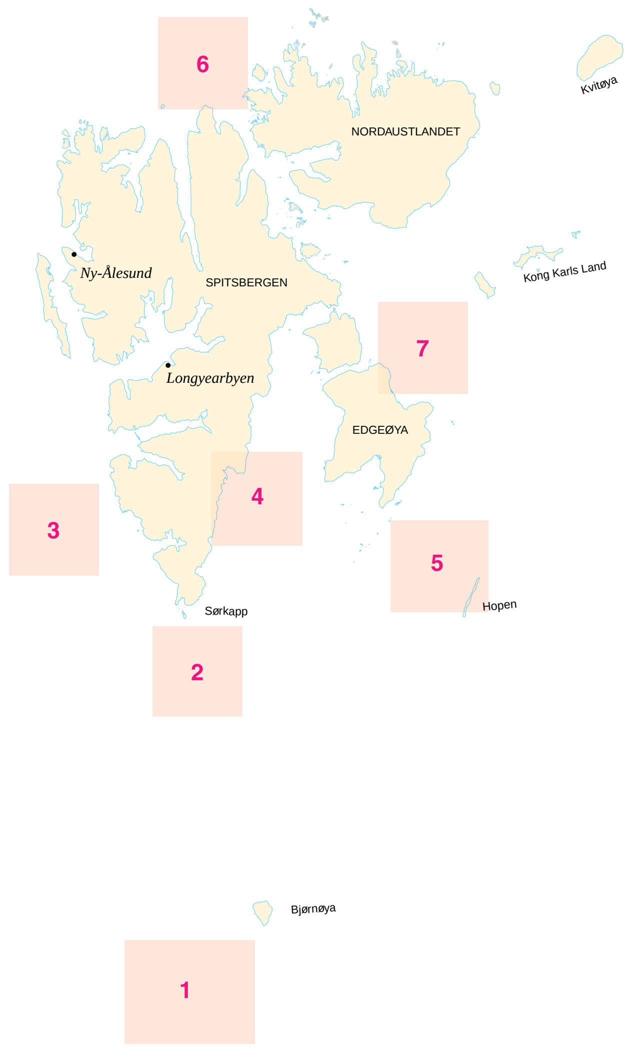
⑤: Calm (%)

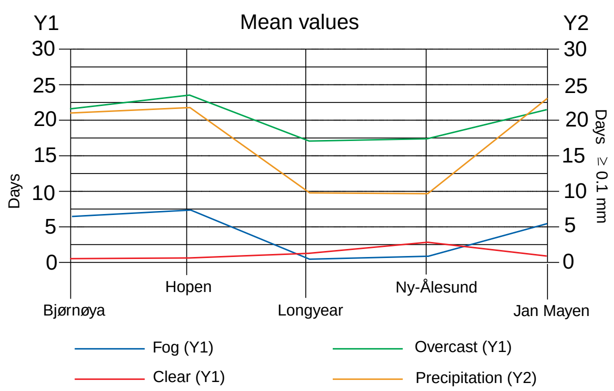
Shows wind from

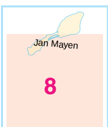
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m										
	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	5	33	35	16	6	3	1	0	0	-	-
2. Sørkapp	10	40	30	13	5	1	0	0	-	-	-
3. Bellsundbanken	13	43	27	12	3	1	0	0	-	-	-
4. Storfjorden	23	41	22	9	3	0	0	0	-	-	-
5. Hopen NW	14	40	27	13	5	1	0	0	0	-	-
6. Barentsøya E	50	31	14	4	1	0	-	-	-	-	-
7. Hinlopenrenna	58	30	9	2	1	0	0	-	-	-	-
8. Jan Mayen S	6	37	31	16	6	3	1	0	0	0	-

Percentage of observations	Bjørnøya	Hopen	Longyearbyen	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	62	61	94	88	65	1971–00
Moderate visibility: 4–10 km	15	14	4	11	14	
Poor visibility: 1–4 km	12	11	2	9	12	
Fog, etc: < 1 km	12	14	1	6	9	
Mean cloud cover in %	86	88	78	77	85	









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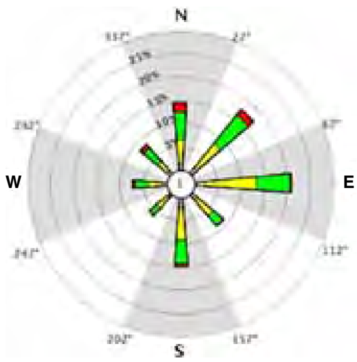
BJØRNØYA (1971–2000)

4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	-	0,6	0,9	2,5	1,7	1,7	0,7	0,2	0,1	-	-	-	8,3
NE	0,2	1,1	2,0	3,9	3,1	2,4	1,3	0,5	0,1	0,0	-	-	14,5
E	0,2	1,3	2,4	5,8	3,9	2,9	0,8	0,5	0,0	-	-	-	17,7
SE	0,4	1,8	4,8	8,2	3,5	2,0	0,3	0,1	-	-	-	-	21,1
S	0,2	1,2	2,5	3,0	1,3	0,8	0,2		-	-	-	-	9,1
SW	0,6	1,6	3,4	4,6	3,0	1,1	0,5	0,1	0,0	-	-	-	15,0
W	0,2	0,6	1,0	2,4	1,0	0,6	0,1	0,1	-	-	-	-	6,0
NW	0,1	0,7	1,2	2,5	1,7	0,7	0,3	0,1	-	-	-	-	7,4
Calm	0,9												0,9
Sum	2,8	8,9	18,2	32,9	19,2	12,2	4,2	1,6	0,2	0,0	-	-	100,0



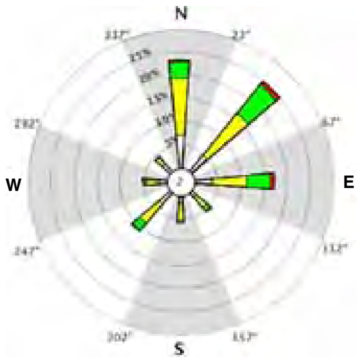
Wind forces:

- ■ >8
- ■ 7-8
- ■ 5-6
- ■ 3-4
- □ 1-2

①: Calm (%)

HOPEN (1971–2000)

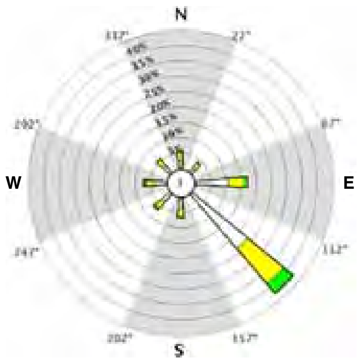
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,4	1,4	1,3	0,9	0,1	0,1	-	-	-	-	-	-	4,3
NE	2,4	4,7	7,1	5,9	2,2	0,8	0,3	0,1	-	-	-	-	23,5
E	1,2	3,3	5,8	7,2	4,5	2,5	0,6	0,1	-	-	-	-	25,1
SE	1,1	2,7	3,4	4,8	2,8	1,9	0,6	0,1	-	-	-	-	17,3
S	0,5	1,0	1,6	1,5	0,8	0,2	0,1	-	-	-	-	-	5,6
SW	0,7	1,0	1,9	1,6	0,5	0,0	0,0	-	-	-	-	-	5,9
W	1,2	1,9	2,7	3,4	1,2	0,4	0,1	-	-	-	-	-	10,9
NW	0,6	1,0	1,8	1,1	0,2	0,2	0,1	-	-	-	-	-	5,1
Calm	2,3												2,3
Sum	10,4	17,0	25,6	26,4	12,3	6,1	1,8	0,3	-	-	-	-	100,0



②: Calm (%)

LONGYEARBYEN (1971–2000)

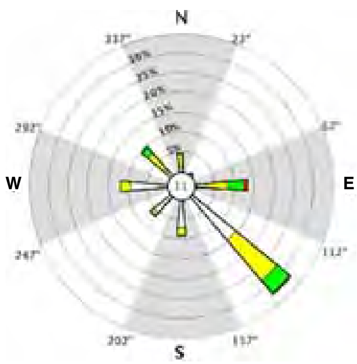
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,3	0,6	1,5	2,4	0,7	0,1	-	-	-	-	-	-	5,5
NE	0,5	0,8	1,5	2,4	0,5	0,1	-	-	-	-	-	-	5,8
E	0,3	0,6	1,0	1,4	0,6	0,3	-	-	-	-	-	-	4,2
SE	1,6	3,9	5,6	3,9	1,6	0,4	0,2	0,0	-	-	-	-	17,3
S	3,6	6,3	13,9	12,4	4,2	2,0	0,5	0,1	-	-	-	-	43,0
SW	1,4	1,0	1,5	2,0	1,2	0,2	-	-	-	-	-	-	7,3
W	1,2	1,0	1,4	1,8	0,7	0,4	0,1	-	-	-	-	-	6,6
NW	1,1	1,8	1,4	1,8	0,7	0,5	0,1	0,0	-	-	-	-	7,5
Calm	2,8												2,8
Sum	12,8	16,0	27,8	28,1	10,2	4,0	0,9	0,1	-	-	-	-	100,0



③: Calm (%)

NY-ÅLESUND (1971–2000)

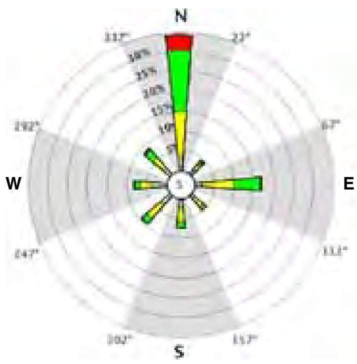
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,7	0,7	2,3	3,8	1,5	0,3	0,0	-	-	-	-	-	9,4
NE	0,4	1,0	1,7	1,5	0,3	-	-	-	-	-	-	-	4,8
E	0,3	0,1	0,2	-	0,0	-	-	-	-	-	-	-	0,6
SE	1,3	1,5	2,4	3,9	2,2	1,5	0,8	0,1	-	-	-	-	13,7
S	6,3	8,0	8,5	6,1	2,0	1,6	0,3	-	-	-	-	-	32,7
SW	4,4	2,9	1,3	0,5	0,1	0,0	-	-	-	-	-	-	9,3
W	3,9	1,7	0,5	0,4	0,1	0,1	-	-	-	-	-	-	6,8
NW	5,3	4,0	1,5	1,2	0,1	0,0	-	-	-	-	-	-	12,2
Calm	10,5												10,5
Sum	33,1	19,9	18,4	17,4	6,3	3,5	1,1	0,1	-	-	-	-	100,0



⑪: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,8	1,1	1,6	2,4	1,5	0,7	0,4	0,1	-	-	-	-	8,5
NE	1,2	2,2	4,8	9,0	7,9	6,1	2,7	0,5	0,0	-	-	-	34,4
E	0,8	0,7	1,1	0,8	0,5	0,3	0,3	0,1	-	-	-	-	4,6
SE	0,7	1,2	2,8	6,6	3,3	2,1	0,5	0,0	-	-	-	-	17,1
S	0,5	0,8	1,5	1,5	0,4	0,2	-	-	-	-	-	-	4,9
SW	0,9	1,4	1,6	2,4	0,9	0,3	0,0	-	-	-	-	-	7,5
W	1,2	1,9	2,3	2,6	1,0	0,5	0,1	-	-	-	-	-	9,5
NW	2,0	1,8	1,5	1,5	0,6	0,5	0,4	0,0	-	-	-	-	8,4
Calm	5,1												5,1
Sum	13,2	11,1	17,2	26,8	16,1	10,7	4,4	0,7	0,0	-	-	-	100,0

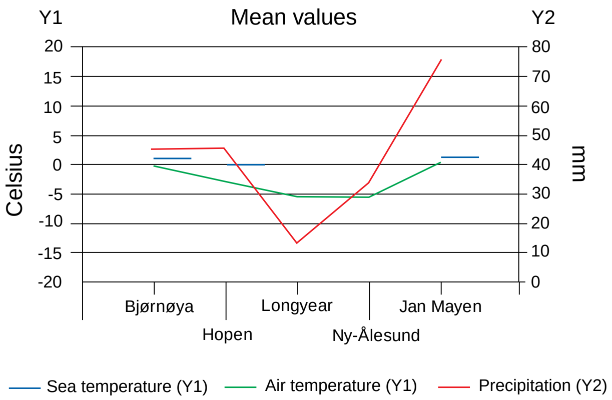


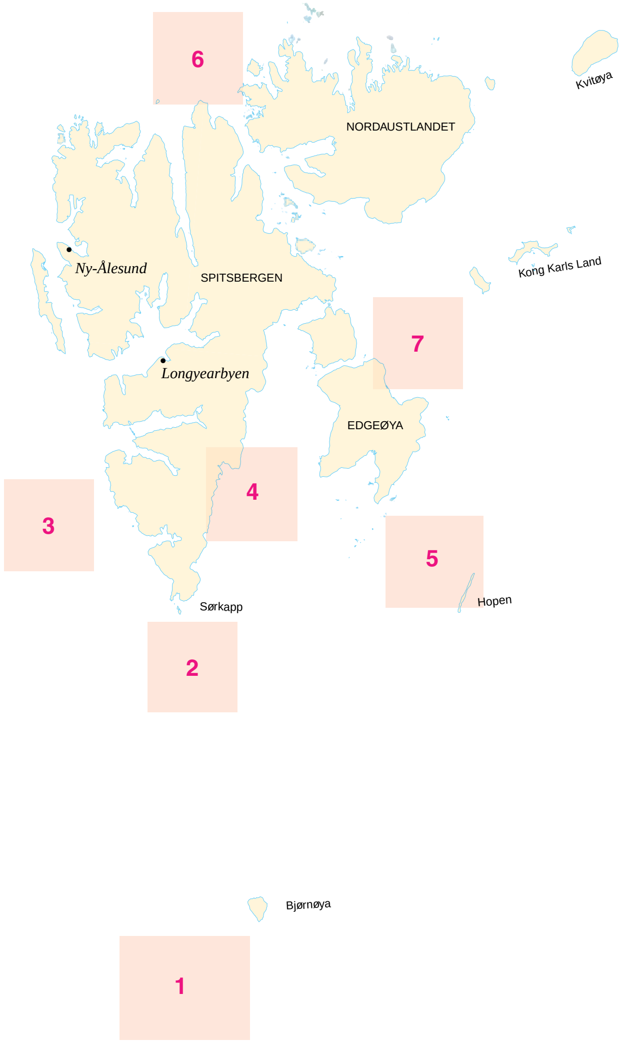
⑤: Calm (%)

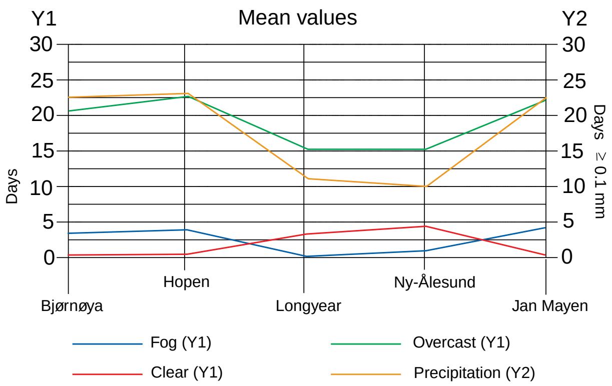
Shows wind from

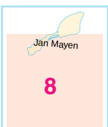
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m 0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	2	21	33	24	11	6	2	1	0	0	0
2. Sørkapp	9	27	30	18	9	4	2	1	0	0	0
3. Bellsundbanken	10	32	29	16	8	3	1	0	0	0	-
4. Storfjorden	29	29	24	10	5	2	1	0	0	-	
5. Hopen NW	25	25	24	13	7	3	1	1	0	0	-
6. Barentsøya E	58	19	13	5	3	1	0	0	0	-	-
7. Hinlopenrenna	61	26	9	3	1	0	0	0	0	-	-
8. Jan Mayen S	2	22	32	22	12	6	2	1	0	0	0

Percentage of observations	Bjørnøya	Hopen	Longyearbyen	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	67	64	92	84	63	1971–00
Moderate visibility: 4–10 km	18	16	6	13	17	
Poor visibility: 1–4 km	10	13	2	11	13	
Fog, etc: < 1 km	5	7	0	6	7	
Mean cloud cover in %	85	86	72	71	86	









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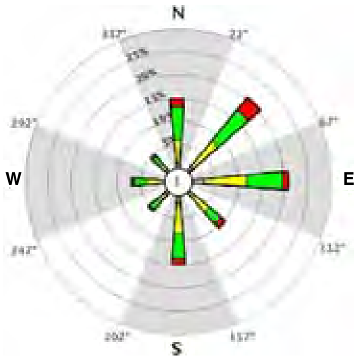
BJØRNØYA (1971–2000)

4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,1	0,3	0,4	1,2	1,1	0,9	0,4	0,2	-	-	-	-	4,7
NE	0,2	0,8	1,4	4,3	3,8	2,8	1,4	0,4	0,0	-	-	-	15,1
E	0,5	0,8	2,3	5,4	4,9	3,3	2,6	0,6	0,1	-	-	-	20,6
SE	0,8	1,7	4,3	6,1	4,1	2,9	0,9	0,1	0,0	-	-	-	20,9
S	0,3	1,0	2,2	2,9	1,8	1,1	0,9	0,2	0,0	-	-	-	10,4
SW	0,3	1,2	2,7	4,6	3,1	1,9	0,8	0,2	0,1	-	-	-	15,0
W	0,2	0,4	1,1	1,4	1,1	0,8	0,3	0,0	0,0	-	-	-	5,3
NW	0,1	0,3	0,8	2,7	1,5	1,1	0,5	0,1	-	-	-	-	7,2
Calm	0,8												0,8
Sum	3,3	6,5	15,2	28,6	21,4	14,8	7,8	1,8	0,2	-	-	-	100,0



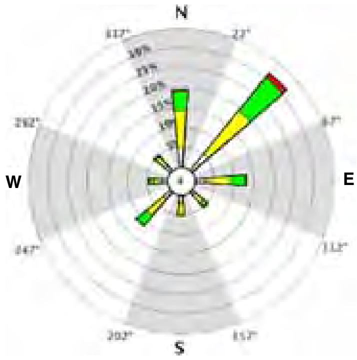
Wind forces:

- ■ >8
- ■ 7-8
- ■ 5-6
- ■ 3-4
- □ 1-2

1: Calm (%)

HOPEN (1971–2000)

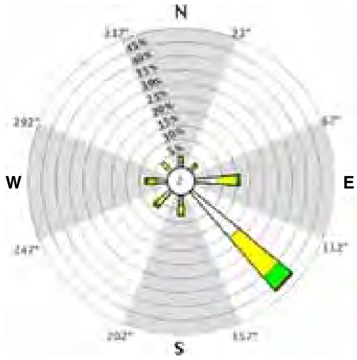
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,6	1,1	1,7	1,1	0,4	0,1	0,0	-	-	-	-	-	5,2
NE	1,6	3,4	4,8	5,4	2,8	1,2	0,3	0,0	-	-	-	-	19,6
E	1,8	3,6	6,6	9,1	5,9	3,5	1,0	0,1	0,0	-	-	-	31,6
SE	0,9	1,8	2,9	3,9	1,9	1,4	0,2	0,0	-	-	-	-	13,0
S	0,7	0,7	1,0	1,8	0,7	0,4	0,2	-	-	-	-	-	5,4
SW	0,9	1,1	1,5	1,4	0,6	0,2	-	-	-	-	-	-	5,6
W	0,7	1,4	2,2	4,2	1,9	0,8	0,1	0,0	-	-	-	-	11,3
NW	0,3	1,0	1,2	0,9	0,8	0,3	0,1	0,0	-	-	-	-	4,7
Calm	3,6												3,6
Sum	11,1	14,1	21,9	27,8	15,0	7,9	1,9	0,1	0,0	-	-	-	100,0



4: Calm (%)

LONGYEARBYEN (1971–2000)

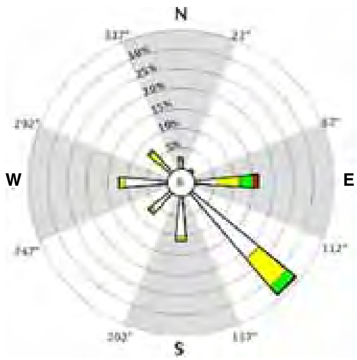
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,4	0,6	0,8	1,5	0,7	-	-	-	-	-	-	-	3,9
NE	0,6	0,6	1,0	1,3	0,3	0,2	-	-	-	-	-	-	4,0
E	0,1	0,4	0,7	1,0	0,8	0,2	0,0	-	-	-	-	-	3,3
SE	1,4	2,1	5,1	5,2	1,7	0,4	0,2	0,1	-	-	-	-	16,2
S	3,5	5,6	13,7	14,4	5,8	2,9	0,8	0,4	0,0	-	-	-	47,1
SW	1,4	1,0	1,4	2,3	1,0	0,5	0,1	0,0	-	-	-	-	7,7
W	1,0	0,9	1,5	2,1	1,5	0,6	0,2	-	0,0	-	-	-	7,9
NW	1,1	1,4	1,1	2,0	1,1	0,6	0,5	0,1	-	-	-	-	7,9
Calm	2,0												2,0
Sum	11,5	12,6	25,3	29,8	12,9	5,4	1,8	0,6	0,0	-	-	-	100,0



2: Calm (%)

NY-ÅLESUND (1971–2000)

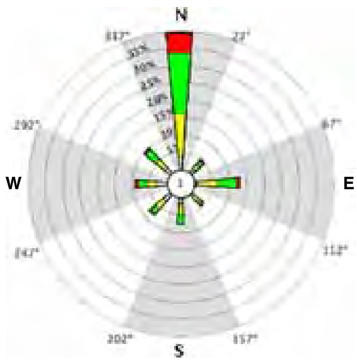
4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,5	0,9	1,7	2,7	1,1	0,3	-	-	-	-	-	-	7,2
NE	0,2	0,7	0,9	0,9	0,0	-	-	-	-	-	-	-	2,7
E	0,1	0,3	0,1	0,1	0,1	-	-	-	-	-	-	-	0,7
SE	1,1	1,7	2,9	3,7	2,8	1,9	1,5	0,5	0,2	-	-	-	16,3
S	4,5	9,3	8,1	7,7	2,6	1,5	0,5	0,1	0,0	-	-	-	34,3
SW	4,6	3,9	1,7	0,6	0,3	0,0	0,0	-	-	-	-	-	11,3
W	3,1	1,8	1,4	0,7	0,2	0,1	0,1	-	-	-	-	-	7,4
NW	5,1	3,7	2,0	1,1	0,2	0,2	0,1	-	-	-	-	-	12,4
Calm	7,7												7,7
Sum	26,9	22,3	18,8	17,5	7,3	4,0	2,2	0,6	0,2	-	-	-	100,0



8: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day						Beaufort							%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,8	1,2	1,3	2,5	2,0	1,3	0,4	0,1	0,0	-	-	-	9,6
NE	1,2	2,4	4,5	9,9	8,3	7,9	3,8	1,1	0,2	0,1	-	-	39,4
E	0,6	1,0	0,6	0,9	0,8	0,7	0,3	0,1	0,0	0,0	-	-	5,0
SE	0,4	0,5	1,9	4,6	3,1	1,7	0,6	0,3	-	-	-	-	13,1
S	0,3	0,7	0,8	1,7	0,9	0,4	0,1	-	-	-	-	-	4,8
SW	0,6	1,1	1,6	2,4	1,5	0,8	0,1	-	-	-	-	-	8,0
W	1,2	1,1	1,8	1,8	1,0	0,7	0,3	-	0,0	-	-	-	7,9
NW	1,4	1,7	1,3	1,4	1,3	1,1	0,5	0,2	-	-	-	-	9,0
Calm	3,2												3,2
Sum	9,7	9,7	13,8	25,2	18,9	14,6	6,1	1,8	0,2	0,1	-	-	100,0

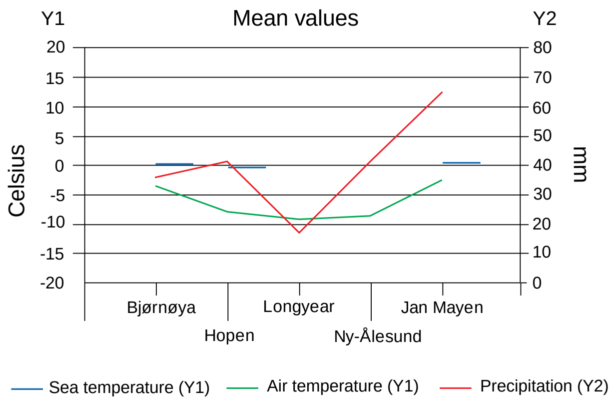


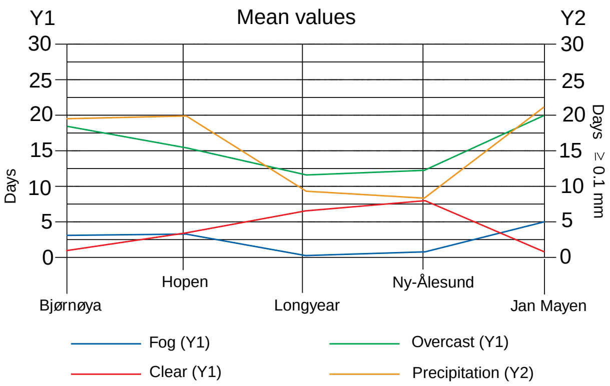
3: Calm (%)

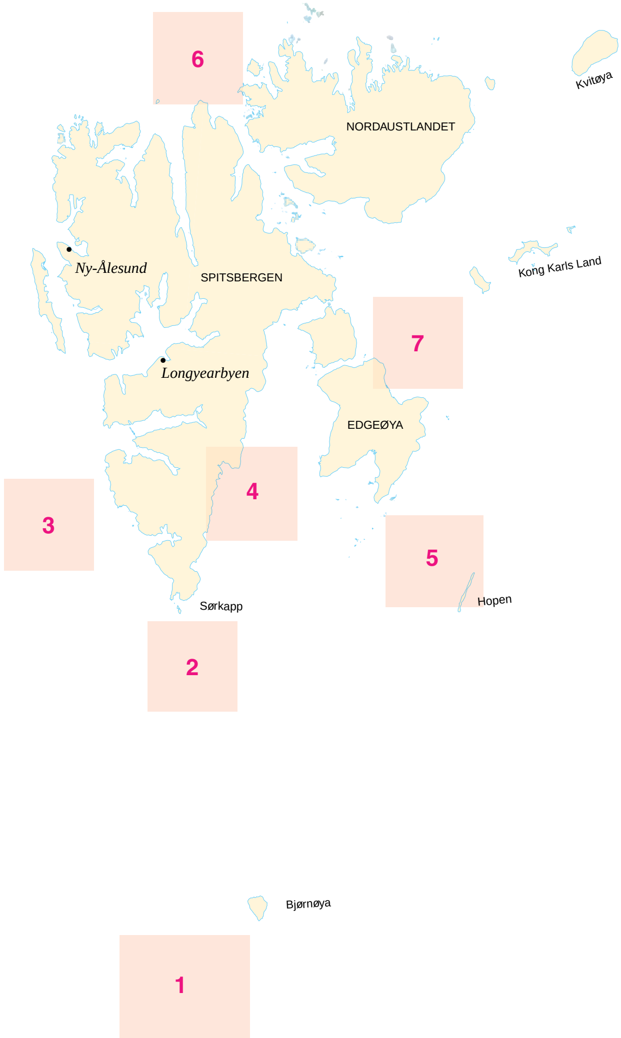
Shows wind from

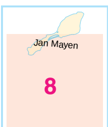
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m										
	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	1	19	29	23	14	9	4	1	0	0	0
2. Sørkapp	19	20	23	18	9	6	3	1	0	0	-
3. Bellsundbanken	14	25	26	18	9	5	2	1	0	-	-
4. Storfjorden	57	14	13	9	4	2	1	0	0	0	0
5. Hopen NW	59	10	13	9	5	3	1	1	0	-	0
6. Barentsøya E	88	5	3	2	1	0	0	0	-	-	-
7. Hinlopenrenna	71	16	10	3	1	0	0	0	-	-	-
8. Jan Mayen S	2	20	28	22	16	6	3	1	1	0	0

Percentage of observations	Bjørnøya	Hopen	Longyearbyen	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	66	61	88	77	56	1971–00
Moderate visibility: 4–10 km	17	17	8	17	20	
Poor visibility: 1–4 km	13	16	4	14	15	
Fog, etc: < 1 km	4	5	0	6	8	
Mean cloud cover in %	82	73	63	61	84	



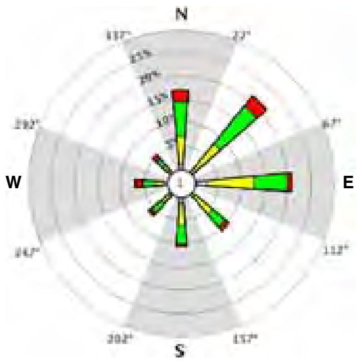






BJØRNØYA (1971–2000)

4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,1	0,3	0,5	1,4	0,8	0,9	0,8	0,3	0,0	-	-	-	5,1
NE	0,2	0,8	1,9	5,3	3,7	2,8	1,7	0,6	0,0	0,0	-	-	17,1
E	0,1	0,9	2,6	5,8	5,1	4,5	1,7	0,7	0,1	0,0	-	-	21,4
SE	0,2	2,4	4,7	6,7	3,4	2,6	0,8	0,1	-	-	-	-	21,0
S	0,3	0,7	2,2	3,2	1,9	1,3	0,6	0,3	-	-	-	-	10,4
SW	0,3	0,9	2,0	3,7	1,7	1,4	0,6	0,1	-	0,0	-	-	10,8
W	0,1	0,5	0,8	1,6	1,4	1,0	0,6	0,2	0,0	0,1	-	-	6,3
NW	0,1	0,3	0,7	1,8	1,3	1,3	1,0	0,5	0,2	0,0	-	-	7,1
Calm	0,8												0,8
Sum	2,2	6,8	15,4	29,5	19,3	15,8	7,8	2,8	0,3	0,1	-	-	100,0



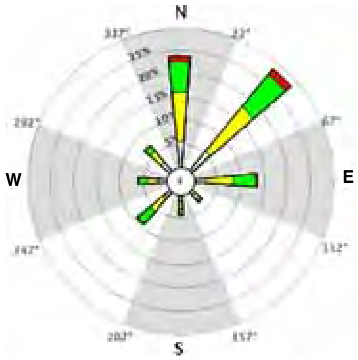
Wind forces:

- ■ >8
- 7-8
- 5-6
- 3-4
- □ 1-2

①: Calm (%)

HOPEN (1971–2000)

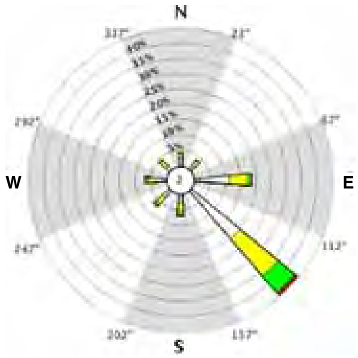
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,8	1,4	2,0	1,4	1,1	0,4	0,0	0,0	-	-	-	-	7,1
NE	2,2	3,4	5,1	6,5	3,4	2,2	1,0	0,1	0,1	-	-	-	24,0
E	1,9	3,4	5,9	7,8	5,2	2,8	1,0	0,2	-	-	-	-	28,4
SE	1,1	1,4	3,0	3,7	2,8	1,4	0,2	0,1	-	-	-	-	13,6
S	0,5	0,6	0,7	0,8	0,3	0,1	0,1	-	-	-	-	-	3,0
SW	0,5	0,8	0,9	1,1	0,5	0,3	0,1	0,0	-	-	-	-	4,3
W	0,6	0,8	1,6	3,1	1,9	1,0	0,2	-	-	0,0	-	-	9,3
NW	0,7	0,9	1,4	1,5	0,8	0,5	0,2	0,0	0,1	-	-	-	6,0
Calm	4,3												4,3
Sum	12,6	12,7	20,6	25,9	16,0	8,7	2,8	0,4	0,2	0,0	-	-	100,0



④: Calm (%)

LONGYEARBYEN (1971–2000)

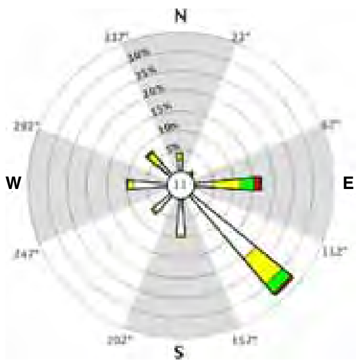
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,3	0,5	0,5	1,9	0,6	0,2	-	-	-	-	-	-	4,1
NE	0,6	0,5	1,4	1,4	0,5	0,1	-	-	-	-	-	-	4,4
E	0,5	0,6	0,7	0,9	0,8	0,2	0,0	-	-	-	-	-	3,8
SE	2,4	3,4	5,3	4,4	1,8	0,7	0,2	0,0	0,0	-	-	-	18,2
S	3,8	5,8	11,2	12,5	5,8	4,2	1,5	0,4	-	-	-	-	45,3
SW	1,5	0,7	1,1	2,1	1,2	0,6	0,4	0,0	-	-	-	-	7,6
W	0,7	0,9	1,4	2,1	1,3	0,7	0,3	0,0	-	-	-	-	7,3
NW	1,2	1,3	1,3	1,6	1,0	0,5	0,4	0,1	0,0	-	-	-	7,4
Calm	1,9												1,9
Sum	12,9	13,7	22,9	26,9	13,0	7,2	2,8	0,5	0,0	-	-	-	100,0



②: Calm (%)

NY-ÅLESUND (1971–2000)

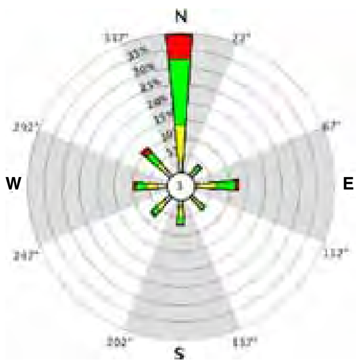
4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,5	0,9	2,2	2,5	1,1	0,3	0,1	-	-	-	-	-	7,5
NE	0,6	0,5	1,8	1,7	0,0	-	-	-	-	-	-	-	4,5
E	0,3	0,2	0,3	0,1	0,0	-	-	-	-	-	-	-	0,9
SE	1,3	1,8	1,9	4,7	3,1	1,9	1,5	0,5	0,1	0,0	0,0	-	16,8
S	5,2	8,0	8,2	7,0	2,7	1,3	0,7	0,4	0,0	-	-	-	33,7
SW	4,0	2,8	2,3	0,6	0,0	0,0	-	-	-	-	-	-	9,9
W	3,3	1,4	0,6	0,6	0,2	0,2	-	-	-	-	-	-	6,3
NW	3,9	2,9	1,9	1,3	0,4	0,1	-	-	-	-	-	-	10,4
Calm	10,0												10,0
Sum	29,1	18,5	19,2	18,5	7,5	3,8	2,3	0,9	0,1	0,0	0,0	-	100,0



⑪: Calm (%)

JAN MAYEN (1971–2000)

4 obs/day					Beaufort								%
Sekt.	≤1	2	3	4	5	6	7	8	9	10	11	12	sum
N	0,8	0,8	1,1	2,6	2,2	1,4	1,2	0,5	0,1	-	-	-	10,7
NE	0,9	1,9	3,3	9,0	10,0	8,2	4,2	1,6	0,2	0,1	-	-	39,5
E	0,3	0,6	0,3	0,8	1,0	0,4	0,3	0,1	0,1	0,0	-	-	4,0
SE	0,4	0,8	2,0	4,0	3,2	1,6	0,8	0,1	0,0	-	-	-	12,8
S	0,4	0,6	1,1	1,9	0,7	0,5	0,1	-	-	-	-	-	5,3
SW	0,7	1,2	1,7	1,7	1,2	0,7	0,1	0,0	-	-	-	-	7,3
W	1,0	1,1	1,5	1,9	0,8	0,6	0,4	0,1	-	-	-	-	7,5
NW	1,2	1,3	1,7	2,1	1,5	1,0	0,6	0,2	-	-	-	-	9,5
Calm	3,4												3,4
Sum	9,1	8,3	12,7	24,0	20,6	14,4	7,7	2,6	0,4	0,1	-	-	100,0

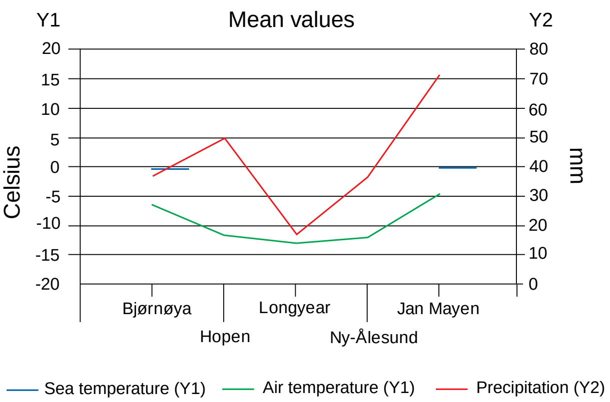


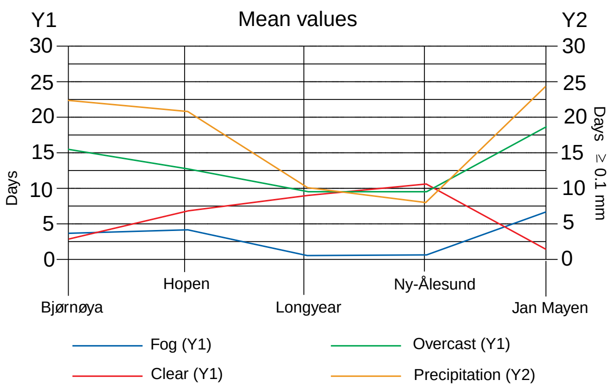
③: Calm (%)

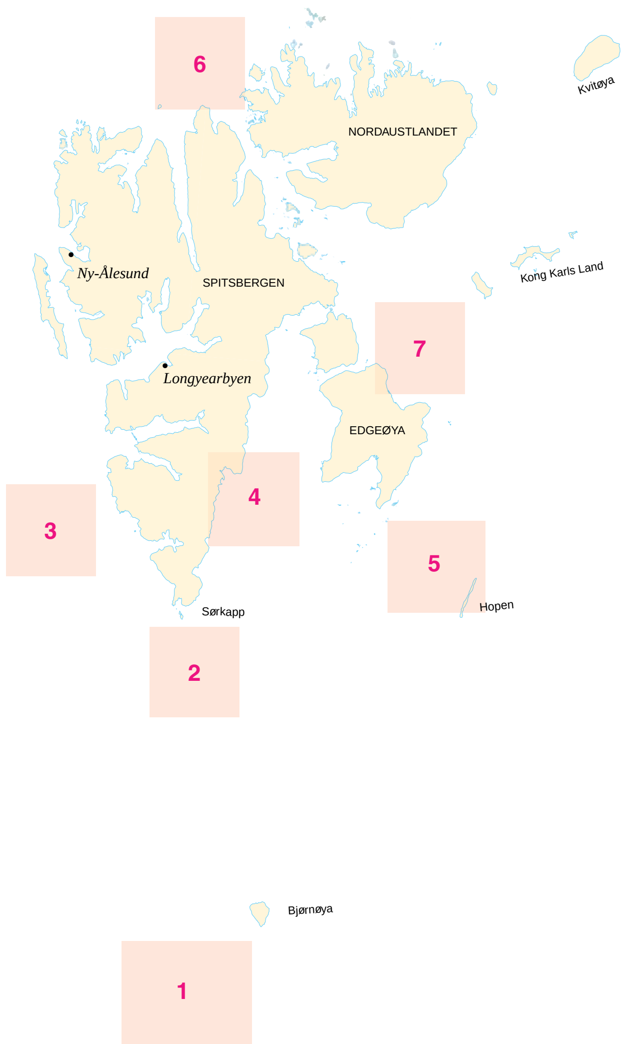
Shows wind from

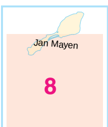
Show percentage occurrence of computed significant wave height for the open sea (1971–2000)											
Places where wave height has been computed:	Wave height in m										
	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	≥ 10
1. Bjørnøya SW	2	15	26	22	16	10	5	3	1	0	0
2. Sørkapp	46	14	14	10	7	5	3	1	0	0	-
3. Bellsundbanken	30	20	20	12	9	5	2	1	0	-	-
4. Storfjorden	87	4	3	2	2	1	0	0	-	-	-
5. Hopen NW	89	2	3	2	2	1	0	0	-	-	-
6. Barentsøya E	97	1	1	0	0	0	0	-	-	-	-
7. Hinlopenrenna	79	11	6	3	1	0	0	0	-	-	-
8. Jan Mayen S	7	15	27	23	13	9	4	2	1	0	0

Percentage of observations	Bjørnøya	Hopen	Longyearbyen	Ny-Ålesund	Jan Mayen	Period
Good visibility: > 10 km	67	66	87	81	52	1971–00
Moderate visibility: 4–10 km	15	14	9	14	19	
Poor visibility: 1–4 km	14	13	4	14	19	
Fog, etc: < 1 km	5	7	0	5	10	
Mean cloud cover in %	76	64	56	52	81	









Meteorologisk institutt
met.no

Light

Latitude	Midnight sun			Polar night		
	From	To	No of days	From	To	No of days
74°	3. mai	9. aug	99	10. nov	1. feb	84
75°	30. apr	12. aug	105	6. nov	5. feb	92
76°	27. apr	15. aug	111	3. nov	8. feb	98
77°	24. apr	18. aug	117	31. okt	11.feb	104
78°	21. apr	21. aug	123	28. okt	14. feb	110
79°	18. apr	24. aug	129	25. okt	17. feb	116
80°	15. apr	27. aug	135	22. okt	20. feb	122
81°	12. apr	30. aug	141	19. okt	23. feb	128

The table shows periods with the sun constantly above the horizon (the midnight sun), or constantly below the horizon (polar night) at Svalbard's latitude (Longyearbyen).

The light conditions in Svalbard are very special, as are those in the Polar Regions in general, and are rather different from those we are used to in lower latitudes. The further north we move from the polar circle, the longer the period when the sun stays above the horizon day and night in summer (midnight sun) and below the horizon in winter (polar night).

The above table shows when the «perpetual day» and «perpetual night» begins and ends, for the latitudes covered by Longyearbyen. These periods increase by around six weeks from 74° to 81° N, corresponding to six days for each degree of latitude travelled northwards which also means about 2.4 hours for every nautical mile.

The midnight sun lasts approximately two weeks longer than the polar night. This is due to the fact that the solar rays curve slightly when they pass through the atmosphere. We therefore see the sun even when in reality it is slightly below the horizon.

Several conditions contribute to the fact that the polar night is for long periods not as dark as we are led to believe. As long as the sun is not too far below the horizon its rays will still strike the higher layers of the atmosphere and become partly diffused and reflected downwards to the earth's surface. This is the reason for the phenomenon known as twilight. It is usual to divide the periods with twilight into three intervals according to the position of the sun:

1. civil twilight, when the sun is between 0° and 6° below the horizon,
2. nautical twilight between 6° and 12°, and
3. astronomical twilight between 12° and 18°.

In the transition from civil to nautical twilight (the sun 6° below the horizon) it should, by traditional definition, still be possible for a person with «normal sight» to read a newspaper under a cloudless sky. When the sun is more than 18° below the horizon, practically all traces of daylight will be gone.

In polar regions twilight is of particular importance, not only because every trace of daylight is of great use during the polar night, but also because the duration of twilight is so much greater than at lower latitudes. This is a consequence of the fact that the sun's diurnal path forms a lower angle with the horizon at high latitudes so that the sun moves in the «twilight zone» for a longer period.

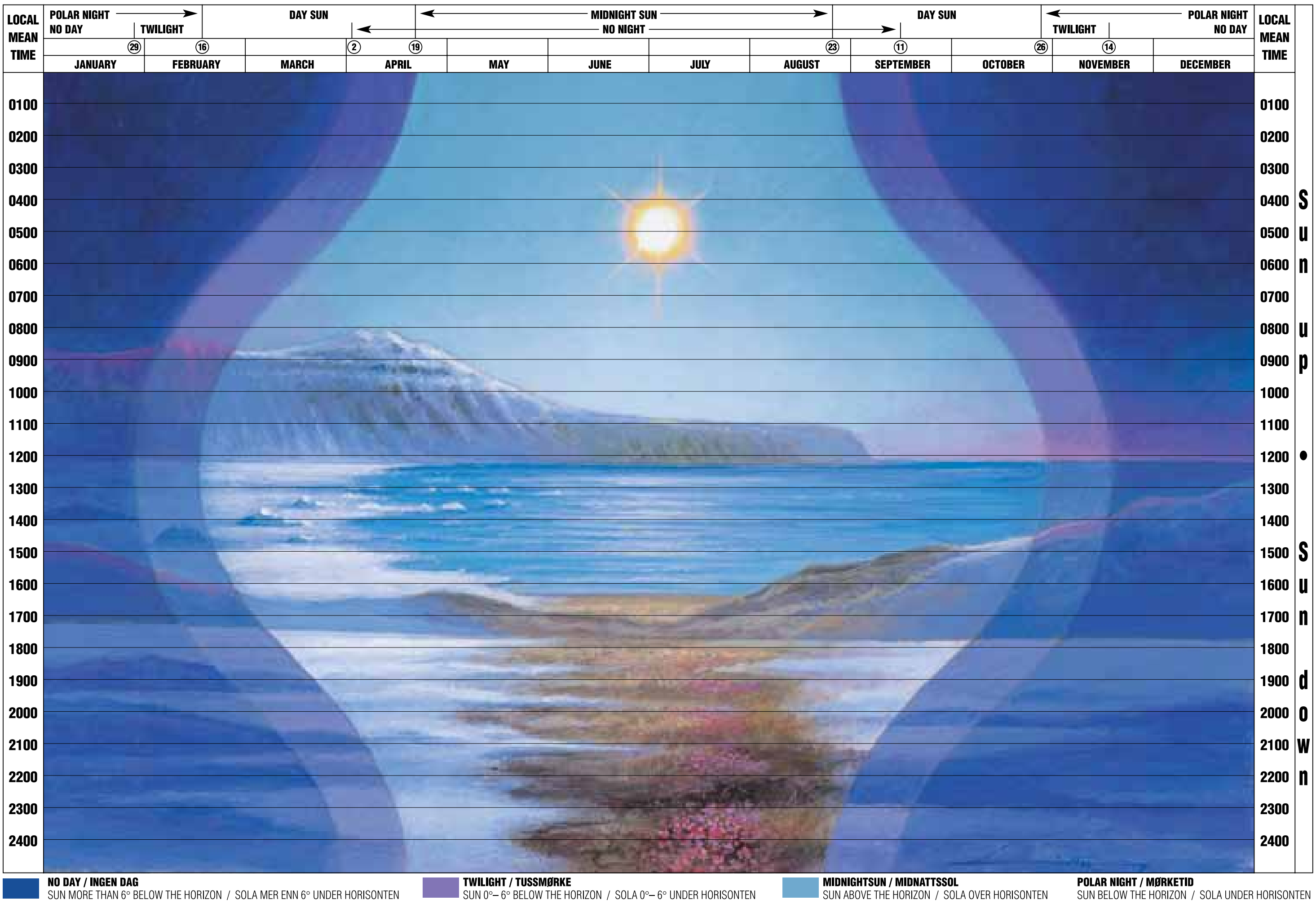
However, the moon is the great «illuminator» during the polar night. In the period from one new moon to the next, i.e. about 29.5 days, the moon moves through almost the same path in the sky as the sun does during the course of a year. This means that the full moon in midwinter stands approximately the same height at midnight as the midday sun in midsummer. During the middle of the polar winter, therefore, the moon stays continuously above the horizon for several days around full moon, in the same way as the sun is up for several weeks during the period around the summer solstice. Correspondingly, the moon will remain below the horizon for several days around new moon, which in itself is no great loss as its power as a light source is then greatly diminished.

When the moon of the polar night is full, or almost full, it will thus make a heroic effort to imitate the course of the midnight sun. At times therefore the moon is a tremendously important, although only a modest replacement for the sun.

The light from the stars and other more imprecise sources (night-glow etc) is very weak. Although not comparable to a full moon, well developed northern lights can be of particular significanc . It is incredible, however, what small amounts of light the human eye is able to utilize, especially when aided by a reflecting snow surface. In this respect it can be said that the light under a clear sky with the sun 30° above the horizon is about 300,000 times stronger than that from an equally high full moon, and an estimated 30 million times stronger than when both moon and northern lights are absent.

We have described the light conditions on occasions with clear weather. A truly black polar night occurs when there is a new moon in addition to heavy cloud cover, preventing even the little remaining light from the sky reaching the earth's surface.

SUNDIAGRAM FOR LONGYEARBYEN



Source: Longyearbyen Lokalstyre

The sun diagram for the period when the sun is constantly above the horizon (the midnight sun) or below the horizon (the polar night) including the twilight period.

Marking of waterways. Aids to navigation

The responsibility for aids to navigation for Svalbard (lights and marks service) was assumed by NCA when the then Harbours and Waters legislation was applied to Svalbard in 2008.

The NCA, however, commission the Norwegian Polar Institute to carry out the main tasks of the lights and marks service on Svalbard as previously. This makes it possible for a combined deployment and maintenance of the lights and sea marks with the Institutes normal summer expeditions. Svalbard presents special logistical challenges of great distances, extreme climate, sea ice and general lack of infrastructure. In addition, private navigation facilities have been established (Barentsburg, Pyramiden and Hornsund).

The cost of establishing aids to navigation on Svalbard is generally high. At the same time the nature of the waterways, with many open and wide fjords, the need for aids to navigation is usually less. In addition, their establishment should not affect the environment of Svalbard. It must follow, therefore, that a precise assessment is required for the establishment of new aids to navigation. The marking of the coastal waters and leads of Svalbard follows the same practice as for Norway's mainland, and assumes the guidelines issued by the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA).

All aids to navigation are shown on the charts. New installations are announced in «Notices to Mariners» (EFS). Temporary (T) and preliminary (P) notices are also published in EFS, for example, installations that are temporarily established or removed, etc.

Fixed and floating marks

A number of cairns and beacons are placed along Spitsbergen's west and north sides as aids to navigation in these waters. The beacons are painted orange or red timber or metal tripods with board-slatted sides.

Floating marks can be of little use as the waters around Svalbard are ice covered for large parts of the year. Even during the summer period they are not too reliable as they can be pushed out of position by pack ice. However, during the season from the middle of June to around November, light buoys are established in Akselsundet (between Bellsund and Van Mijenfjorden) and spar buoys are established at Revneset (Adventfjorden).

BEACON Photo: NCA

Lights and lanterns /Aero Lights

The installations of aids to navigation with light signals include sector lights, leading lines and lanterns. A number of the lanterns were originally gas powered and have been converted to electricity. They are now normally powered by primary batteries as energy source.

In addition, a number of aero lights (Q Fl) have been established to provide light signals as an aid to the helicopter air traffic. Most of them are located so that they can also provide navigational guidance for mariners. The aero lights normally stand on a small hut and are supported by guy stays.

NEW AND OLD LATICE BEACON Photo: NCA

FUGLEHUKEN LIGHT Photo: NHS

GROTTEN AEROLIGHT Photo: NHS

RADAR REFLECTOR Photo: NCA

Racons (Radar beacons)/Radar reflectors

Racons are established in some places as aids for radar navigation, including land fall or where there may be poor natural radar targets.

Racons are scheduled to be installed on the **Sørkapp** and **Sarstangen** in 2012.

Radar reflectors are located in **Bellsund**, **Akseløya**, **Daudmannsodden** and **Kvadehuken**.

Conservation

From 1945 and earlier, permanent cultural relics are protected under Svalbard's environmental legislation. Navigational installations are also automatically included. Cultural relics, post 1945 of special cultural historic value may also be protected by decree.

An automatically protected cultural relic has a security zone of 100 metres in all directions surrounding the visible or known outer edge of the relic, providing that the District Governor has not set other limits.

Svalbard Communications

Svalbard Radio transmits from the tower of Longyearbyen airport. The transmitter in Longyearbyen also has two remote controlled VHF transmitters/receivers that provide cover for most of the west coast and parts of Kongsfjorden (see plan). In addition to the given working channels, each station also has channel 16. Svalbard Radio maintains a twenty-four hour listening watch on channel 16. In addition to VHF, the stations have HF transmitters and can therefore be used to arrange telephony for HF equipped vessels in the northern areas. The radio stations can be contacted on telephone 134 for booking a call. On Bjørnøya, VHF channel 16 and 66 can be used for traffic arrangements. Bjørnøya Radio and Jan Mayen Radio are remotely controlled from Bodø Radio and cover the area around these islands for radio telephone calls and weather reports on MF and VHF.

In 2006 Bodø Radio assumed control of all maritime radio installations on Svalbard, including Svalbard Radio and Isfjord Radio, the emphasis being on maritime communications. Land bases shall use the maritime frequencies only in emergency situations. Vessels that have a reporting requirement within Svalbard's territorial waters shall report to Bodø VTS on VHF channel 16 or on other channels operated by Bodø or Vardø Radio.

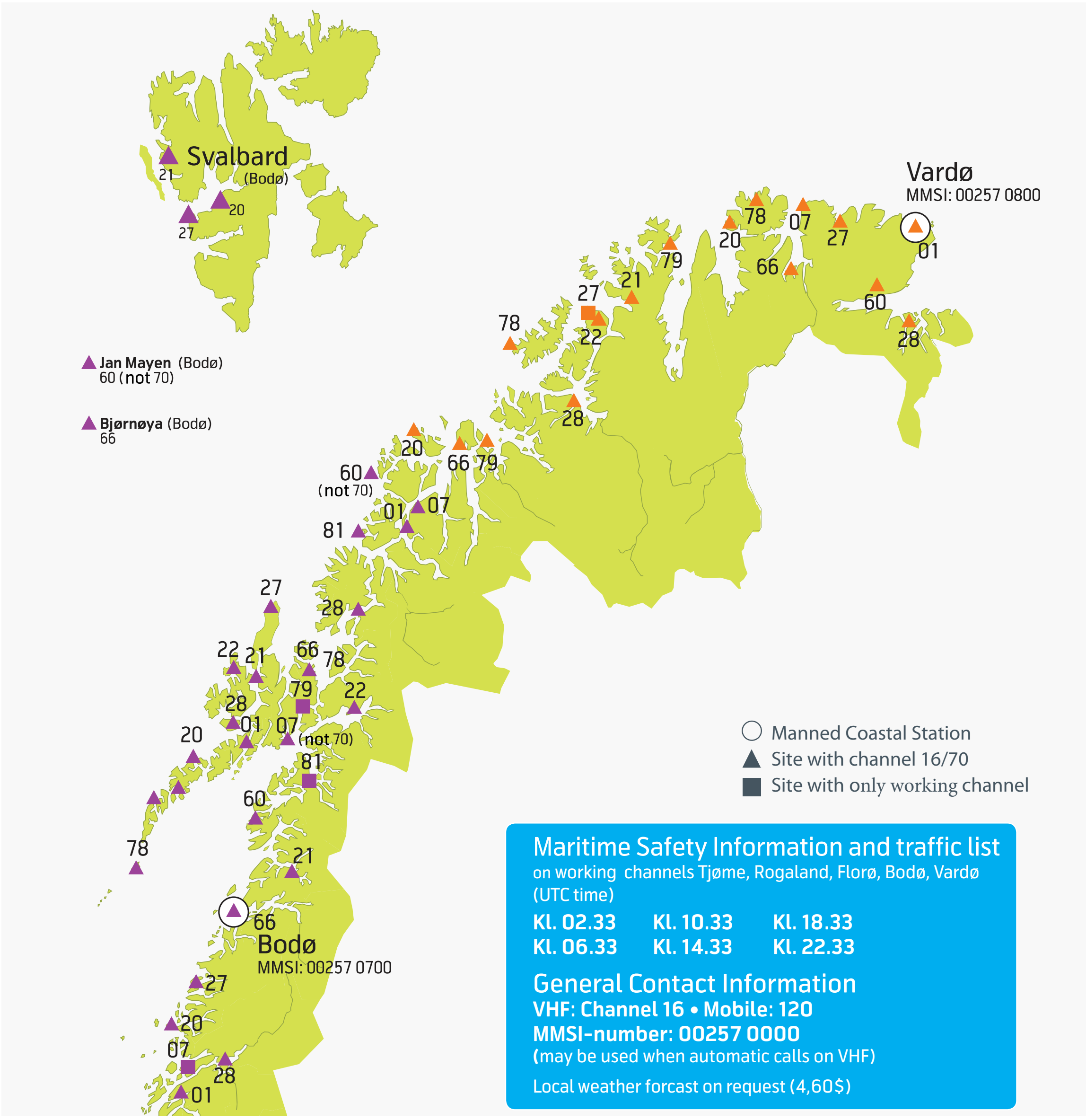
Longyearbyen is connected to the other populated places on Spitsbergen with the help of double 30–155 Mbits/s radio line transfer. The third generation's mobile communications UMTS was also installed on Longyearbyen in 2003. On 13th January 2006 Telenor introduced mobile broadband – the so-called HSDPA. It has full GSM coverage for mobile phones in Longyearbyen, Adventfjorden and large parts of Isfjorden. In addition, Telenor extended GSM coverage to Reindalen between Longyearbyen and Sveagruva in 2007, assigned by the Store Norske Spitsbergen Kulkompani. Svalbard is not subject to the Ekomlov. However, NetCom has an agreement with Telenor on the use of central and base stations, so that NetCom has almost as good mobile coverage on Svalbard as Telenor.

Radio telephony

Maritime VHF is an international system for mariners' on the VHF frequency band via a coast radio station (see VHF channel plan). In addition the Polish station in Hornsund has a VHF station but this is not connected to the coast radio.

Maritime MF is an international system for middle distance radio connection for shipping on the MF frequency band via a coast radio station.

Maritime HF is an international system for long distance radio connection for shipping on the HF frequency band via a coast radio station.



VHF–CHANNEL PLAN for Northern Norway and Svalbard (2016) Soure: Telenor/www.maritimradio.no

2016

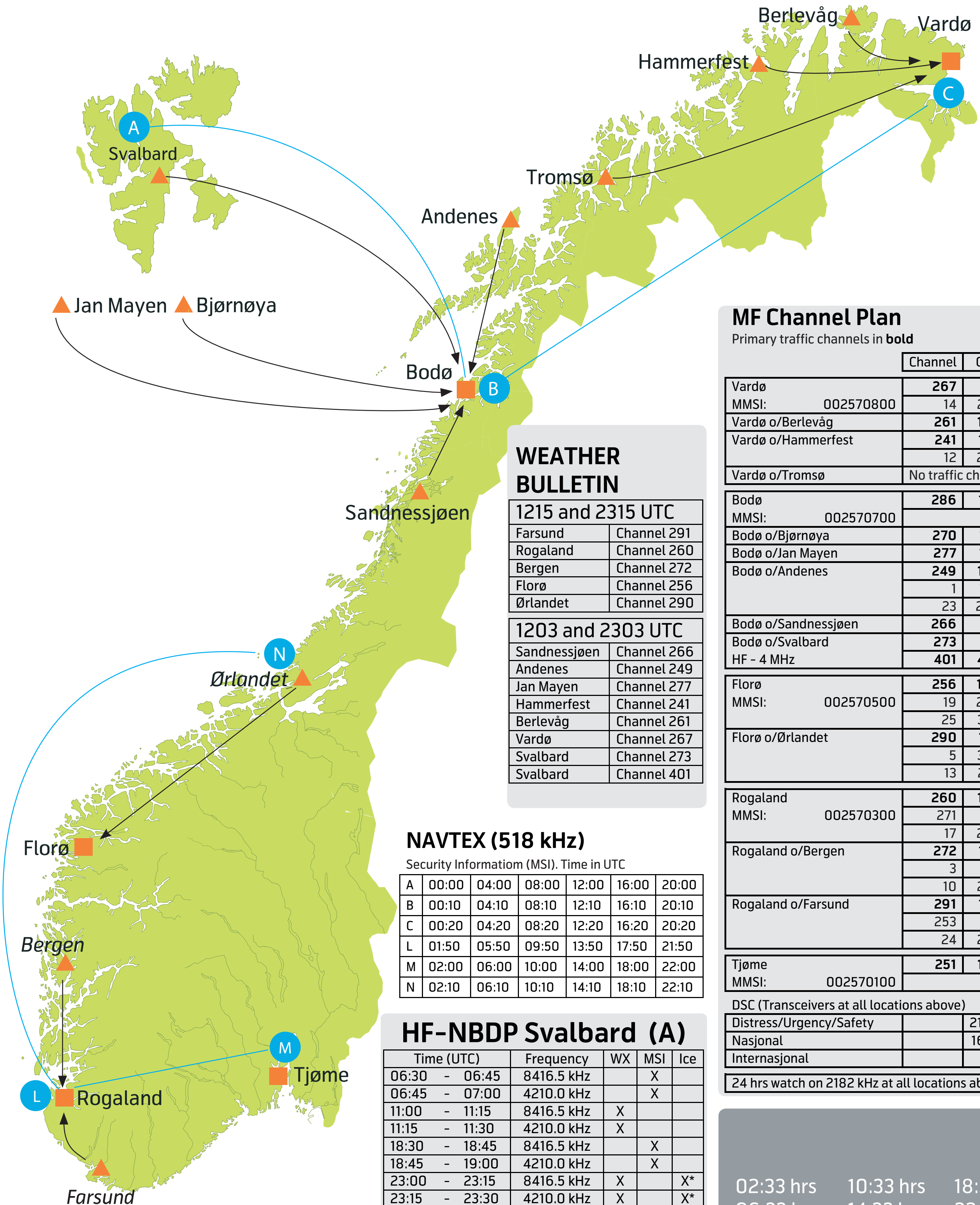
MF channel- and Navtex plan for Norway

telenor | kystradio

safety at sea

www.kystradio.no

- Manned station
- Remote controlled station
- Navtex transmitter
- Navtex transmitter controlled by



WEATHER BULLETIN

1215 and 2315 UTC	
Farsund	Channel 291
Rogaland	Channel 260
Bergen	Channel 272
Florø	Channel 256
Ørlandet	Channel 290

1203 and 2303 UTC	
Sandnessjøen	Channel 266
Andenes	Channel 249
Jan Mayen	Channel 277
Hammerfest	Channel 241
Berlevåg	Channel 261
Vardø	Channel 267
Svalbard	Channel 273
Svalbard	Channel 401

NAVTEX (518 kHz)

Security Informationm (MSI). Time in UTC

A	00:00	04:00	08:00	12:00	16:00	20:00
B	00:10	04:10	08:10	12:10	16:10	20:10
C	00:20	04:20	08:20	12:20	16:20	20:20
L	01:50	05:50	09:50	13:50	17:50	21:50
M	02:00	06:00	10:00	14:00	18:00	22:00
N	02:10	06:10	10:10	14:10	18:10	22:10

HF-NBDP Svalbard (A)

Time (UTC)	Frequency	WX	MSI	Ice
06:30 - 06:45	8416.5 kHz		X	
06:45 - 07:00	4210.0 kHz		X	
11:00 - 11:15	8416.5 kHz	X		
11:15 - 11:30	4210.0 kHz	X		
18:30 - 18:45	8416.5 kHz		X	
18:45 - 19:00	4210.0 kHz		X	
23:00 - 23:15	8416.5 kHz	X		X*
23:15 - 23:30	4210.0 kHz	X		X*

* Tuesdays only

MF Channel Plan

Primary traffic channels in **bold**

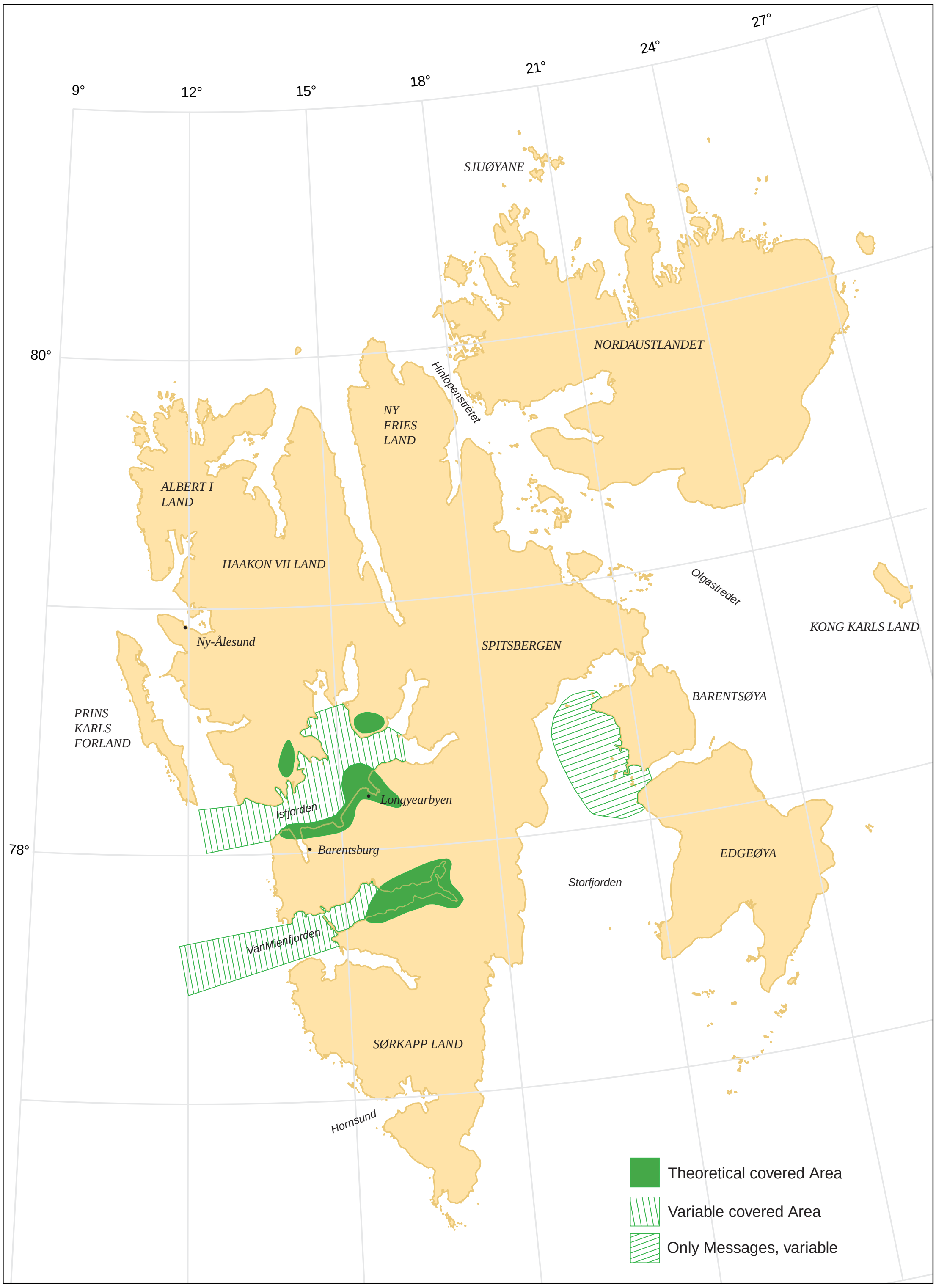
		Channel	Coast	Ship
Vardø		**267**	**1713**	**2138**
MMSI:	002570800	14	2642	3203
Vardø o/Berlevåg		**261**	**1695**	**2120**
Vardø o/Hammerfest		**241**	**1635**	**2060**
		12	2695	3168
Vardø o/Tromsø		No traffic channel		
Bodø		**286**	**1770**	**2114**
MMSI:	002570700			
Bodø o/Bjørnøya		**270**	**1722**	**2066**
Bodø o/Jan Mayen		**277**	**1743**	**2087**
Bodø o/Andenes		**249**	**1659**	**2084**
		1	1803	2406
		23	2660	3274
Bodø o/Sandnessjøen		**266**	**1710**	**2135**
Bodø o/Svalbard		**273**	**1731**	**2075**
HF - 4 MHz		**401**	**4357**	**4065**
Florø		**256**	**1680**	**2105**
MMSI:	002570500	19	2649	3217
		25	3645	2466
Florø o/Ørlandet		**290**	**1782**	**2126**
		5	3628	2463
		13	2635	3200
Rogaland		**260**	**1692**	**2117**
MMSI:	002570300	271	1725	2069
		17	2656	3210
Rogaland o/Bergen		**272**	**1728**	**2072**
		3	3631	2449
		10	2667	3277
Rogaland o/Farsund		**291**	**1785**	**2129**
		253	1671	2096
		24	2676	3214
Tjøme		**251**	**1665**	**2090**
MMSI:	002570100			

DSC (Transceivers at all locations above)

Distress/Urgency/Safety	2187.5	2188
Nasjonal	1621.5	2157
Internasjonal	2177	2190

24 hrs watch on 2182 kHz at all locations above.

02:33 hrs	10:33 hrs	18:33 hrs
06:33 hrs	14:33 hrs	22:33 hrs



The plan shows the coverage area of mobile broadband by Telenor and NetCom. The hatched areas were noted in the M/S «Hydrograf» survey. There are other areas where connection can be obtained, including areas in Forelandsundet, but they are highly variable and uncertain.

Telephone/Telefax

There is a normal telephone/fax service on Svalbard in Longyearbyen, Ny-Ålesund, Sveagruva and Barentsburg.

GSM

Telenor and NetCom operate the GSM network on Svalbard. It covers the Isfjord area (Longyearbyen) and the inner parts of Van Mijenfjorden (Svea). Additionally, there is the Russian GSM network which covers the area around Barentsburg.

Iridium

Iridium is a satellite communications system that uses 66 satellites in low orbit. Unlike Inmarsat, Iridium has full coverage of the Arctic areas which makes it especially suitable for Svalbard. The telephones are relatively small and easily handled, with a price of calls about 8–10 NOK per minute (2012). The system can also be used for data transfer (e.g. e-mail) but transfer speed is slow (2.4–4.8 kbit/sec).

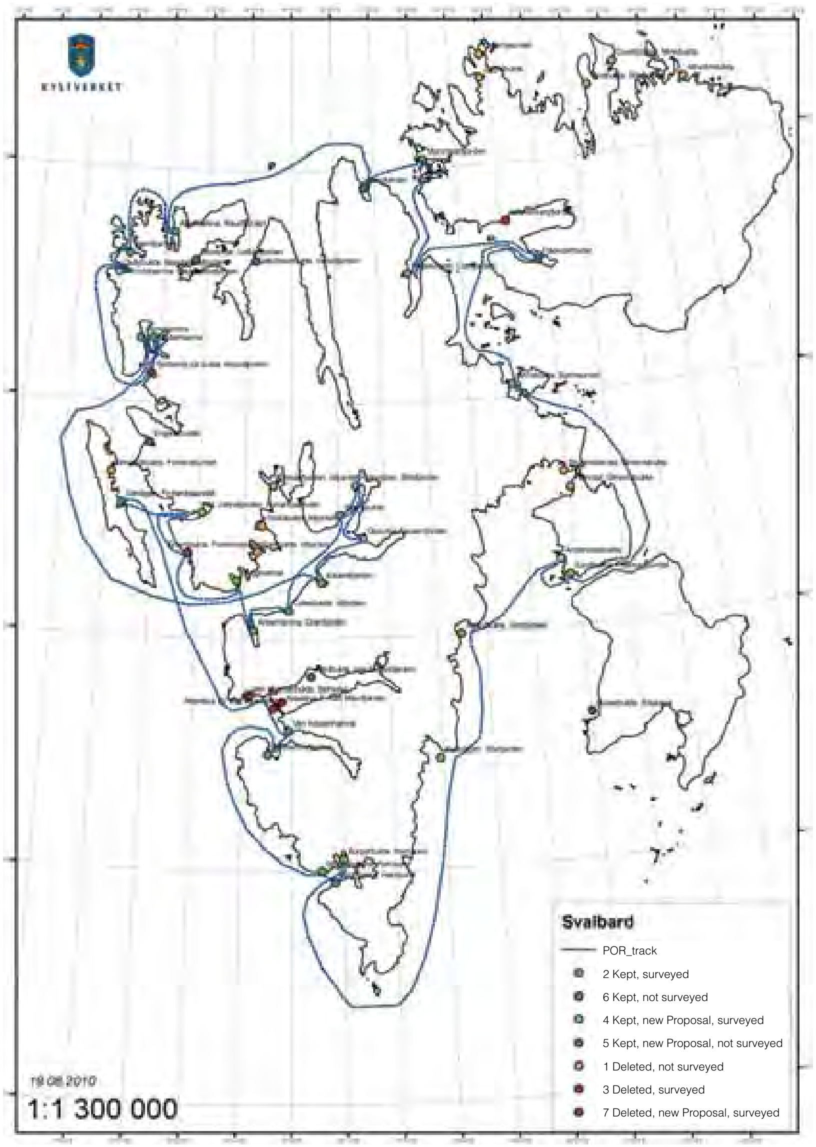
The communication service around Svalbard, August 2010

From «The expedition report – inspection of Places of Refuge localities on Svalbard 9–16th August 2010 (Marsafe North Project MARINTEK-SINTEF)»

The communications services have been tested at almost every refuge harbour that has been inspected, 35 localities (see list of places of refuge in the section at the beginning of the book).

The systems tested were: VHF, MF, HF, GSM (mobile phones and ships' GSM) VSAT, Inmarsat C and Iridium OpenPort. Available communications equipment on KV «Svalbard» was used, with the exception of mobile phones and Iridium OpenPort that were taken along. The different systems were tested by the following methods at the inspected places of refuge:

- VHF: calls up Bodø Radio on channels 20, 21 or 27
- MF: calls up Bodø Radio on channel 273, calls up Vardø Radio on channels 241, 26 or 267.
- HF: calls up Bodø Radio on channel 401
- GSM-3G: checks coverage indicator of mobile phone and ships GSM line
- Inmarsat C: checks signal noise content on Inmarsat terminal.
- VSAT: checks ships VSAT telephone line, checks on access to the internet. In addition the digital signal noise content (Eb-NO)log over a longer period on the east side of Spitsbergen
- Iridium OpenPort: access to the internet was checked together with a ping test carried out over a period. In one ping test a number of bytes were sent to a known IP address.



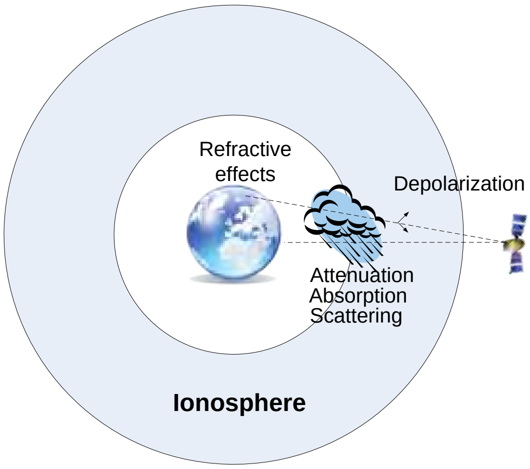
Plan showing the results and sailing route.

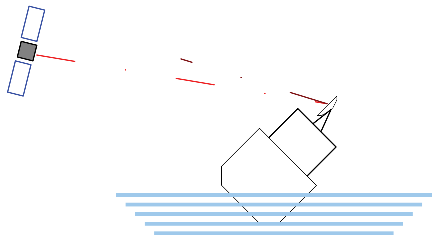
Communications via the geo-stations satellite systems around Svalbard

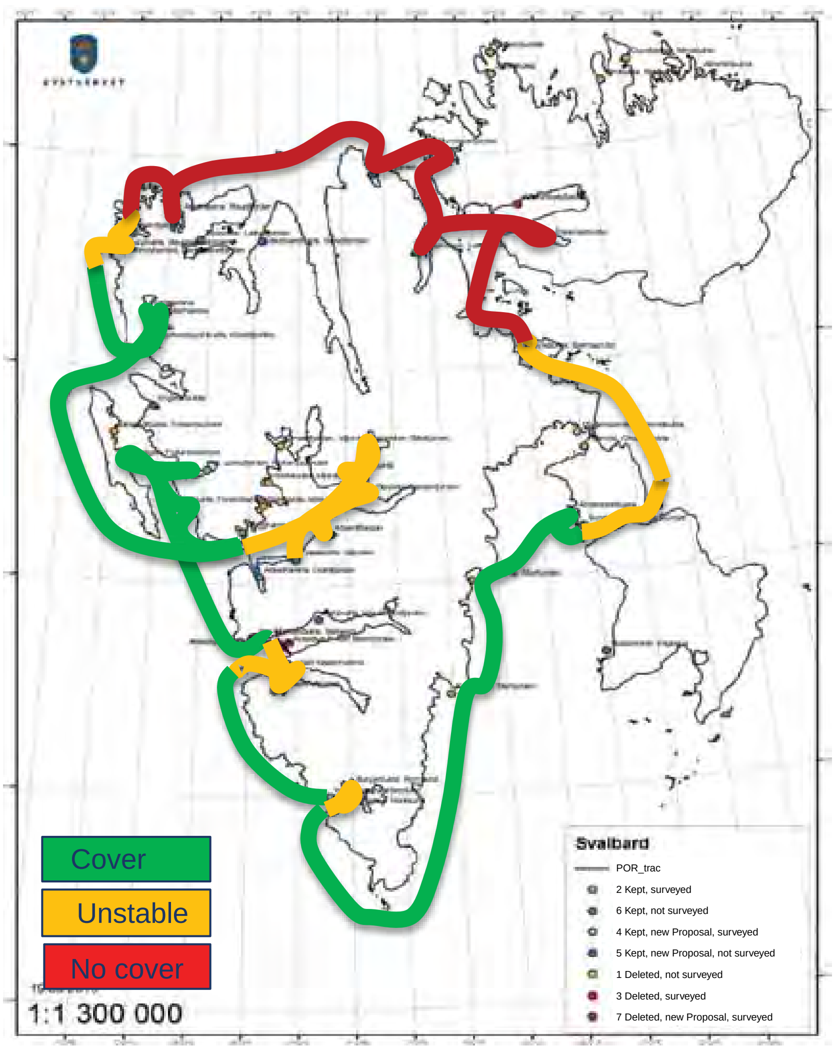
The satellite systems based on the geo-stations satellites (e.g. VSAT and Inmarsat) have theoretic coverage up to 81.3°N.

Actual coverage is dependent on:

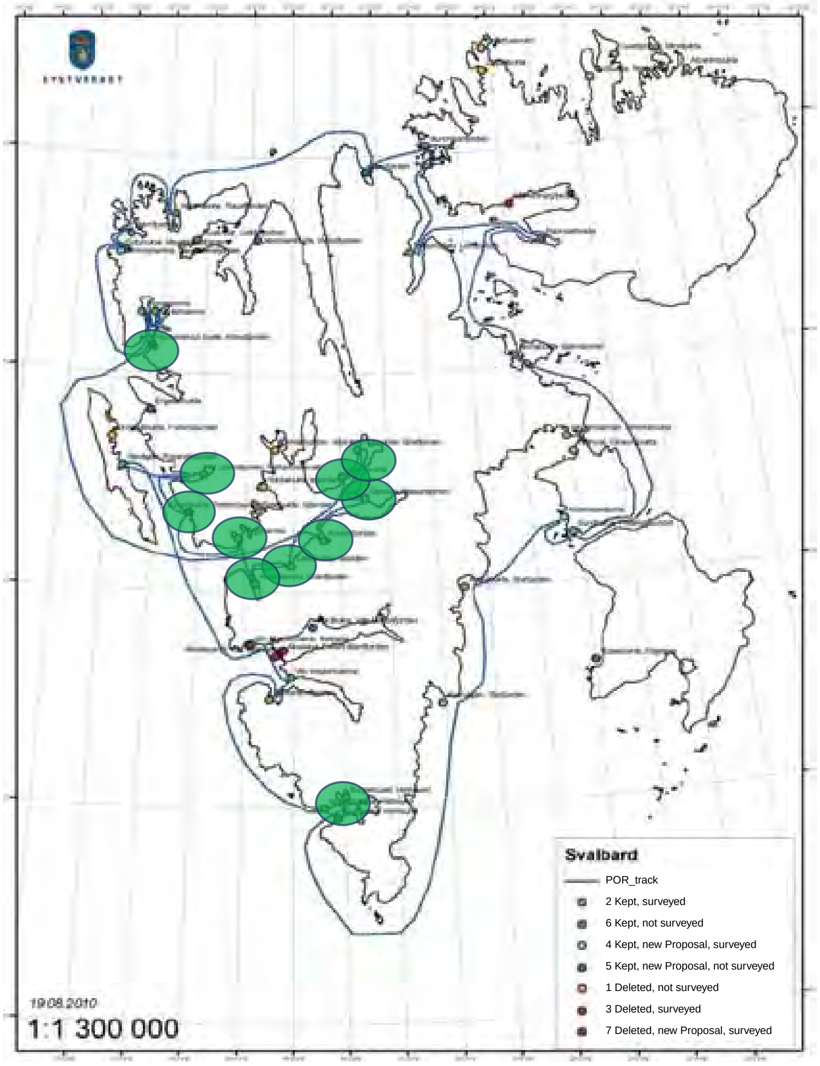
- Weather conditions
- Sea and wave state (motion of the ship)
- Atmospheric conditions, (e.g. sun storms)
- Topography (mountains, building, boats, etc.)
- Antenna type (directional or 360°)
- Frequency area
- Signal effect from satellite
- Satellites position
- Multi interference. Reflections f om sea and land, etc.
- Actual coverage will typically be:
- Coverage, but unstable performance 70°and 75°N
- Poor or no coverage north of 75°N







The plan shows the results of the surveys of the VSAT system 9–16th August 2010. Inmarsat C was also surveyed. Some places where VSAT was unstable (yellow) as is Inmarsat coverage due to other frequencies and antenna.



VHF coverage

MF channel 273 (Bodø) had coverage at all refuge harbours.

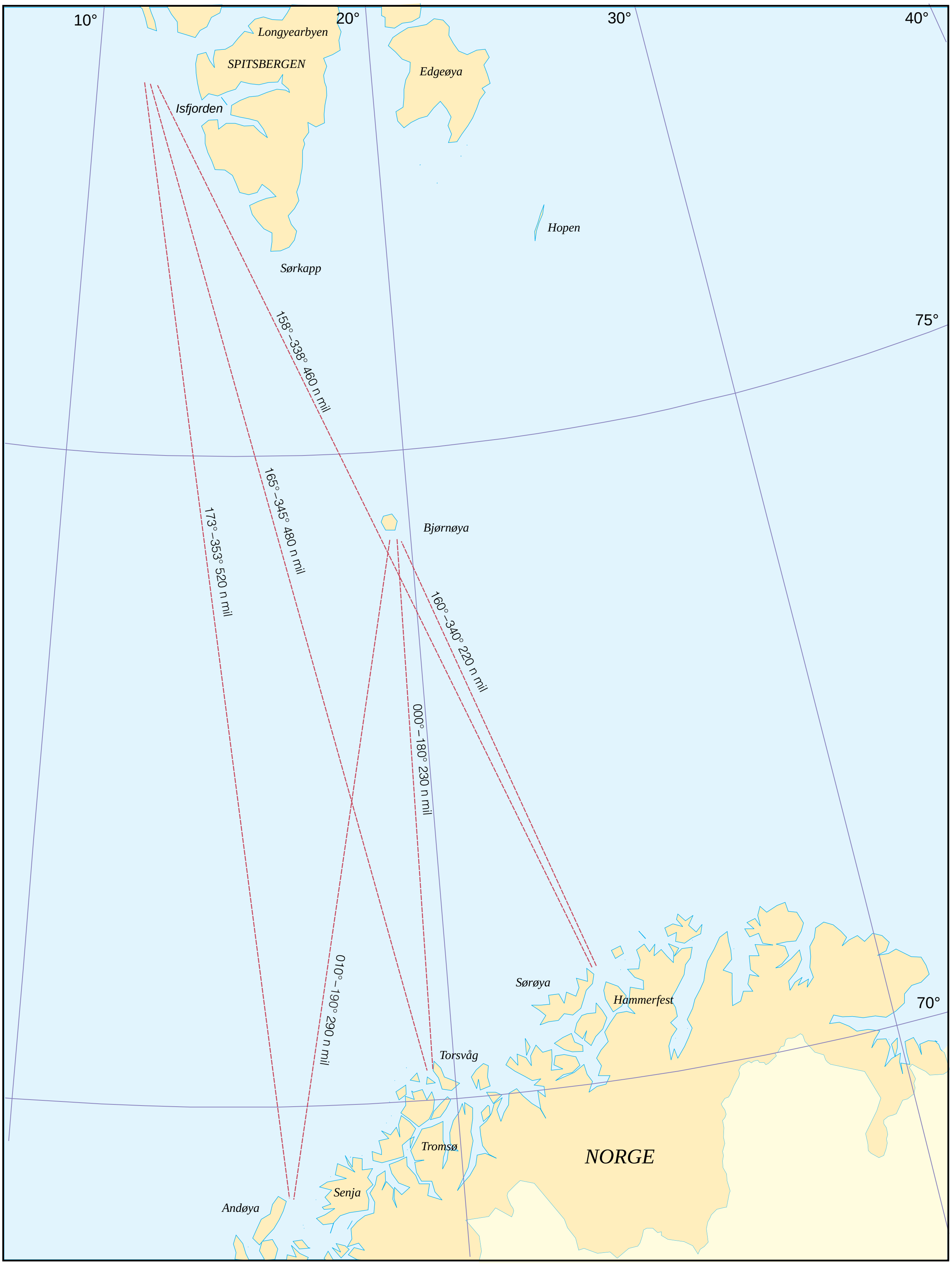
HF channel 401 (Bodø) had coverage at all refuge harbours but the radio line in some cases was a little weak:

- Raudfjorden/Alicehavna
- Sorgfjorden/Heklehavna
- Lomfjorden/Faksevåg
- Kvalvågen
- Horsund/Burgerhana/Gåshamna
- Van Keulenfjorden/Van Mijenfjorden
- Trygghamna

Additional comments on communications in the north

Iridium is the only satellite system that provides global coverage but users should be very aware that the system is unstable. In practice it means that signals can be missed and it can take several minutes before contact can be re-established.

Iridium also has a digital service (Iridium OpenPort) but has very limited range capacity (max 128kbps) and unstable performance. The Coastguard recommends that all those sailing in the area are equipped with AIS. This makes it easier to fin boats that may have problems.


10°
20°
30°
40°
75°
70°
Longyearbyen
SPITSBERGEN
Isfjorden
Edgeøya
Hopen
Sørkapp
158°–338° 460 n mil
165°–345° 480 n mil
173°–353° 520 n mil
Bjørnøya
160°–340° 220 n mil
000°–180° 230 n mil
010°–190° 290 n mil
Sørøya
Hammerfest
Torsvåg
Tromsø
NORGE
Senja
Andøya

The passage from North Norway to Svalbard

(Chart nos. 300, 303, 514, 552)

Passage from North Norway to Spitsbergen

The crossing between North Norway and Svalbard is usually from the mainland at Andenes and Fugløykalven. From Andenes the course is 353°, passing about 70 nautical miles W of Bjørnøya, about 45 nautical miles west of Sørkapp and then to a point about 11 nautical miles south of Salpynten (Prins Karls Forland) off Isfjorden. The distance of this voyage is 520 nautical miles.

From Fugløykalven to the same point off Isfjorden the bearing is 345° and the distance 479 nautical miles. This course will pass about 34 nautical miles west of Bjørnøya and about 30 nautical miles west of Sørkapp.

ICE AND CURRENT CONDITIONS ON PASSAGE

Early in the summer, pack ice can be encountered or ice sky observed up as far as Bjørnøya, when course is held westwards to go clear of the ice. As the ice often forms long points between wide and deep bays, navigators should not be too quick to steer eastwards again. In easterly winds it may require sailing up to 70 nautical miles off the west coast of Spitsbergen on because of ice. Normally ice will stop or slacken north of Sentinellefla et, and vessels making for Kongsfjorden can be clear of ice off Prins Karls Forland.

Along the west coast of Spitsbergen, a north-fl wing current of 1–2 knots can be expected. This stream will also drive ice into the fjords, especially on the south side and out again on the north side (the Coriolis Effect) where in calm wind conditions it will be more spread. In such weather broken ice with large open channels on the northern and southern sides of the fjords can be expected. The current emerging from Isfjorden will, when the ice masses are not too great, have a tendency to stop the north-fl wing ice drift near Sentinellefla et.

In all cases the circumstances should be carefully considered before entering ice as current, and especially wind, can quickly change the situation with closer ice and compression of channels.

See additional information on ice, currents and wind in Chapter I.

Passage from North Norway to Bjørnøya

When sailing from Norway vessels leaving from Harstad or further south usually depart from Andfjorden, or in poor weather, from Torsvåg. Vessels from Tromsø also leave from Torsvåg. Course is set for the west side of Bjørnøya in order to sail against the current which sets north-eastwards of the Norwegian coast.

In clear weather **Miseryfjellet** (Urd 535) can be seen at a distance of about 40–50 nautical miles but most often the is island wholly or partially hidden in cloud, while Miseryfjellet rises above it. When there is pack ice in the water, passage should be made well up on the west side of the island where the extent of the ice is least.

Bjørnøya viewed from south Photo: NHS


Harbour sketc
landing area
18°50'
19°
19°10'
74°33'
501
74°24'
74°21'
BJØRNØYA
IKKE SJØMÅLT OMRÅDE
UNSURVEYED AREA
Kapp Kjellström
Herwighamna
Nordkapp
Kapp Olsen
Padda
Skratteskjer
Kapp Forsberg
Emmaholmane
Nordhamna
Kapp Posadowsky
Bjørnøya radio
Kobbebukta
Taggen
Flisa
Snyta
Kvalrossfjæra
Lakselva
Lomvatnet
Engelske Staur
Kolbukta
Laksvatnet
Jacobsenodden
Kapp Bergersen
Austervåg
Tunheim
Haussvatnet
Fugleodden
Matholmane
Grytvika
Grunningen
Nordhøgda
Ut - Utstein
Lunckevika
Haugenneset
Holmavatnet
Engelskelva
Framnes
Kapp Nordenskiöld
Evensenbukta
Tverrsjøen
Stedvatnet
Lygna
Ågot
Vernevågen
Krokvatnet
Elisabeth
Rifleodden
Schivebukta
Vardehaugen
Øyangen
Steinflya
Knortodden
Gygrenova
Kapp Levin
Losbrotet
Langbukta
Tårevatna
Kapp Hanna
Varde
Vorta
Røyevatnet
Syningen
Skuld
Miseryfjellet
Verdande
Vesalstranda
Urd
Lågholmane
Grunnbukta
Kapp Ruth
Oswaldfjellet
Blåsen
Miserygrunnen
Ærfuglvika
Stegghholmane
Kvalkjeften
Bogevika
Kapp Maria
Skurven
Gåsavatna
Russerelva
Røedvika
Russehamna
Lognvika
Steinkjerholme
Blyhatten
Norskehamna
Kjærgrunnen
Landnørdings-vika
Ellasjøen
Kapp Kåre
Svartkulpen
Båtvika
Hamnevika
Kvalrossbukta
Kapp Nilsson
Kapp Harry
Skredneset
Ymerdalen
Antarcticfjellet
Grøa
Alfredfjellet
Sørhamna
Kapp Heer
Parholmane
360
337
Jektvika
Hambergfjellet
Revdalen
Evjebukta
Fuglefjellet
411
Perler
Alkeholme
Kapp Bull
Stappen
Letteste vei mellom S og N

Bjørnøya

(Chart nos. 501)

GENERAL INFORMATION

Bjørnøya lies 120 nautical miles south of Spitsbergen. The distance from Hammerfest in North Norway is 220 nautical miles. The island has the approximate shape of a triangle with its point southwards. Bjørnøya's outermost geographic point lies between about 74°20'–74°31'N and 18°45'–19°16'E. The area is 178 km² with its greatest length (N–S) about 20 km and width 15.5 km.

The southern part of the island is a mountainous area with large fl t summits with a height of 360–440 m. The land falls steeply to the sea and in some places overhangs it. Bjørnøya's highest mountain (Miseryfjellet) lies on the east coast with summits URD (535), Verdande (462) and Skuld (454).

Towards the north the land slopes evenly down towards a level, very stony plain which is covered with large and small shallow lakes. In total, there are about 700 lakes covering an area of about 18.8 km², or a good 10 % of the island. The plain has a poor plant life, mostly moss and nearer the coast it changes to marshland. Otherwise there are well-known. Scurvy grasses are among the most common plants, especially on the bird cliffs toward the sea, where the plain almost everywhere ends in a 25–50 m high, steep cliff wall.

The sea's erosion of the coast has carved characteristic features in the form of isolated stacks in the sea that have survived from the time when the island was larger. The transition to columns has often been from earlier caves, for example, **Perleporten** below **Kapp Kolthoff**. When the caverns became too large the roofs collapsed, such as with **Borgmesterporten** in Longvika. The most conspicuous objects as sea marks are **Stappen** (186) 74°20.1'N 19°03,8'E, **Sylen** (80) to the south, **Engelske Staur** (29) and **Måkestauren** (32) to the northeast, and **Taggen** (23) in the northwest.

In addition, there are a few cabins; the only habitable dwellings in Bjørnøya's radio area. Otherwise, there are only ruins from earlier occupation related to coal mining and hunting.

WILDLIFE

Bjørnøya has a small population of arctic foxes. The polar bear appears only when drift ice reaches the island. Both the arctic fox and polar bear are fully protected. There are bearded and ringed seals in the sea. The walrus was previously common, but in recent times it is a rare guest. Snow bunting and ptarmigan are the only land birds but sea birds are abundant.

The cliffs around the southern point are among the richest sites in the northern hemisphere. Year after year the island is visited by bird species that are normally at home in more southerly latitudes.

The sea surrounding Bjørnøya is rich in fish. In 2002 Bjørnøya was designated as a nature reserve. Chapter 1 contains the conservation regulations.

BJØRNØYA S, from KAPP HARRY with SYLEN, STAPPEN and SØRHAMNA to RØEDVIKA, viewed from SW

Photo: Eiliv Leren

BJØRNØYA S, STAPPEN TO KAPP MALMGREN, viewed from SW Photo: Norwegian Polar Institute

WEATHER CONDITIONS

(See also the articles on «Climate and Light» in chapter 1).

Despite the latitude the climate is mild. Winter temperatures are especially high considering the northerly location. This is primarily responsible for the frequent passages of low pressure which carry mild sea air from the south.

In the 30-year period from 1951 to 1980, January had the lowest mean temperature, minus 7.9 °C. Winter temperatures above 5 °C or below minus 25 °C are rare. In summer the temperature is relatively stable. In the above-mentioned 30 year period July and August have almost the same average, respectively 4.4° and 4.5 °C. The highest recorded temperature is 23.6 °C, and the lowest is minus 31.6 °C.

Winter has the most intense low pressure and consequentially the strongest air circulation. In January, more than about 17 % of wind observations recorded 6 on the Beaufort scale (i.e. strong breeze). July has the corresponding frequency of only 1 %. Fog is conversely a typical summer phenomenon and is recorded in about 20 % of all weather observations in July, while this only occurs in about 1 % of the observations in January.

Precipitation is slight, around 350 mm per annum in the northern low land. However, precipitation is a frequent weather phenomenon. October, for instance, has an average of 23 days with precipitation, but in fewer than half of these days the amount exceeds 10 mm. There are no glaciers on the island, although some smaller snow fields can survive the melt season.

On the northern part of Bjørnøya the period of darkness (the polar night) extends from the 8th November to the 3rd February, and the midnight sun lasts from 2nd May to 11th August (The entire solar disk is below or above the horizon for the full twenty-four hours).

TIDES

Bjørnøya is small but there is, however, a big difference in the tides around the island. Tidal range in the south (Sørhamna) is approximately half of the tidal range in the north (Herwighamna) and high and low water in the south occurs about 40 minutes earlier than in the north. There is a sufficient correlation with tidal differences and the strength of the tidal stream around the island. See the section on currents and general description of currents in the Barents Sea in Chapter 1.

CURRENT CONDITIONS

As mentioned in Chapter I, a part of Gulf Stream, the Norwegian Atlantic Current, sets eastwards along the Norwegian coast, while a part sets northwards and passes west of Bjørnøya at a distance of 30–40 nautical miles at a rate of approximately 0.7 knots.

BJØRNØYA S, viewed from NE Photo: Norwegian Polar Institute

The tidal stream fl ws around the island with exceptional strength and in some places creates violent seas which can be quite dangerous for smaller vessels. The current is particularly strong around the southern point of the island (Sørhamna–Sylen) near Framnes and near Kapp Dunér, where it runs at about 3 knots. The stream eddies around Bjørnøya extend well out to sea. The many reports of breakers on unknown shoals are undoubtedly often causing a confusing between tide rips and ground breakers.

On the flood tide the stream fl ws northwards on the east and west coasts while it fl ws westwards on the north coast. After high water the stream weakens and there can be thirty minutes of slack water. The ebb stream sets in the opposite direction. Because of the many bays that form the coastline, especially the east and north coasts, strong eddies are formed in some places.

ICE CONDITIONS

In the section in chapter 1 «Ice at sea», there is a description of the types of ice that occur in the area.

Fast ice forms every year in the bays round Bjørnøya, while in the seas around the skerries it only occurs during particularly cold winters at an interval of many years. This winter ice does not become thick and it is easily broken up by swell.

Pack ice which comes from the Barents Sea and the seas further north with the southwest going current, is also carried towards the Bjørnøya waters. The greatest spread occurs with wind directions between north and east, whereas winds from the opposite quarter keep the water ice free. During the summer months the ice usually stays longest inside a small area between Bjørnøya, Storfjorden and Hopen, but it can also disappear completely towards the end July. During the winter season the island usually lies within the pack ice limit. Occasionally the ice begins to appear even in October, but as a rule it arrives in large quantities in February. However, close ice and open water can be changeable, and the island can normally be visited (by shipping) during throughout the year. See the chart of pack ice limits in chapter 1.

MAGNETIC CONDITIONS

The magnetic variation at **Herwighamna** on Bjørnøya was 8°00' (easterly) in 2010. At present the variation increases by 14' annually.

FRESH WATER

Water can be filled from several rivers along the coast of Bjørnøya but in the summer they run dry, with the exception of Russeelva (Longvika), Engelskeelva (Austervåg) and Lakselva (Nordhamna).

Bjørnøya is situated at 74°30'N 19°01'E, approximately midway between the mainland and Spitsbergen. The area is 176 km². The island is quite fl t with the mountains mostly in the south. Miseryfjellet is the highest at 536 m. Six hundred small lakes are spread across the island.

Bjørnøya lies on the continental shelf which extends from the Norwegian coast to north of Svalbard with depths out to 500 m. 40 nautical miles west of the island the seabed falls steeply down to the great depths of the Norwegian Sea.

The waters around the island appear clear of the 20 m contour line, and smaller vessels should stay more than 1 nautical mile off shore to navigate safely.

Except for a shoal of 12 m off the southern point of the island there is quite clean water close to the shore while elsewhere along the coast it is foul with shoals out to 200–400 m from the shore.

The land falls to the sea almost everywhere in vertical cliffs (precipices). Only in a few places are there gentler slopes that make it possible to land on the island. There are few inlets from the sea that have good landing conditions and it can be truly said the island has no completely sheltered harbours. In bad weather vessels must look for the islands lee side to anchor behind points and headlands or the small bays that can be found. Otherwise vessels can anchor anywhere around the island up to a couple of nautical miles from the shore in depths of 14–40 m with predominantly sandy bottom.

The south and east coasts

The waters around the south point of Bjørnøya are clean but there are neither harbours nor landing places. Strong katabatic winds can spring up during ice loosening in the spring and summer there are constant landslides and rock falls, making it dangerous for small boats to sail along the shore. The sea currents are strong around the southern point and in bad weather large waves can build up. Vessels should keep a good distance from the shore in these conditions.

There is a welfare cabin on the cliff in **Evjebukten** in Revdalen. For further information see list of cabins in Chapter 1.

The best harbours on the east coast are Sørhamna, Kvalrossbukta and Austervåg.

Sørhamna (see harbour plan) is a big open bay surrounded by cliffs up to100 m high. The harbour provides shelter from winds from the northern semicircle but the strong breeze from the southern semicircle causes rough sea in the bay and violent waves in the entrance, especially around the southern point of **Måkeholmen**. Northeast in the bay there are some minor rocks but otherwise vessels can anchor in even depths from 5–6 m innermost to a good 20 m in the mouth. The seabed is sand and holding ground is usable.

The cabin in LONGVIKA Photo: NHS

In calm weather small boats can pass the narrow channels on either side of Meholmen. Depths are only 3–4 m, and great caution must be displayed as the current in the channel is very strong.

At the head of Sørhamna there is a small sandy beach that offers possibility of landing. From here the cliff can be scaled with some difficult . Sørhamna is normally the only ice-free harbour in the northern area.

Kvalrossbukta, just north of Sørhamna, there is an anchorage much used by fishing vessels. The depth is generally even, 5–6 m, sand bottom. The land slopes evenly down the shore and it is therefore easy to land on the island at this point. In Kvalrossbukta there are some ruins of a whaling station from 1905 to 1908.

Norskehamna is not particularly recommendable as an anchorage and there is nowhere to land on the island.

Lognvika is the most northerly harbour on the southeast side. The harbour is narrow with a width of only about 60 m (1/3 cable) and depth 3–7 m, suitable only for small vessels. It should be entered from the south and not between the two outer islets, Steinkjerholmane, where it soon breaks again.

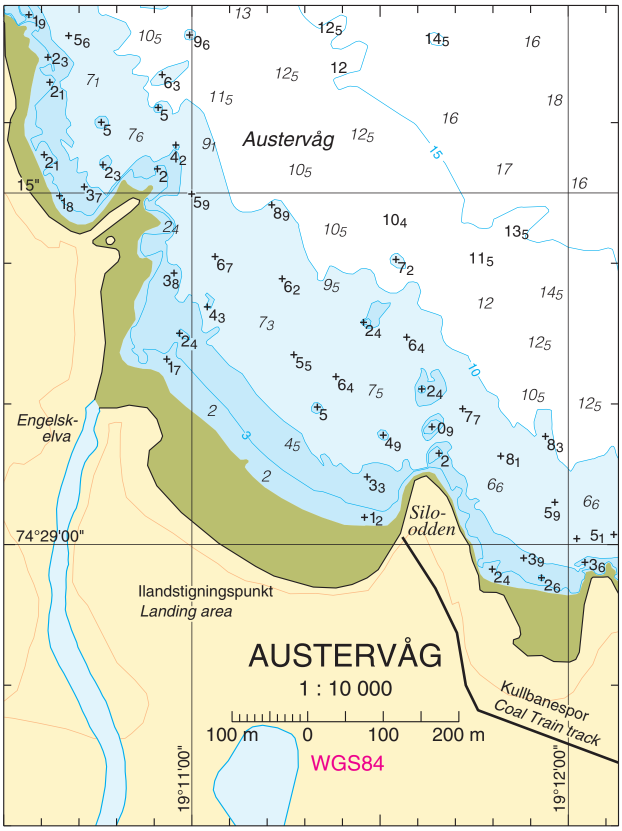
The seabed at the head of Longvika is sandy. Small boats can be hauled up on the sandy beach in the mouth of Russeelva which carries water all year.

Further northward to Kapp Levin the coast is completely inaccessible. Miseryfjellene, the slopes of which fall steeply to the sea, and the off-lying waters are exposed to strong katabatic winds in westerly weather.

During westerly storms, however, **Røedvika** will be the safest harbour with even winds and least sea and current but a watch must be kept for Miserygrunnen, which lies just northwards and out to three cables offshore. The shoals are often difficult to see, particularly in the spring when the sea, just as along the

BLYVIKA, Sørhamna Photo: NHS


SØRHAMNA
1 : 10 000
100 m
0
100
200 m
WGS84
19°09'00"
19°10'00"
19°11'00"
74°22'30"
74°22'15"
74°22'00"
74°21'45"
74°21'30"
Kvalross-
bukta
Kapp Nilsson
Blyvika
Kapp Heer
Lernervegen
Meholmen
Bergmester-
porten
Migande
Sørhamna
Måkeholmen
Pisla
Iversenbukta
Kapp Roalkvam
IKKE SJØMÅLT OMRÅDE
UNSURVEYED AREA
Jektvika
Kapp Malmgren



rest of the coast, is discoloured by clay suspended in the melt water.

Losbrotet, 3 m and 6 m, lie about 5 cables south of Kapp Levin and break the otherwise clean waters further along Miseryfjellet.

The welfare cabin «Sagatun» sits on the cliffs at **Kapp Levin**. See the list of cabins in Chapter 1.

Kapp Nordenskjöld, between Kapp Levin and Framneset, gives the best possibility of landing on the island. Here, however, there are no usable anchorages, partly because of the strong set of the currents, partly because of the foul waters. Straumrevet off Kapp Nordenskjöld extends quite a long way out and with little wind there is a violent stream sea that is marked well out to sea. Vessels are clear of Straumrevet with *the southern hump on Måkeholmen* (50) *visible well outside Miserylandet* (Vesalstranda) bearing 195°.

The welfare cabin «Tunheim» is situated at **Kapp Bergesen**. See list of cabins in Chapter 1.

Austervåg (see harbour plan) on the northeast coast between Siloodden and Engelskeelva has room for smaller vessels. Previously there were two cairns on the cliff that functioned as a bearing line between the two 2.4 m shoals that lie about 120 m from each other, but the cairns are no longer visible. The harbour is usable in southerly and westerly weather.

On **Siloodden**, by the former silo, there was sufficient depth where vessels up to 1200 tons could moor and load. There are still mooring rings there. Loading coal from the mine at **Tunheim** took place here. During the period between 1916–1925 one million tons of coal was shipped out and Tunheim consisted at the most of 25 houses with 182 inhabitants. It was here that the first meteorological station was established on Bjørnøya in October 1918, by the Geophysics Institute in Tromsø. One year later the mining company Bjørnøen AS set up a radio station on the island. After coalmining finished the government decided that the Norwegian meteorological Institute should have responsibility for the administration and operation of the radio station, from 1st July 1932.

During the Second World War the place was evacuated and laid to ruins by allied forces. The most favourable place to land on the island is the mouth of Engelskeelva which has water all year.

Along the coast from Jakobsenodden past Måkestauren (32) the waters are foul and the land falls vertically to the sea. Engelske Staur (29) and **Måkestauren** are conspicuous and with high, inaccessible cliffs near the shore are good landmarks. Around midway between Måkestauren and Harvhestholmen there is a dangerous rock awash (Skratteskjer) about 2 cables from the shore.

Coalmine railway at Tunheim Photo: Odd Harald Selboskar/NPI

SILOODEN, the ruins of the coal railway and the alongside berth Photo: NHS

Meteorological station, HERWIGHAMNA Photo: NHS

The north coast

The north coast of the island has the best places for landing and accessibility is relatively easy.

The most used anchorages are Herwighamna, Nordhamna and Kobbebukta. There are few places between Jakonsenodden and Herwighaman to land on the island. The best place is **Kaffistigen**, a small inlet just west of **Nordkapp** (74°30.9'N 19°05.4'E).

Westwards from Kaffistigen the land slopes evenly down the sea.

The meteorological station in **Herwighamna** (74°30.3'N 18°59.7'E) is manned throughout the year. The station has a crew of nine; one leader, fi e meteorologists, one operational technician and two cooks.

In addition of making meteorological observation twenty-four times each day and releasing radio probe balloons twice daily, they carry out measurements for several scientific institutions, e.g. the Norsk Institutt for Luftforskning (UILU), Nordlysobservatoriet and Jordiskelvstasjonen. The radio station is remotely controlled via satellite.

Bjørnøya's position gives the island special importance for the landing and bunkering of helicopters. Without bunkering on Bjørnøya a helicopter service to Svalbard would not be possible.

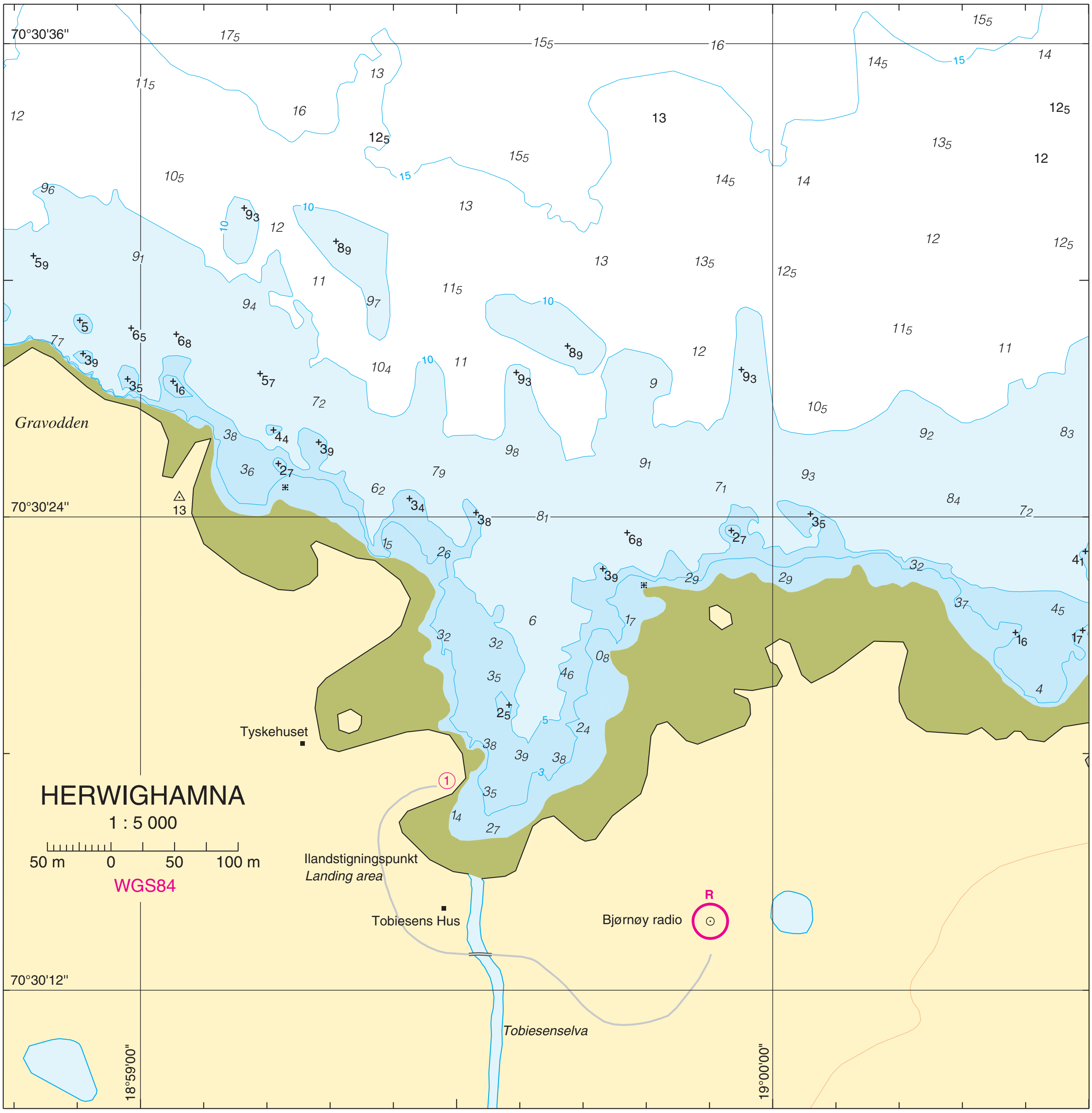
The Coast Guard delivers new supplies during June and September. Small boats shuttle between the ship and the quay to unload. For the rest of the year the Coast guard and Rescue Service are a great help in solving transport problems that arise. The radio meteorological station at Herwighamna was built in 1947. In 1968 it was replaced by a new station building. The old station building is now a museum.

Herwighamna consists in total of about 20 buildings including «Hammerfesthytte» which is the oldest preserved hunting cabin in Svalbard. The cabin is now used for recreation by the crew of the station.

In the summer there is an increasing number of sailing craft and cruise ships.

From the living room of the meteorological station
Photo: NHS

Meteorological station, HERWIGHAMNA Photo: NHS



The station, which listens on VHF channel 16, has no harbour that can accommodate a ship for unloading as there is only a small quay suitable for smaller boats (see harbour plan):

1. Stone and concrete quay, depth 2.0 m.

There are two leading marks innermost in the harbour that lead midway between Gravodden (0.5 cables off) and a rock awash. Vessels can anchor off the harbour in depths of 8–15 m.

Nordhamna, a large and particularly shallow bay with fl t beaches, lies between Herwighamna and Kapp Kjellström. Close inshore there are some stones and shoals but otherwise the bay is clear. Lakselva, which emerges here, has water all year.

Emmaholmane near Kapp Kjellstrøm are easily recognised from a long distance.

To the west of the islets is **Kobbebukta**, which is partly shallow but clear. The land slopes evenly towards the sea except in the westerly part where the coast again begins to be inaccessible. No landing is possible before Kapp Dunér.

A sand reef extends out from **Taggodden** about 2 nautical miles northwards with least depths of 13–14 m. The current over the reef can be strong.

The west coast

Small boats will find a quite good anchorage with depths of 9–5 m in **Grytvika**, on the north side of **Kapp Dunér** (74°28.3'N 18°45.0'E). This is a comparatively clear bay with even sandy bottom but landing is not possible.

Utstein is a small islet separated from Kapp Dunér by the 2 cables wide **Straumsundet**. The sound can be passed close the islet in a depth of 13 m.

A welfare cabin is situated on **Kapp Dunér**. See the list of cabins in Chapter 1.

The boat quay in HERWIGHAMNA Photo: NHS

On the south side of Kapp Dunér, **Teltvika** and **Lunckevika** lie separated from each other by a low hill crest. Both have a small beach and are the best and most used landing places on the west coast. On the south side of Telyvika there is a 2 m shoal and it is also somewhat foul along the shore westwards and southwards from Lunckevika. Otherwise the bottom is sand, provides good shelter and is especially roomy with depth of 8–10 m. The anchorage is much used by fishing vessels that heave-to on the west side of Bjørnøya.

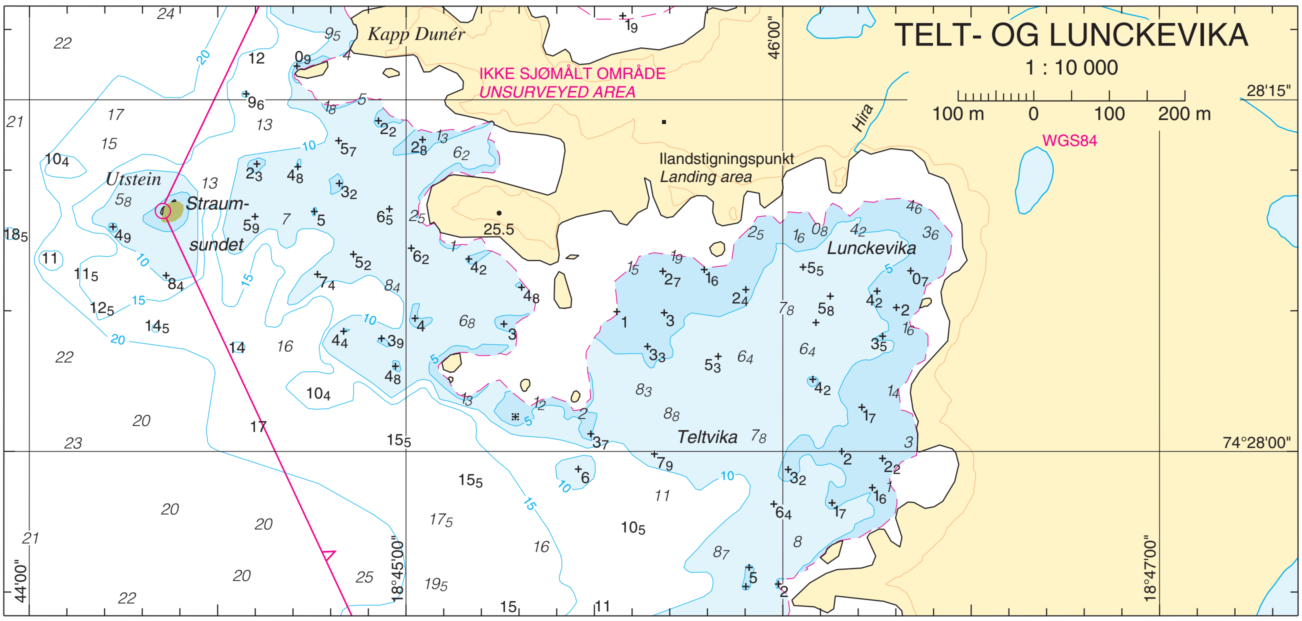
Landing is possible on the island at **Kapp Elisabeth**, but further south the coast is inaccessible, right up the river mouth in **Ærfuglvika**, south of Kapp Ruth. Course must be held close to the north side of Steggholmane to clear the 2 m shoal in the river mouth.

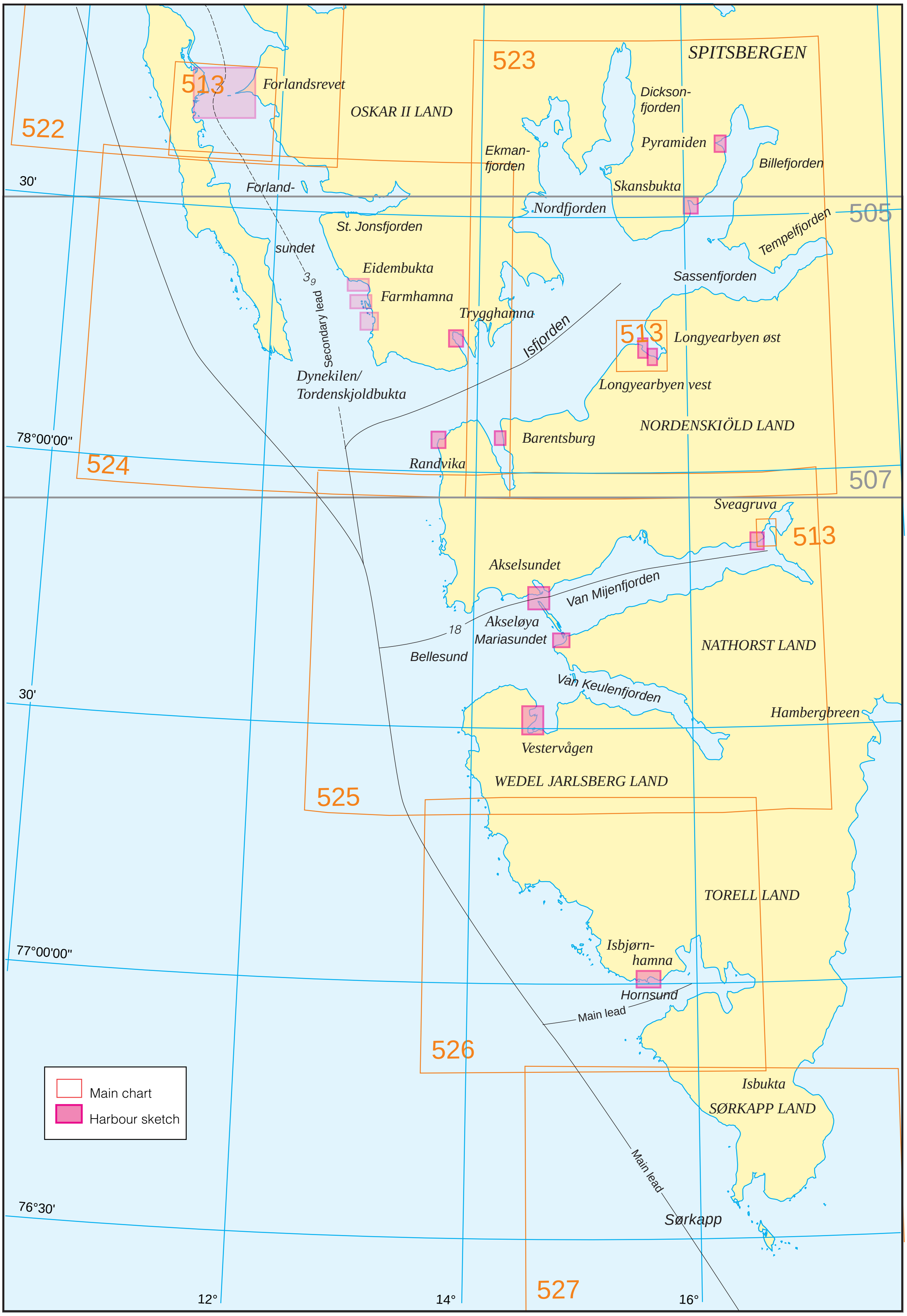
In calm seas landing is possible on the north side of Kapp Kåre and on both sides of Kapp Harry in **Båtvika** and **Hamnevika**. Within Båtvika vessels keep close to Kapp Harry to clear a 2 m shoal.

Landnørdingsvika provides a usable anchorage in easterly gales but frequently with considerable swell. Vessels can anchor in the middle of the bay on sand bottom with depths of 12–15 m with *the outermost large stone near Skredneset in line with Kapp Harry*. The water further into the bay is foul.

The coast from Kapp Harry round Stappen (186) to Sørhamna on the east side is unusually wild and inhospitable. In the southwest Hambergfjellet (440) and Fuglefjellet (411) fall almost vertically more than 400 metres down to the sea. About 1 cable out from the shore west of Hambergfjellet, is **Sylen** (80) with its narrow base. In the southeast the mountains are lower but with dangerous overhanging cliffs in places.

In addition to the above-mentioned names there are plenty of places, when snow is present, to land on the island over landslips and snowdrifts.





SPITSBERGEN
OSKAR II LAND
Forlandsrevet
Forland-
sundet
Secondary lead
39
Dickson-
fjorden
Pyramiden
Billefjorden
Ekman-
fjorden
Skansbukta
Nordfjorden
St. Jonsfjorden
Tempelfjorden
Sassenfjorden
Eidembukta
Farmhamna
Trygghamna
Isfjorden
Longyearbyen øst
Longyearbyen vest
Dynekilen/
Tordenskjoldbukta
NORDENSKIÖLD LAND
Barentsburg
Randvika
Sveagruva
Akselsundet
Van Mijenfjorden
Akseløya
Mariasundet
18
Bellesund
NATHORST LAND
Van Keulenfjorden
Hambergbreen
Vestervågen
WEDEL JARLSBERG LAND
TORELL LAND
Isbjørn-
hamna
Hornsund
Main lead
Isbukta
SØRKAPP LAND
Main lead
Sørkapp
513
522
523
505
524
507
513
513
525
526
527
30'
78°00'00"
30'
77°00'00"
76°30'
12°
14°
16°
Main chart
Harbour sketch

Spitsbergen from Sørkapp land to Isfjorden

(Chart nos. 505, 507, 513, 524, 525, 526, 527)

RADAR NAVIGATION

When using radar as an aid to navigation along the coast, the mariner must be aware that at a great distance from land the mountains will appear on the radar before the edge of the wide lowland plains to seaward of them are apparent.

ICE AND CURRENT CONDITIONS

A north-fl wing current of 1–2 knots can be expected along the west coast of Spitsbergen. This current will also carry ice into the fjords, especially in on the south side and out on the north side (the Coriolis Effect), where under calm wind conditions it will be more scattered. In such weather loose ice with large open channels can be expected on the north and south sides of the fjords. The current out from Isfjorden will, when there are not large ice masses, have a tendency to stop the north-fl wing ice drift near Sentinellefla et.

In all cases the circumstances should be carefully considered before entering the ice as currents and especially wind can rapidly change the situation with closer ice and by compression of the channels.

See chapter 1 for further information on ice, currents and wind.

Sørkapp–Hornsund

(Chat nos. 504, 505, 509)

The greater part of Sørkapp is covered by glaciers. On the east side they fl w out to the sea where they are not limited by the edges of mountains that fall steeply to the sea. Between Hambergbreen and Tromsøbreen there is an almost continuous ridge with **Hedgehogfjellet** (596) as the most easterly and most prominent. The most southerly, Havkollen (398) ends in a low ridge towards Tromsøbreen's good 1 km wide front. Further on to Haketangen there is a long but narrow land area about 2.5 km in length. From Haketangen the mighty **Vasil'evbreen** forms an almost continuous glacier front, about 18 km long, broken only by the low **Morentangen**. To the south of this tongue the glacier forms the broad **Isbukta** down towards Nordre and Søre Randberget (305 and 186) which fall steeply to the sea are separated by a 200 m long glacier front. South of Søre Randberget, Vasil'evbreen pushes a tongue, Randbreen, down towards the sea.

In the mountain areas inside Vasil'evbreen, the pointed **Haitanna** (932) is the dominant summit, standing out easily both from the east and west sides of Sørkapp Land.

Vasil'evbreen is bounded to south by several mountain areas, of which the outermost and hump shaped **Dumskolten** (596) is the highest. Here, the coast turns south-westwards in an arc with a low plain which runs across in front of Keilhaubreen.

The most southerly mountain areas in Spitsbergen are **Keilhaufjellet** (660) and **Kistefjellet** (646)(see coastal view), separated by Mathiasbreen which terminates on land. Keilhaufjellet is easily identified by its stratific tion near the summit and slope southwards towards a peak (532), and Kistefjellet with its fl t, horizontal top. In front of these mountains there is the low plain which to west broadens across **Øyrlandet**. The plain is 8–10 m high, about 7 km at the widest and with a coastline to the west of almost 12 km. To the south, a narrower part with many lakes goes over into a series of islets and skerries towards **Sørkappøya** (15).

To the north, Øyrlandet is bounded by Olsokbreen which runs into the sea with a front about 5 km long on the eastside of **Stormbukta**.

From Øyrlandet further northward towards Hornsund, the coast is formed by a foreland plain up to 3–4 km wide, and behind this there is a series of mountain areas. Furthest south there is Hilmarfjellet (810) with its snow covered summit. Further north-westwards there are Plogen (696) with Vitkovskibreen between these mountains, and Bungebreen between Plogen and Wiederfjella (757). Neither of the two glaciers mentioned extend to the coast.

Further north, there are Struvefjella with the highest summit, **Hohenlohefjellet** (616) furthest north. This summit has a characteristic haystack shaped appearance. Further into the background, **Hornsundtind** looms up which, with its 1429 m high, pointed and rugged peak, is the highest mountain on South Spitsbergen. Hornsundtind and the previously mentioned Haitanna are the best landmarks when approaching the coast from seaward. In good visibility, Hornsundtind can be seen at distance of 75–85 nautical miles.

Sørkappøya, refuge cabin and RACON Photo: NHS

1 Sørkapp viewed from SW

With about 20 m of depth and even bottom, it is possible for those with experience to go safely all the way to Negribreen at the head of Storfjorden.

From **Kikutodden** south of Keilhauffjellet, and up along the west side of Sørkapp Land to Hornsund a systematic sounding took place around 1920. By today's standards the soundings must be considered sparse, as this was carried out before the introduction of echo sounders. As a background to this, therefore, extra attention should be paid when going in towards the shore, all the more because the waters consist of a wide shallow bank with many small islets, rocks and dangerous shoals.

Round **Sørkappøya** and further northwards along the west side of Sørkapp Land it is advisable to maintain over 40 m on the echo sounder. Mariners are warned strongly against depending on the distance that Sørkappøya appears to be in good weather, as the island is low (highest point 15 m) and the situation can therefore be misinterpreted. Along the length of the reef southwards from Sørkappøya there may be undiscovered shoals.

The maritime radio beacon (racon) on Sørkappøya (76°28.7'N 16°32.3'E) about 23 m high, was taken down in 2009 for repairs. A new racon is planned for the summer of 2012.

By the side of the light there is a refuge cabin. See list of cabins in Chapter 1.

Sørkappøya–Stjernøya and the surrounding rocks and islets are bird reserves and legal access to the islands is limited on account of the conservation regulations (see Chapter 1).

Sørkappfallet lies about 2 nautical miles south of Sørkappøya where the sea is usually very broken. With *Hohenlohfjellet clear of Øyrlandsodden* vessels go clear of this bank and the shoals on the west side of Sørkappøya.

The tidal streams run violently to and from in between the islets south of Sørkappøya at a presumed rate of 5–7 knots. It is very important to take the current into consideration, especially when sailing eastwards and up Storfjorden. Large margins are recommended for course changes, with a minimum of 6 nautical miles distance from Sørkappfallet.

Between Sørkappøya and **Øyrlandsodden** there is an almost continuous archipelago and the sounds here are difficult to navigate.

Sommerfeldbukta can be entered north of Tresteinane, closer to these than to Kikutodden with its 1.5 nautical mile long reef southwards. Passage is also possible between Tresteinane and Flakskjeret, in both cases vessels continue inwards in midwater. It shoals evenly up and vessels can anchor in depths of 15–3 m.

A service cabin, on which is mounted a light (Fl.W), is situated on **Skjemmeneset**. See list of cabins in Chapter 1.

From the west there are two channels into Sommerfeldtbukta that can be used by boats and smaller vessels:

1. Close inside, the small islets and stones along the northwest side of Sørkappøya can be passed with up to 2 m of water (**Båtsundet**).
2. South of Tokrossøya it can be entered 2–3 cables north of Svartskjeret, midway between this and the rock awash further north. Course is then straight towards the north side of Meskjeret (the largest isolated rock with two smaller ones to its south). Because of the current it should be picked out from the background. Immediately after passing between Tokrossøya's south-easterly point and a small rock to starboard, the course runs between two 1 m shoals which can usually be detected by the stream race.

SKJEMMENESET, service cabin with light, a cairn in the background. Photo: NHS

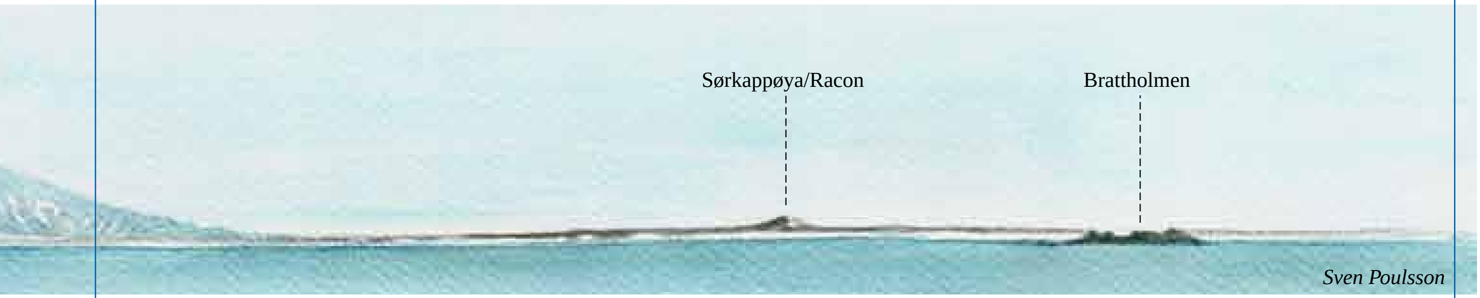
The line across Meskjeret is maintained until 200 m before turning south-eastwards towards Vardeholmen (the largest islet north of Skolteneset). Course is held until a small rock on the port side has been passed, when course is turned eastwards out into clear water. There is not less than 3 m in this channel at low water.

Between Sørkapp Land and Hornsund the bottom rises evenly to a wide uneven shallow area along the shore. When passing through these water vessels should be kept outside the 50 m contour. Even outside the unbroken 20 m contour there are of shoals with a depth of 9 m.

It is clearest in to **Stormbukta** where vessels can anchor on the north side in about 10 m of water. The bay, however, is open to the west and vessels are exposed to strong down winds from the glaciers. Vessels can anchor on both sides of the bay and up along the shore towards Hornsund in depths of 18–20 m, sand bottom.

It will usually be calm here, even if a strong easterly wind blows out from Stormbukta and Hornsund.

The whole stretch, with few exceptions, is otherwise foul in by the shore and difficult for even small boats to land. **Hovdenakgrunnen** is particularly dangerous for shipping, with the rock awash and a 2 m shoal. The shoal lies 3 nautical miles from the shore south of the entrance to Hornsund. Just within the shoal there is a small rock which should be kept at a distance of at least 1 nautical mile to go clear of Hovdenakgrunnen.



STJERNØYA, MESUNDET and TOKROSSØYA viewed from SSE Photo: Eiliv Leren

Hornsund

(Chart No. 526)

Hornsund is a 16 nautical mile long fjord, which together with Hornbreen and Hambergbreen, forms a natural division between Sørkapp Land and the rest of Spitsbergen. Innermost, the fjord branches into **Samarinvågen** southwards, **Brepollen** eastwards and **Burgerbukta** northwards. The mouth is marked to the south by the easily identifi ble, haystack-shaped **Hohenlohfjellet** (614) and to the north by the lengthier **Torbjørnsenfjellet** (692). Both these mountains are without glaciers in the adjacent valleys, whereas the mountain areas further inwards on both sides of the fjord are separated by glaciers. The most remarkable features on the north side are the massive nesting cliffs of **Sofiekammen** (924) which fall steeply to the sea. Further in, on the south side, the rugged **Hornsundtind** (1429) is dominant. East of Hornsundtind, Samarinbreen has retreated so far back that vessels here can go right up to the foot of the massif. On the south side of Brepollen, **Bautaen** (487) rises up as a giant monolith.

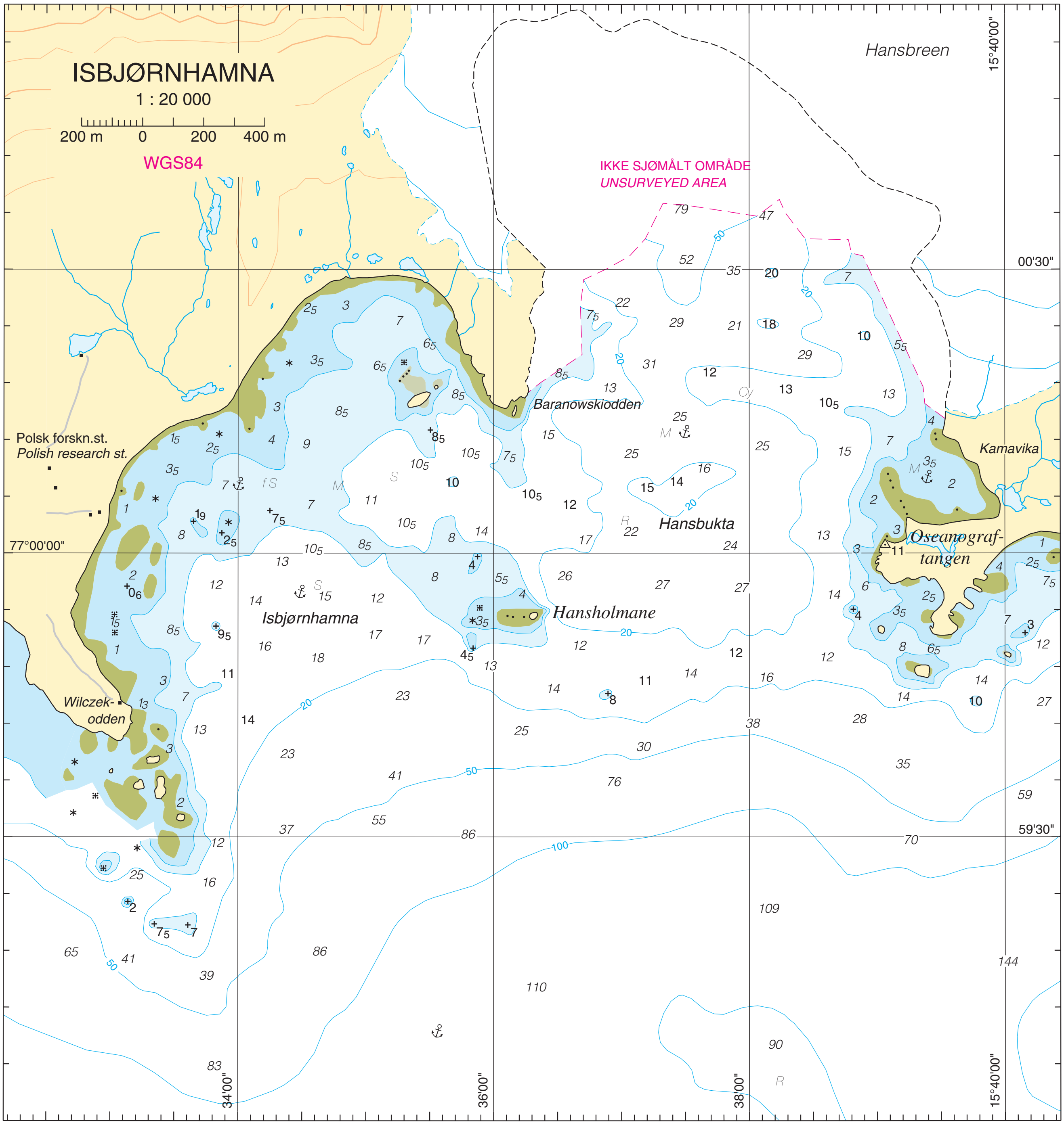
Hornsund obtained its name from the time the seafarer Jonas Poole found a number of reindeer horns here in 1610.

Whereas the depth inside Hornsund goes down to over 200 m, there is a sill, **Hornryggen**, off the fjord with depths up to 40–60 m. This shallow area is broken in the south by **Hornsunddjupet**. Approaching from the south to enter Hornsund, vessels should keep about 4 nautical miles from land to avoid the previously mentioned Hovdenakgrunnen. Out from the shoal there is a deep channel towards a 20–30m bank about 4 nautical miles northwards. Inside Hornsund, vessels have safe depths by keeping 1 nautical mile from the shore.

The best anchorage in the fjord is **Gåshamna**. However, there are some rocks awash along the eastern shore. Vessels can anchor in a depth of 25 m, mud and clay in the outer part,

SVOVELBUKTA with Bautaen and Chomjakov glacier Photo: Eiliv Leren

ISBJØRNHAMNA with the POLISH STATION, views from NW Photo: Eiliv Leren



and 6–7 m with sand in the inner part of the harbour. It is exposed to swell during strong winds from northwest-west and some weaker easterly down winds that sweep out of Hornsundet. Within the beach there are remains of the Russian Degree Measurement Expedition of 1899–1901.

Smaller vessels can find a fair-weather harbour in **Arkeologvika** between Höfnerpynten and Schønningholmane, depth 2–4 m, sand bottom. The entrance is along Höfnerpynten.

Gåshamna, Isbjørnhamna and Burgerhamna in Hornsund are designated places of refuge against acute pollution. See chapter 1 for more information.

The north side of **Isbjørnhamna** (see harbour plan) between Wilczekodden and Hansbreen is best but the seabed slopes gradually. In the outer part the depths are 15–17, sand bottom and the inner part, 6–8 m, finer sand. It is exposed to swell in strong winds from west- southwest and some not so strong easterly down winds that sweep out of Hornsundet.

The Polish scientific station from the International Geophysical Year (IGY) 1957–1958 is situated in Isbjørnhamna.

Just south of the polish station lies the cabin Konstantiovkahytte, which was erected in 1889 and restored in 1965 as a refuge cabin. See the list of cabins in chapter 1 for further information.

Since Hansbreen retreated, **Hansbukta** has become a good anchorage, depth 15–20 m, mud bottom. There is good protection to seaward in easterly winds but the wind can be strong when it accelerates down over Hansbreen.

A refuge cabin built by Kjellmo/Wallum stands on **Gnålodden**. The cabin is used by the Poles on the station. See list of cabins in chapter 1 for further information.

Burgerbukta is well sheltered from westerly weather but it is open and exposed to ice from the glacier. Violent down winds can also occur here. The depth is 30–50 m, mud and clay bottom.

TRESKELEN, refuge cabin Photo: NHS

A refuge cabin, Treskelenhytta, is situated in **Adriabukta**. See list of cabins in chapter 1.

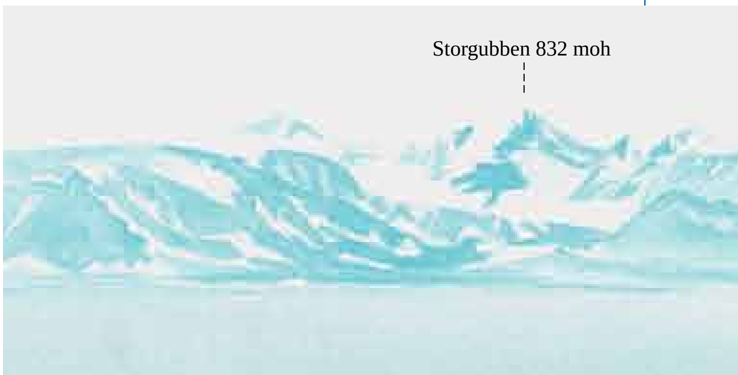
In westerly weather vessels can also anchor on the inner side of **Treskelodden**, 20–30 m and innermost in **Treskelbukta**, 10–15 m, but be aware of any ice in this area.

Vessels can anchor in **Selbukta** in 20–40 m where the glacier is land fast.

With easterly winds, it may become necessary for vessels to leave Hornsund, as down blowing winds of gale to storm force can easily arise, while there are gentle wind conditions north and south of the mouth.

In such conditions calf ice from the glaciers, from the fronts of **Brepollen** in particular, can fill up the fjord and become a serious danger to anchored vessels.

On old charts an islet which was left detached by the retreating glacier in the 1930s, can be seen just outside the fjord east of Hornsundtind. The islet was given the name Grusholmen but waves, ice and current have since removed the islet.



Hornsund–Bellsund

(Chart nos. 505, 525, 526)

Together with the mountains further north, **Torbjørnsenfjellet** (692) the formation is about 10 km long, which from seaward appears as a continuous mountain crest. The mountains extend forward to Elvefl a, approximately 5 km wide, where two glaciers terminate in moraines. Between these two glaciers, **Tonefjellet** (933) is the highest and is easy to recognise.

Northwards from Elevfl a, **Torellbreen** forms a front, about 16 km long, of which the central part ends on the land. **Raudfjellet** (1016), which is the highest mountain between Hornsund and Bellsund, stands above this large, fl t glacier. With its position, its orange colour and triple peak, the mountain is the best landmark in the area. Northwards from Hornsund the shoals continue along the shore, with a number of islands, islets and rocks, of which the groups of Dunøyane, the most southerly, and Isøyane off Torekbreen are the largest. Generally it is a very shallow and partly unapproachable area from seaward. The islands in the area are low and provide no shelter from winds.

Dunøyane consist of three islands and a number of minor islets and rocks. The island group is surrounded by large drying reef areas and is mostly inaccessible with the exception of a couple of anchorages for smaller vessels.

KAPP BORTHEN, light and cairn viewed from SW Photo: NHS

In the south vessels can enter **Hyttevika** by first keeping midway between Dunøyskjera and the shore. Smaller vessels can anchor inshore towards the cabin in depths of 4–7 m but it is somewhat exposed to south-easterly and southerly winds. The refuge cabin is from the Claus Andersen expedition, built in 1907. See list of cabins in chapter 1 for further information.

In **Dunøyhamna**, the bay to the east of the outermost of the three large Dunøyane, there is excellent anchorage well sheltered from sea and ice. The anchorage is entered from the north and there is no need for anxiety because of the small islets to starboard, as it is clear off them. Just before Tonefjellet (933) goes into line with the easterly island, vessels can anchor in 8–9 m of water. Smaller vessels can go further in.

At low water even small boats will scarcely be able the pass between Dunøyane and the shore as it is stony and very shallow. Both Dunøyane and Isøyane further north are bird sanctuaries and lawful access to the islands is restricted because of the protection regulations. See chapter 1.

In **Skoddebukta** the waters are clear in the middle of the bay. Vessels can anchor in the bay but there is some swell in winds from south to north. Ice from the glacier penetrates the area and lies especially along the shore and the islands towards the north (Isøyane).

The moraine ridge in the middle of Torellbreen continues as a stony fl t shoal about 3.5 nautical miles southwards. The whole of this area is known as **Isøyane**. The most northerly is Aurholmen while the most southerly group of islets and rocks is called Isøyskjera. Vessels can anchor east and south of **Nordre Isøya**, the largest of Isøyane. Vessels can enter the eastern anchorage from north between the island and the moraine ridge where the depth is 6–8 m.

Cabin innside on LOGNEDALSFLYA Photo: NHS

From the western edge of Torellbreen and **Kapp Borthen** (72°10.2'N 14°27.0'E) a large shoal fl t extends about 6 nautical miles southwards. The area between Flatholmen in the north and Nøisbåen (1 m) in the south is very shallow and foul. Two large dark stones, **Svartsteinane**, which are always visible, stand approximately in the middle of the fl t. To the northeast of these Sandrevet and then Kroghryggen lie further up to Flatholmen. Grunnryggen is a sharp rocky reef with about 1 m of water and is usually visible because of the stream ripples.

West of the shoal ridge and **Flathomen** the bottom is even over the whole fl t, 8–13 m, apart from a 5 m shoal. Between the shoal ridge south of Flathomen and Isøyane, a deep channel cuts in from the south to a little way inside Flatholmen and the most northerly of Isøyane. Further in the bay off Torellbreen, **Isfjellbukta** dries to about one nautical mile outwards. It is also very foul off Kapp Borthen.

From Torellbreen and further northwards the glaciers again fall down towards the coast, which consists of a low foreland 2–3 km wide.

From **Peder Kokkfjellet** (582) in the south to Fløyfjellet in the north, there is a series of mountain areas separated by 6–7 narrow valleys. Inside the third valley from south, the sharp **Orvinfjellet** (796) is prominent.

Along the coast from Kapp Borthen further northwards to Dunderbukta the 20 m contour varies between 1–3 nautical miles from the shore. The whole stretch along the shore is foul and vessels intending to anchor off the coast should stay in 25–30 m of water.

Smaller vessels can find anchorage inside **Olsholmen**, due west of Peder Kokkfjellet (580). The area Olsholmen–**Vassodden** is a bird sanctuary, and lawful access to the islands and land side is restricted because of the protection regulations (Chapter 1).

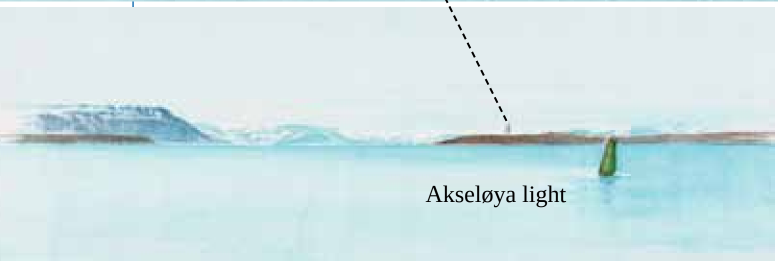
Just north of Olsholmen vessels can anchor in **Storvika**, where water-filling is possi le.

Further northwards vessels can anchor south of **Middagsskjera** and in **Dunderbukta**. Water can be filled in Dunderbukta but extra care must be taken in the bay because of the many shoals and rocks awash.

From Dunderbukta, Dunderdalen runs south-eastwards as a broad valley about 17 km long. The mountain ridges on the north side of the valley end in the outstanding **Dundrabeisen** (436) outermost to the west.

The most dominant mountain on the peninsula between Dunderbukta and Recherchefjorden is **Storgubben** (832) with its pyramid shaped summit with snowdrifts. From Storgubben and Emil Nilssonfjellet (791), also with snowdrifts, the mountain ridges radiate out in fan shape towards the narrow coastal plain where the coast turns towards Bellsund. The most westerly ridge ends in **Klokkefjellet** (557). This is a descriptive name from 1610 when Jonas Poole christened it Bell Mountain because it resembled a ships bell. **Bellsundhesten** (487) is easily recognised by a slight resemblance to a horse back.

2 Bellsund: Akselsundet–Klokkefjellet



Bellsund and its branches

(Chart nos. 505, 513, 525)

The first charts of Spitsbergen showed only the entrances to the fjords and it was natural for the discoverers to use the term «sound» as they were not aware of the branching inside. As with Horsund, it was Jonas Poole who in 1610 gave Bellsund its name after a ships bell-shaped mountain on the south side of the fjord. The name became the term for the whole fjord system as it was gradually charted. Today in practice the name is restricted to the outer area from which Recherchefjorden, Van Kuelenfjorden and Van Mijenfjorden branch into the land the latter by more than 40 nautical miles.

Bellsund is the common name for the previous mentioned fjord arms further in, and the sound is about 12 nautical miles long and almost as wide. On the south side of Bellfjorden, west of Recherchefjorden, the land is filled with a wild, mountain area with jagged edges and pointed peaks and glaciers. The coastal plain is here quite narrow. On the north side of the sound the land consists of a coastal plain which then goes into the wide Ytterdalen between Ytterdalssåta (598) and a long stretch of mountain area which ends on the coast on **Ingeborgfjellet** (715). This mountain is easy to identify from seaward with its long black ridge and small «hat» on top of it.

In the east the long, low Akseløya closes towards Van Mijenfjorden and further south of Akseløya, **Midterhuken** with the

KAPP MARTIN viewed from SW Photo: Eiliv Leren

beautiful **Midterhukfjellet** (781) which displays folded strata up towards the summit.

Berzeliustinden (1211) on the south side of the entrance to Van Keulenfjorden is the highest mountain in this area and is therefore a good landmark.

Pack ice that fl ws up along the coast can more or less fil Bellsund – and to some extent the fjords in the summer – if the easterly wind does not prevent it.

When approaching from seaward the first to be seen are the high mountain peaks between Dunderbukta and Recherchefjorden with **Storgubben** (832) as the highest. **Nathorst Land** with its high mountain appears as a huge island in the background. Closer to shore the eye is readily attracted to **Bellsundhesten** and **Ingeborgfjellet**.

Bellsund light is situated near **Kapp Martin** (77°43.3'N 13°56.9'E) and further in Akseløya light stands at the entrance to Van Mijenfjorden.

From Lågneset, outermost on the north side of Bellsund, a ridge, **Lågnesflaket**, runs about 15 nautical miles south-westwards with evenly sloping bottom to a good 100 m before rising again to about 75 metres on **Geitegrunnen**, about 20 nautical miles west-southwest of the mouth of Bellsund.

On the south side of Bellsund and further into Recherchefjorden, it is deep close to the shore, and by keeping about 1 nautical mile offshore vessels will have safe depths.

Off **Calypsobyen** by the entrance to Recherchefjorden the seabed falls away sharply but vessels can anchor well in towards the beach. In Calypsobyen there are a few houses that were erected by the Northern Exploration Company in 1918–1921. The living quarter is a refuge cabin but is often used by researchers. See list of cabins in Chapter 1.

On the north side of Bellsund there are anchoring possibilities in **Van Muydenbukta** on the inner side of Kapp Martin. With the exception of the northeast side, northwest of Reiniusøyane, the bay is clear but relatively shallow and exposed to winds from the southern semi-circle. The holding ground is

CALYPSOBYEN Photo: NHS

not particularly good. Smaller boats can also anchor in **Vårsolbukta**, behind Reiniusøyane, but mariners should be aware of the rocks awash which lie there.

The depth is 4–5 m with sand bottom. Around the bay are the cabins of Camp Bell and a little further east, Camp Millar and Vårsolhytta, all of which were built by «The Northern Exploration Company» in 1908, 1910 and 1910. The first two are service cabins, while Våsolhyttais a rental cabin and has two beds and a sofa. See list of cabins in chapter 1.

A little further east, in **Diabasbukta**, there is Hageruphuset, Steinuren, which functions as a refuge cabin.

Recherchefjorden (Chart No. 525)

Recherchefjorden runs about 4 nautical miles southwards from Bellsund and is 2–3 nautical miles wide. Two glaciers end in the sea here, on the west side **Renardbreen** and in the southeast the great **Recherchebreen** with its particularly high front. Between the two glaciers a wide, ice free valley runs southwards towards Dunderdalen. To the east the fjord is bounded by a long jagged ridge. Martinfjella with **Maria Theresiatoppen** (653) are the most northerly. The mountain levels out northwards towards Reinodden and continues eastwards in a plain past Antoniabreen.

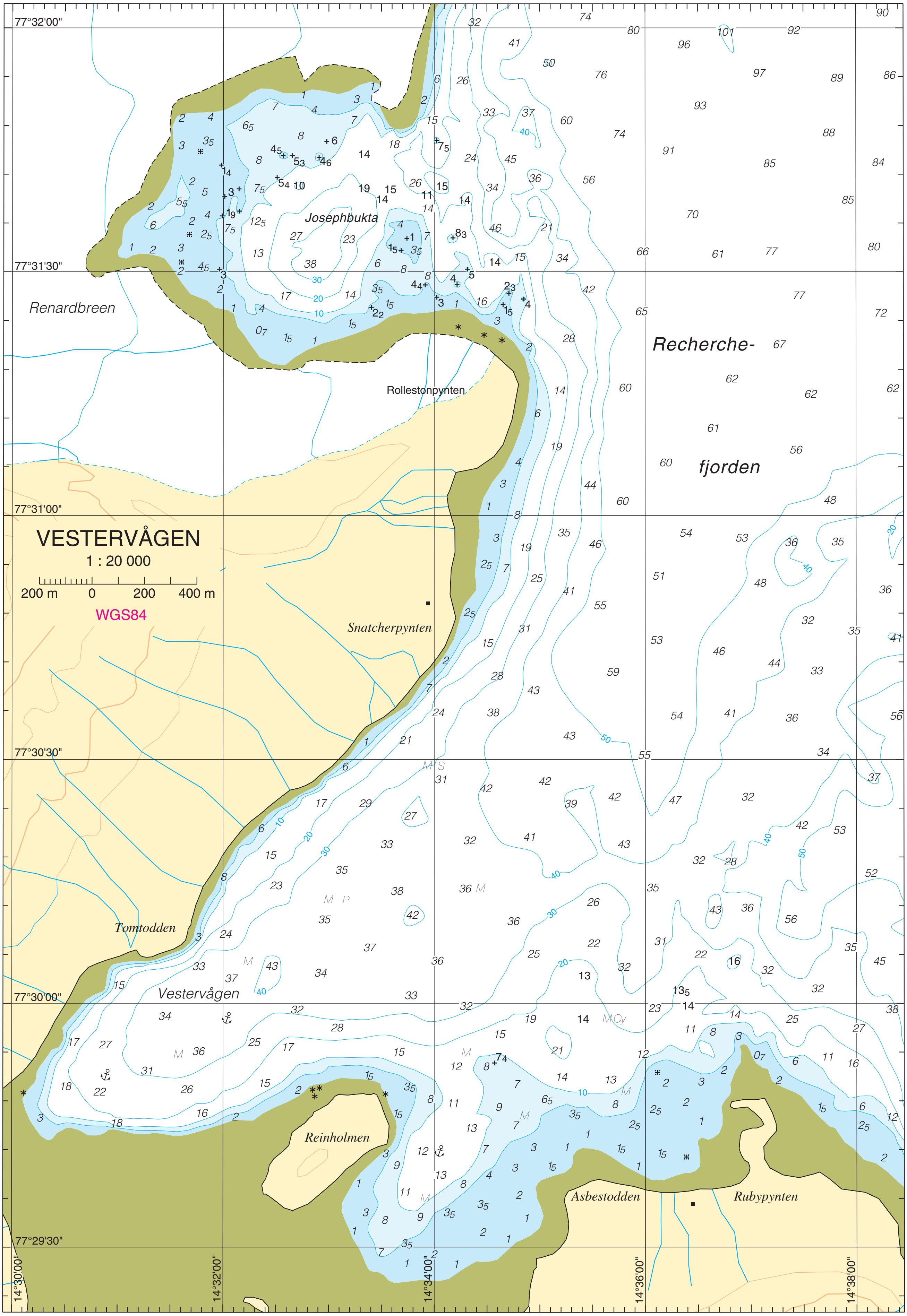
Recherchefjorden is completely clear and deep close inshore, with the exception of along Reinodden outermost on the east side of the fjord and innermost into the fjord near Reinholmen.

There is good anchorage in **Vestervågen** (see harbour plan) east and northwest of **Reinholmen**, in 12–13 m and 20–40 m of water and both places have mud bottom. Large and smaller vessels will find good anchorage here. The harbour is well sheltered from all wind directions but north-westerlies can create some swell. Calf ice from Recherchebreen is not particularly troublesome. Vestervågen is designated a place of refuge against acute pollution. For further information see chapter 1.

Smaller vessels can also anchor in **Josephbukta** where they can lie well sheltered from ice and sea, with the exception of strong east winds, depth 25–30 m, and mud bottom.

There are good facilities for water filling from the smaller rivers and streams that fl w into the fjord.

JOSEPHBUKTA and RENARDBREEN viewed from E Photo: Eiliv Leren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200 m 0 200 400 m
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Renardbreen
Josephbukta
Rollestonpynten
Recherche-
fjorden
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Tomtodden
Vestervågen
Reinholmen
Asbestodden
Rubypynten
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77°31'30"
77°31'00"
77°30'30"
77°30'00"
77°29'30"
14°30'00"
14°32'00"
14°34'00"
14°36'00"
14°38'00"

Van Keulenfjorden (Chart No. 525)

Van Keulenfjorden runs about 15 nautical miles east-south-eastwards. The main channel narrows to about 1 nautical mile, while further into the fjord it widens to about 3–4 nautical miles before it turns south-eastwards and tapers to about 2 nautical miles. Apart from the 1211 meters high Berzeliustinden, the fjord is surrounded by a rock plateau 600–800 metres high. On the south side the plateau is cut by three glaciers which all terminate on the land. There is also here a comparatively narrow coastal plain, while the mountains on the north side mostly fall steeply to the sea. Fully innermost in the fjord, **Nathorstbreen**, with its high front falls out into the fjord. On both sides there is a wide moraine landscape left by the glaciers.

The many rivers that run into the fjords supply fresh water which accelerates the formation of ice until the autumn, when the rivers run dry. In general, it can be assumed that Van Keulenfjorden is navigable from about 1st July. Occasionally it freezes over again in September.

The fjord mouth is restricted due **Eholmen** which covers half of the channel between the protruding headlands on either side.

Eholmsundet, on the N-side, is navigable with a depth of 11 m in the middle of the sound. The main channel, however, runsbetween the islet and Ahlstrandodden where vessels are kept in mid waters through the sound across a 50 m deep sill. Further into the fjord it is clean and deep until it turns more southwards with an arm. On the bend there is sill of 14–18 m, laid down by glaciers over time. On both sides within the sill there is an amount of shoaling along the shore from the large moraine areas.

Otherwise, the depths in the middle of the bay go down to 40–60 m. It can be mentioned the glacier front position in 1970 had retreated about 30 km from 1870, after deosirting the sill. Nathorstbreen has increased since 2009.

Vessels can anchor on the south side of Van Keulenfjorden, in bays inside Ahlstrandodden. In the most easterly bay, **Fleur de Lyshamna**, vessels can anchor in depths of 18–28 m where they are well sheltered, except when the wind blows out of the fjord.

EHOLMSUNDET with VAN KEULENHAMNA, viewed from WSW Photo: Eiliv Leren

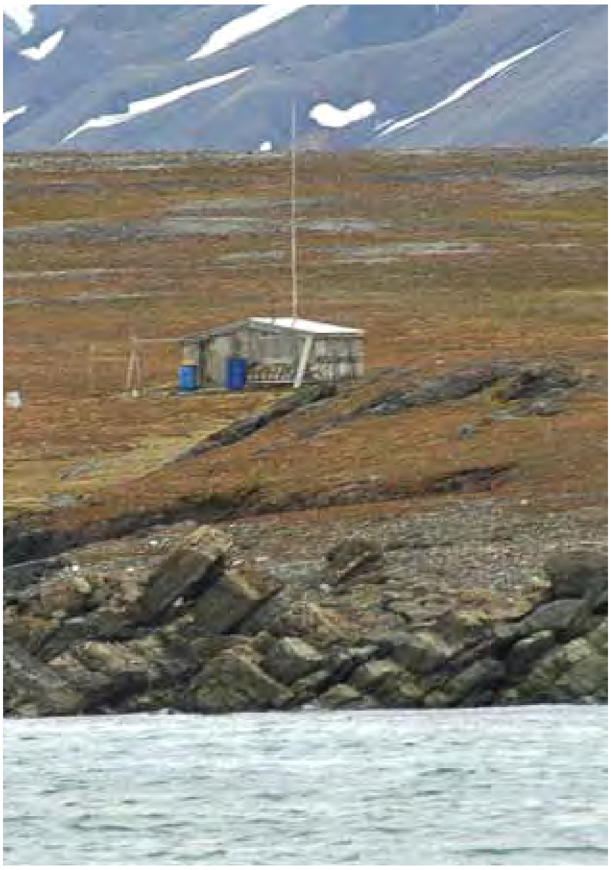
The same applies to **Bourbonhamna** further east, where smaller vessels can anchor off a well maintained cabin on Kapp Toscana.

Ingebrigtsenbukta to the east of this point is foul and shallow. The shallow sill to the inner part of the fjord provides good holding ground but ice from the glacier causes disturbance. Vessels can alternatively anchor in the bays on both sides of the fjord head, although the bottom falls away steeply.

Along the north side of **Van Keulenhamna** just inside Eholmen there is a well sheltered harbour with good holding ground. The bay is deep and clear so smaller vessel can therefore go well in. The harbour is designated as a place of refuge against acute pollution. For further information see Chapter 1.

There are otherwise no usable anchorages on the north side of the fjord inside Eholmen.

FLEUR de LYSHAMNA, service cabin Photo: NHS



EHOLMEN cabin Photo: NHS

BAMSEBU, Ingebrigtsenbukta Photo: NHS

Midterhukhamna can be entered from south near Midterhuken. The harbour has been much used as an anchorage and vessels anchor best in 12–17 m of water just inside the southern point of the islet which protects the harbour towards the west. Mariners should look out for the rock awash to the south of the islet. Smaller vessels can go further in, between the islet and the shore but the east side of the bay must be avoided as there are a number of rocks and stones. There is a refuge cabin, in Midterhukhamna, built by J. Hagerup in 1898. See list of cabins in Chapter 1.

The dangerous **Thistlegrunnen**, 2 m, lies about 1 nautical mile west of Midterhuken. With *Eholmsundet* (the north side of Eholmen) *just closed*, vessels are clear south of the shoal, and also go clear north of the shoal with *Mariasundet closed*.

Vessels can also anchor in **Gåsbergkilen** (see harbour plan of Mariasundet) in depths of 5–8 m. It is a fine harbour in southerly winds but exposed to considerable swell.

Van Mijenfjorden (Chart nos. 525, 513)

See also page 49 (Regulations applicable to the use of waters in Bellsund and Van Mijenfjorden).

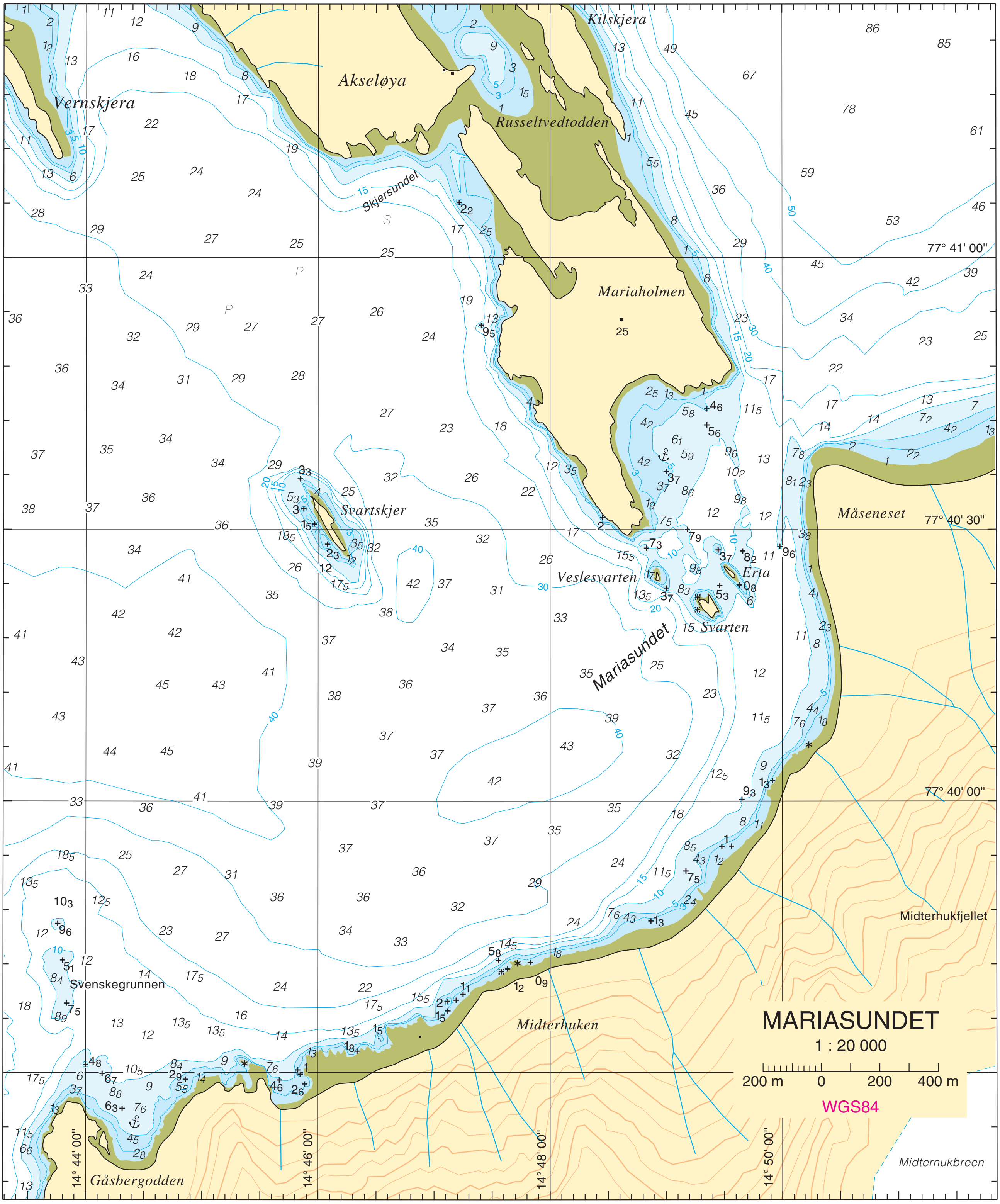
Van Mijenfjorden extends about 32 nautical miles east-north-eastwards from Akseløya to **Rindersbukta** where Paulabreen meets the sea. **Fridtjovbreen**, innermost on the north side, is otherwise the only glacier that goes fully to the sea. Van Mijenfjorden is surrounded by plateau-shaped mountains of which the inner area rises to a height of 1200 metres, and which are separated by wide, fl t bottomed valleys. Reindalen on the north side is, in particular, one of the biggest on Svalbard.

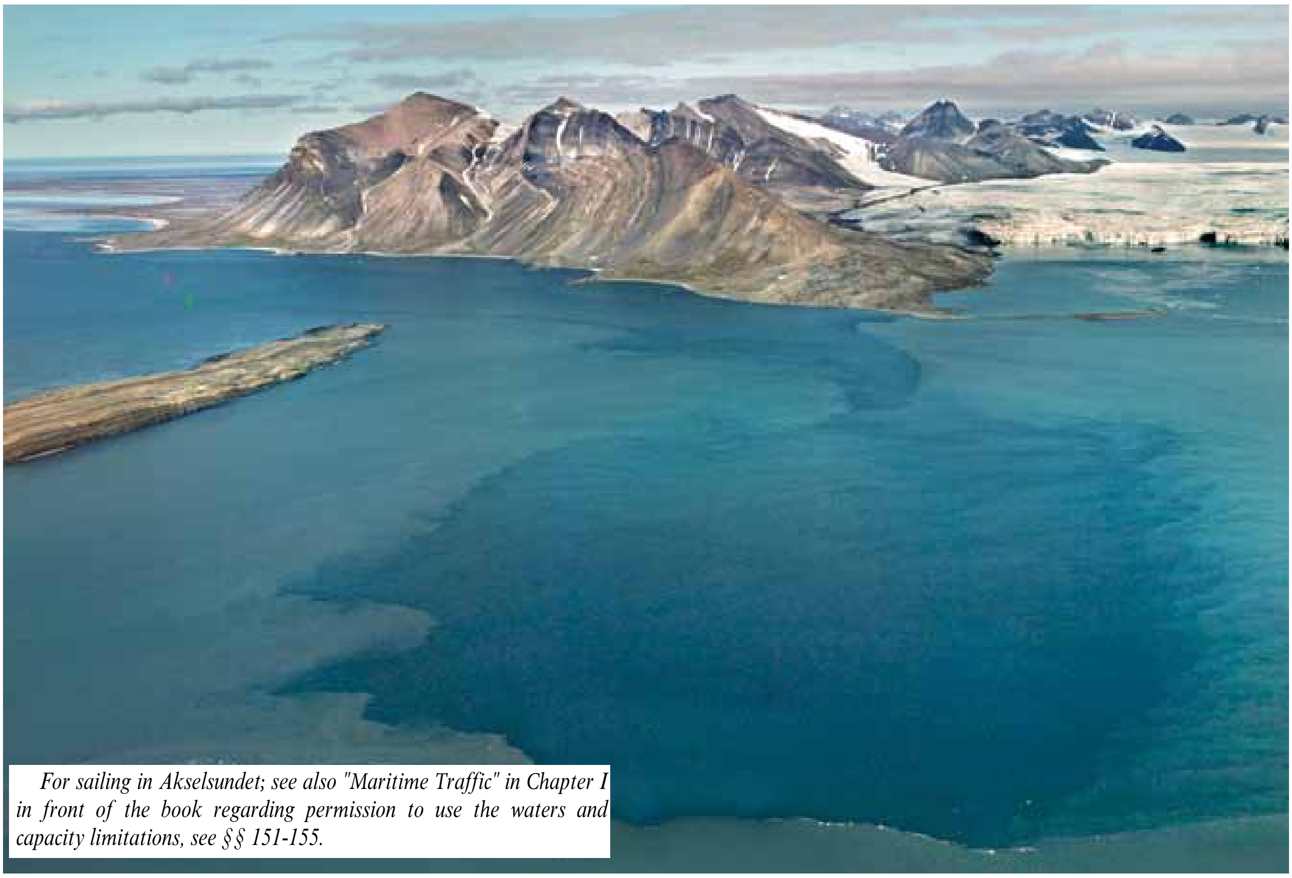
The long narrow **Akseløya** with **Mariaholmen** to the south lie across the fjord mouth. The sound between these two islands is un-navigable. Here stands 3 cabins; hunting cabin from 1898, restored and listed, Slettbakkhytta, built by E Slettbakk/ Audun Paulsen in 1963, refuge cabin and the hunting cabin

MARIASUNDET viewed from SSW Photo: Eiliv Leren own by Louis Nielsen «Hiawatha» was for many years a huntsman on Svalbard, removed his cabin from Fridjovhamna and rebuild it here in 1990 and used the cabin as a base since.

Mariasundet (see harbour plan) between Mariaholmen and Måseneset is also navigable but is somewhat crooked. Midway between the south point of Mariaholmen and the shore there is a small islet, Svarten, and two rocks, Veslesvarten and Erta. Navigators must also look out for Svenskegrunnen, north of Midterhuken if going through Mariasundet. When approaching from west vessels go clear of both Thistlegrunnen and Svenskegrunnen by keeping *Måseneset well visible north of Veslesvarten*. When Svenskegrunnen is safely passed course is steered up into the sound between Svarten and the shore, and then between Erta and the shore, with least depth in the sound of 11 m. It should be well noted that in this area vessels are exposed to heavy squall winds from Midterhuken. During easterly winds in Van Mijdenfjorden there can be considerable sea current at Måseneset. In Mariasundet vessels can anchor in the bay south of Mariaholmen, depths 4–6 m, sand and stone bottom. It is well sheltered from westerly winds.

The main entrance into the fjord passes through **Akselsun-**



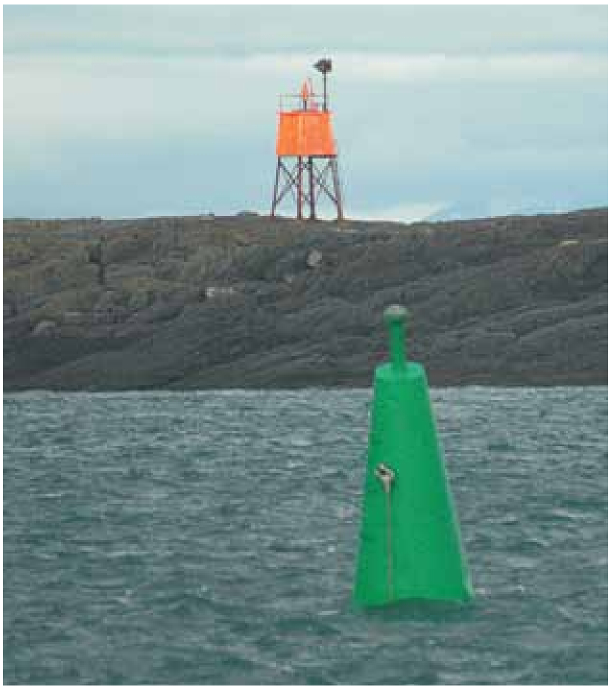


For sailing in Akselsundet; see also "Maritime Traffic" in Chapter I in front of the book regarding permission to use the waters and capacity limitations, see §§ 151-155.

AKSELSUNDET and FRIDTJOVHAMNA viewed from E Photo: Eiliv Leren

det (see harbour plan), north of Akseløya and the entrance is marked by a light on the north point of the island. Under passage of the sound, vessels can be kept a little closer to Akseløya than to the shore where it shelves out a little. A ridge with maximum depths of 18–18.5 m between the two spar buoys, crosses the outer part of the sound. See also page 49 (Regulations applicable to passing Akselsundet).

The tidal streams in Akselsundet are strong with eddies, and can run at up to a rate of 5–6 knots. It fl ws eastwards (into the fjord) on the rising tide and westwards (out of the fjord) on the ebb). The narrow opening in to Van Mijenfjorden results in a delay of the tide, and high and low water occur about 40 minutes later than at Longyearbyen. At high and low water the tide is the same on both sides of the sound, and the current will turn. This means that slack water occurs «a bare hour» after high or low water at Longyearbyen.



AKSELØYA light and spar buoy Photo: NHS

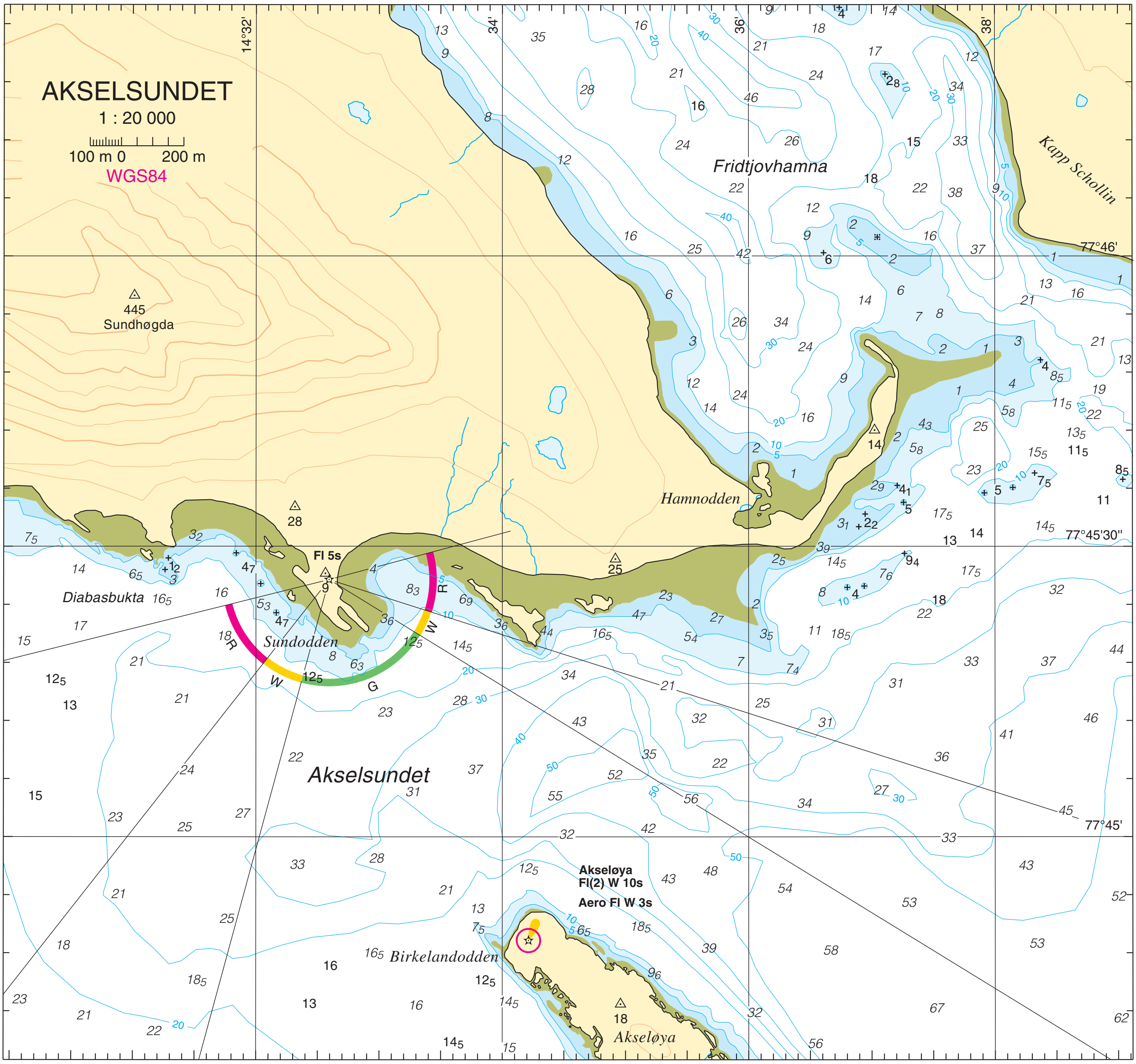
In **Fridtjovhamna** (see harbour plan of Akselsundet) just on the inner side of Akselsundet there is a good harbour on the inside of the long narrow Hamnodden. It is shallow along the south and east sides of Hamnodden and the entrance to Fridtjovhamna and when sailing to Fridtjovhamna vessels should keep nearest to the eastern shore. There are good depths in the entrance to the harbour but a watch should be kept for the shoal area that extends well out into the sound. Usually the clarity of the water is almost zero. Inside the bay there are suitable anchoring depths of about 20 m. It is a well sheltered harbour.

Louis Nilsen «Hiawatha», the long-time hunter on Svalbard has a cabin on **Kapp Schollin**.

Clara Ville, near **Camp Morton**, built by the «Northern Exploration Company» in 1913, stands a little further in. To-Takter'n has the cabin for hire. See the list of cabins in Chapter 1.

Vessels can anchor on the north side of Van Mijenfjorden in **Kaldbukta** between Dom Miguelodden and Akseløya, in front of the wide Reindalen. Here and along the east side of the bay it is very shelving, after which the bottom falls away sharply. On the west side of the bay there are better anchorages during favourable wind conditions. Vessels will be better sheltered from east winds on the west side of **Dom Miguelodden**.

The headland with drying areas projects quite a long way out



and provides shelter from waves that come out from the fjord. Kaldbukta is designated as a place of refuge against acute pollution. See chapter 1 for further information. Further inwards in Van Mijenfjorden, a light to aid shipping traffic has been erected on Dom Miguelodden (**Blåhuken light**).

CLARA VILLE, Camp Morton Foto: NHS

BLÅHUKEN light, Dom Miguelodden, viewed from SW
Photo: NHS

The settlement at SVEAGRUVA viewed from E See also http://kystnor.no/ Photo: Eiliv Leren

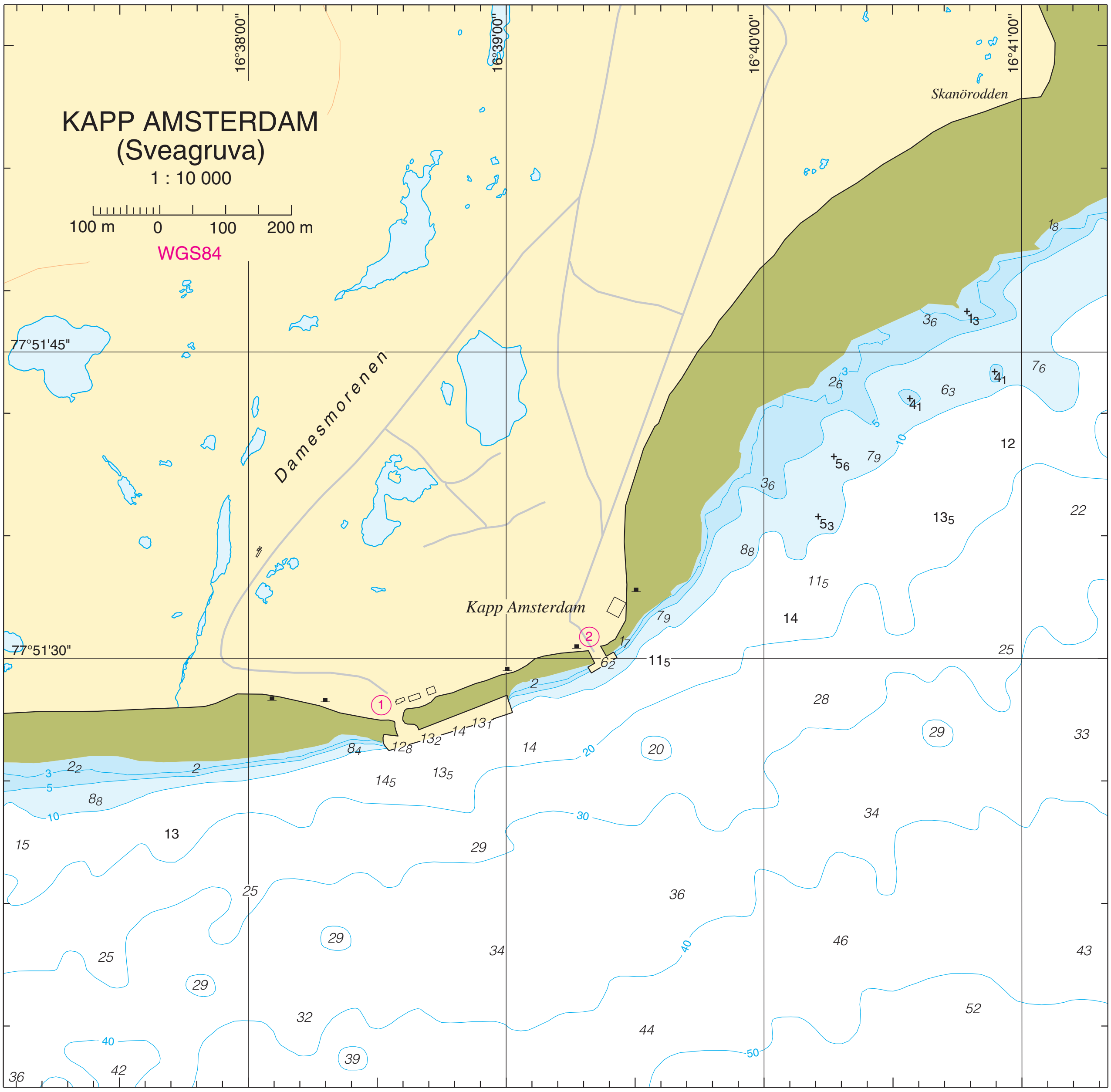
From Akseløya and inwards the fjord is clear, with the exception of a reef – with two shoals of 4 m and 7 m – which projects 1.3 nautical miles north-westwards from **Conwentzodden**,

Further into the fjord there is a sill with depths of 11–12 m on either side of the 10.5 m shoal in the middle of the entrance to **Rindersbukta**. Vessels can anchor just off the sill in a depth of 15 m, clay bottom.

From Conwentzodden around Rinderbukta and Sveabukta to Liljevalchneset on the north side of the fjord, Paulabreen has deposited large moraine ridges which also extend a little from the shore.

Sveagruva was originally built in 1917 by A B Spetsbergens Svenska Kolfält and taken over by Svenska Stenkolsaktiebolaget Spetsbergen, who operated it until 1925, when there was a fi e in the mine. In 1934 the installation was taken over by Store Norske Spitsbergen Kulkompani AS (SNSK). In 1944 the building was burnt down by a German submarine but it was reconstructed after the war. SNSK operated the mine up to 1949, when the company decided to concentrate on Longyearbyen.

KAPP AMSTERDAM, Sveagruva, viewed from SE Photo: Eiliv Leren



See also http://kystnor.no/

At the start of 1970 the company began to explore the deposits more systematically and early in 1997 the Store Norske began ordinary coal mining production again. The activity in Sveagruva is operated by personnel permanently resident in Longyearbyen who work in Sveagruva by rotation. At any time there are between 50 and 100 people working in Sveagruva.

Store Norske has plans for a new coalmine north of Sveagruva, Sveagruva-Nord. If the permision is given to start mining this mine, the indications of extractions from this fiel suggest the company could produce between 700 00 and one million tons per year for the next thirty years.

There is only a road connection between the settlement and the mines and out to the harbour near Kapp Amsterdam. In the winter Longyearbyen can be reached by snow scooter, about 60 km, and by boat in the summer when the fjord is ice-free. Sveagruva airport, which is situated innermost by the settlement, services the mining establishment at Sveagruva. The airport is owned, operated and used by the mining company Store Norske Spitsbergen Kulkompani to transport personnel to Svalbard airport at Longyearbyen. The harbour master can be contacted on VHF channels 12 and 16.

The quays for Sveagruva at **Kapp Amsterdam** have storage place and workshops (see harbour plan):

1. Utskippingskaien (exporting quay), 195 m concrete quay on pillars, depths (at the quay/fender front) see harbour plan. There are mooring bollards on both sides of the quay.
2. Taubåt kaien (tug boat quay) 45 m concrete quay on pillars, depths from SW (7.8)–(at the quay/fender front)6.8–6.2–6.8–(6.8) m. Oil discharging point. There are mooring bollards on the shore on both sides of the quay.

The entrance into **Sveasundet** to Gammelkaien has partly silted since traffic stopped and is now un-navigable. Only the ruins of the earlier quay remain.

Further in, the almost 4 nautical miles long **Braganzavågen** opens up but this is not completely navigable either.

Belsund–Isfjorden

(Chart nos. 505, 524, 525)

LANDMARKS
The coastal stretch between Bellsund and Isfjorden is characterised by a wide, low coastal plain with a mountain chain behind it. There are several conspicuous mountain peaks separated by clefts or valleys.

Ingeborgfjellet (715) with its little «hat» furthest south, is the most distinctive, and **Ytterdalssåta** (598) have already been mentioned. The most dominant summit further northwards towards Orustdalen is the pyramid shaped **Ytterdalsgubben**, which at 901m is the highest in the region. North of Orustdalen the mountain chain is divided into three mountain areas of approximately even height, **Systemafjellet** (745), **Aagaardtoppen** (732) and **Greigfellet** (781). The latter slopes evenly down towards the coastal plain at the entrance to Isfjorden.

THE COASTAL WATERS
The waters along the Nordenskiöld coast are shallow and fille with many skerries and shoals. The danger line (20 m) is approximately parallel to the mountain chains on the land, so that it runs only at about 0.5 nautical miles offshore at Långneset in the south and 5.5 nautical miles off in the north, where it also includes **Røvigflaket**. The depth on the shoal varies between 10 and 20 m, except for Tessemgrunnen, (7 m) and Ivergrunnen,(3 m) on the southern part of the shoal fl t. Northeast of Røvigfla et there are highly irregular seabed conditions with depth from 13 m to 80 m. Vessels run clear north of Røvigfla et with *Isfjord light in line with Starostinaksla* (the northern spur of Vardeborg).

There are no sheltered harbours on this stretch of the coast but in good weather with offshore winds, vessels find excellent anchoring grounds by going in towards the danger line. Even though winds of gale force blow out of Bellsund and Isfjorden, there may be little wind off the Nordenskiöld coast.

Southwest of Røvigfla et, between 8–16 nautical miles off

3 Grønfjorden–Russekeila viewed from N

the shore, there is the noted **Sentinelleflaket** (Vaktpostfla et) with depths of 30–50 m. In bad visibility the use of echo sounders provides a good position marker for further navigation into Isfjorden when approaching from south. The fl t shoals up slowly from the south but falls more steeply off on the north side towards **Isfjordrenna**.

Isfjorden

(Chart nos. 505, 513, 523, 524)

Isfjorden, with its many branches, is the largest fjord in Svalbard. It stretches 55 nautical miles into the land and is about 13 nautical miles wide at its broadest, halfway into the fjord. The most important part of the commercial activity and population on Svalbard are gathered around Isfjorden. The fjord has a number of large and smaller side arms.

The south and north sides of Isfjorden are very different in appearance. On the north side, and especially between Isfjordenmunningen (the mouth) and Ekmanfjorden, there are several glaciers that front on to the sea, while on the south side glaciers are to be found innermost in Grønfjorden where they terminate on the land.

ISFJORDFLYA with KAPP LINNÉ, viewed from SW Photo: Eiliv Leren

Sven Poulsson

The mountain formations west of Ekmanfjorden and Grønfjorden consist of rugged ridges and pointed peaks, whilearound the rest of the fjord there are plateau-like stratified mountains with some isolated pointed summits, such as, for example, **Pyramiden** (938) in Billefjorden. The most conspicu-ous formations in the valley on the south side are described from west as follows:

In the valley inside the previously mentioned Greigfellet (781) there is one of Svalbard's largest lakes, **Linnévatnet**, with an outlet to a small bay, Russekeila. Between the valley and Grønfjorden, there is **Vardeborg** (588) with the outlier Starostinaksla, the height of which decreases towards the sea.

Between Grønfjorden and Colesbukta the terrain rises evenly, broken by the wide Hollenderdalen. Southwest of Colesbukta the pointed summit of **Vesuv** (741) is easily identified. Colesbukta is a continuation of the wide Colesdalen.

Further eastwards the terrain changes to a steep 400 m high wall towards the sea, **Fuglefjella**. The mountain side is green in colour from the luxuriant vegetation. At the west end of the mountainside there is the derelict mining town of **Grumantbyen** and Bjørndalen cuts in on the east side. Between **Bjørndalen** and Adventfjorden lies the wide, flat Platåberget (about 466 m) and **Nordenskiöldfjellet** (1050 m) towers above everything.

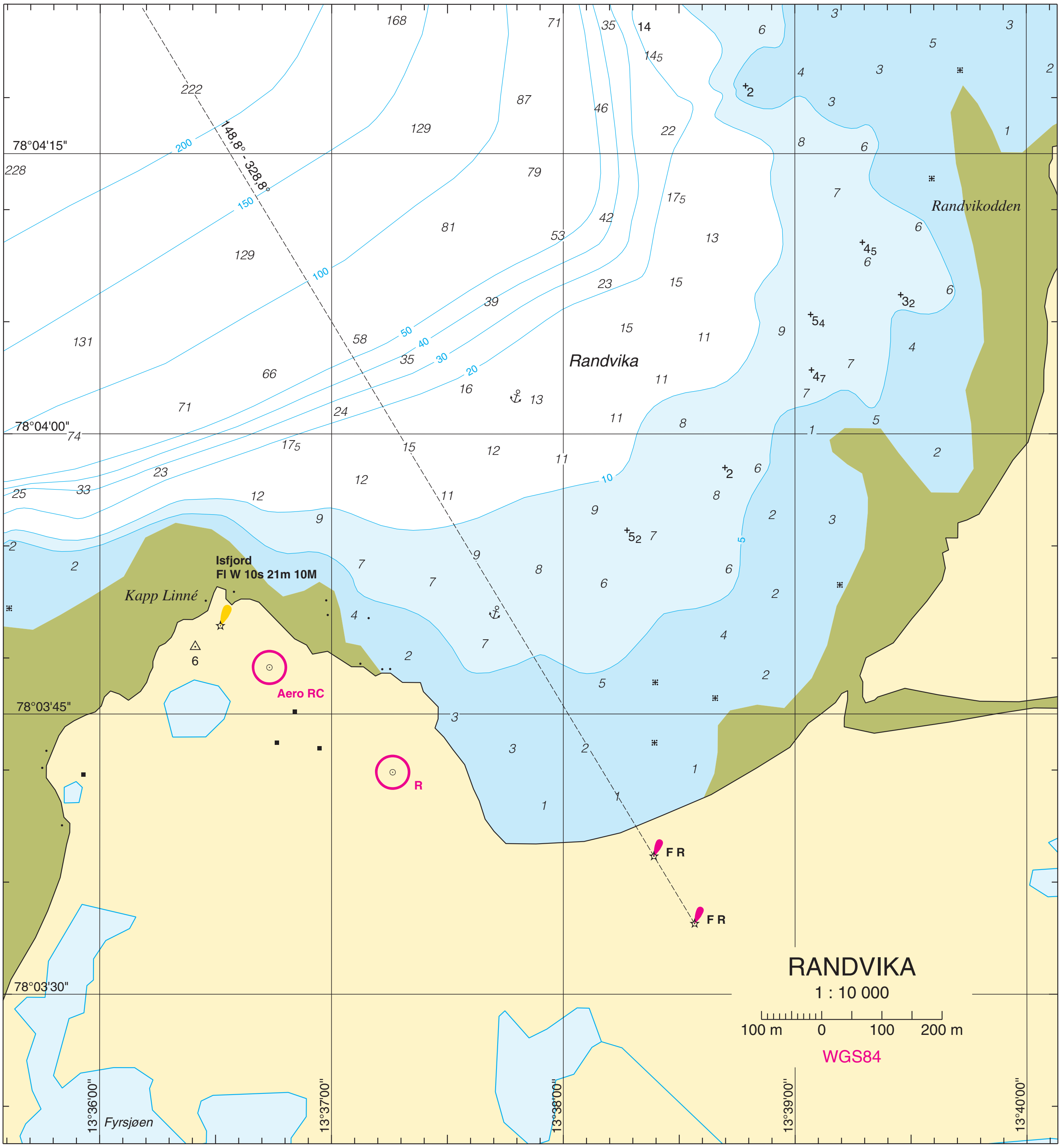
Vessels approaching from south making for Isfjorden should be steered so that they pass over Sentinellefla et, with depths of 30–50 m or over Lexryggen with 60–80 m, which is a westwards extension of Sentinellefla et.

Approaching from the south, **Salfjellet** (430) on **Prins Karls Forland**, appears approximately dead ahead as a separate island. Course is maintained northwards towards the high mountains on the east side of Adventfjorden (with Konusen (982) which is the highest) is brought to about the middle of Isfjorden's mouth, when course is set into the fjord.

Approaching from the north and making for Isfjorden, vessels run clear of the shoals south of **Salpynten** 78°12.4'N, 12°09.11'E) with *the beacon on Daudmannsodden* (78°12.6'N 12°59.11'E) *a little closer to Lexfjellet* (997) *than to Daudmannsodden* (770). Vessels then go clear south of the shoals off Daudmannsodden with *Konusen clear of Alkhornet*. In clear weather and with pack ice in the area these can be clearing marks worth noting. When entering Isfjorden it can also be useful to remember that pack ice on the north side of the fjord is generally more open than on the south side.

There is some shoaling inwards along the north side of Isfjorden, in addition to the two detached skerries **Sagaskjeret** and **Floskjeret** on the outer side of Selmaneset and Borebukta. Isfjorden is otherwise clear and should not present any problems to navigation.

ALKHORNET viewed from WSW Photo: NHS



«The harbour» at Isfjord Radio, viewed from S Photo: NHS

ISFJORD RADIO, Kapp Linné Photo: NHS

ISFJORD RADIO, Kapp Linné, viewed from S Photo: Eiliv Leren

The most westerly anchorage in Isfjorden, **Randvika** (see harbour plan) lies outermost in the mouth and on the south side of the fjord inside **Kapp Linné** (78°03.8'N 13°36.6'E). To enter the anchorage vessels can go in with *2 marks on posts innermost in the bay in line* (149.5°) and anchor in suitable depths. With Kapp Linné (Isfjord light) abeam, vessels will have about 12 m of water.

Isfjord Radio was established in 1933 by the Norwegian State and is used for coast radio and as a weather warning station. Since 1995 the station has been used for tourist activity, first by Telenor and more recently by Svalbard Polar Travel and Spitsbergen Travel who have operated it since 2002.

In December 2005 Telnor sold Isfjord radio to Store Norske.

Basecamp Spitsbergen took over the operation of the place on the 1st January 2008 and arranges tours from Longyearbyen Adventures and overnight accommodation, with 46 beds. The place is fully equipped. The winter season is mid February–May and the summer season is mid June through September. Advanced booking only, isfjordradio@basecampexplorer.com

The area south of Isfjord Radio to Revleodden, including Fyrsjøen, is a bird sanctuary and lawful entry to the area is restricted on account of the protection regulations (Chapter 1).

It is possible for smaller vessels to anchor in **Russekeila**, about 1.5 nautical miles further east, and where there is a cabin built in 1945 and later extended. Svalbard Hytteforening (LJFF) has cabins for hire. See list of cabins in Chapter 1. Both of these anchorages are exposed to strong winds that set out from the fjord, and which occur relatively frequently

Festningen (light) stands at the entrance to Grønfjorden and is a small islet characterised by its vertical sides.

BARENTSBURG viewed from SW Photo: Eiliv Leren

Grønfjorden (Chart No. 523)

Grønfjorden is the outermost fjord arm on the south side of Isfjorden, is about 1.5 nautical miles wide and cuts south-south-eastwards about 10 nautical miles. The fjord is deep and clear but at the mouth, however, it is foul along the shore.

Lights have been established on both side of the mouth of the fjord, on Festningen and on Heerodden Lights in line have also been established; *3 lights in line*, 146.5°, which lead into the middle of the fjord mouth and then in towards the quay in Barentsburg. A light has also been established inside Barentsburg, on Finneset. All the lights on the east side of the fjord are operated by the Russians.

Barentsburg (78°03.7'N 14°13.0'E) is presently the only populated Russian settlement on Svalbard. Coal is now extracted from a mine in the centre of the settlement. Barentsburg has a population of about 800 inhabitants (2009), considerably fewer than just fi e years ago, when it numbered about 1500.

Barentsburg has earlier exported about 250 000 tons of coal annually from here. For many years coal exportation has been in decline but now the Russians have plans to revive it.

It was a Norwegian company that originally secured the place in 1912, before selling it to N V Nederlandsche Spitsbergeb Compagnie, which gave Barentsburg its name.

In 1932 the Russian company Trust Arktikugol took it over and now dominates employment at the place. Most of the mineworkers are from the Ukraine and Russia and have two year contracts with Trust Artikugol. A Norwegian factory, Barents Tekstil, employs 40 women in the production of folklore children's clothing for sale on the Norwegian mainland. Up to 1994 Barentsburg was a family community but due to tightening economic constrictions, the children were sent to the mainland.

The Barentsburg community has been beset by two serious accidents. In August 1996 141 people were lost in an air crash on Operafjellet off Longyearbeyn on the way to Barentsburg, and in September 1997 23 miners perished in an explosion in the mine.

The place, which lies about 40 km from Longyearbyen, has an hotel, a souvenir shop, museum, a meeting house, a sports hall and a swimming pool. The inhabitants are partly self-sufficient with vegetables from greenhouses and have their own cattle barn. There is a post office in the hotel

BARENTSBURG HOTEL Photo: NHS

Barentsburg has a Russian consulate and there is a research station, which mainly records geophysical data, has been established.

There is limited space for several vessels to tie up the quay in Barentsburg. It attracts relatively low harbour dues so it can be an advantage to book a berth in advance during the tourist season.

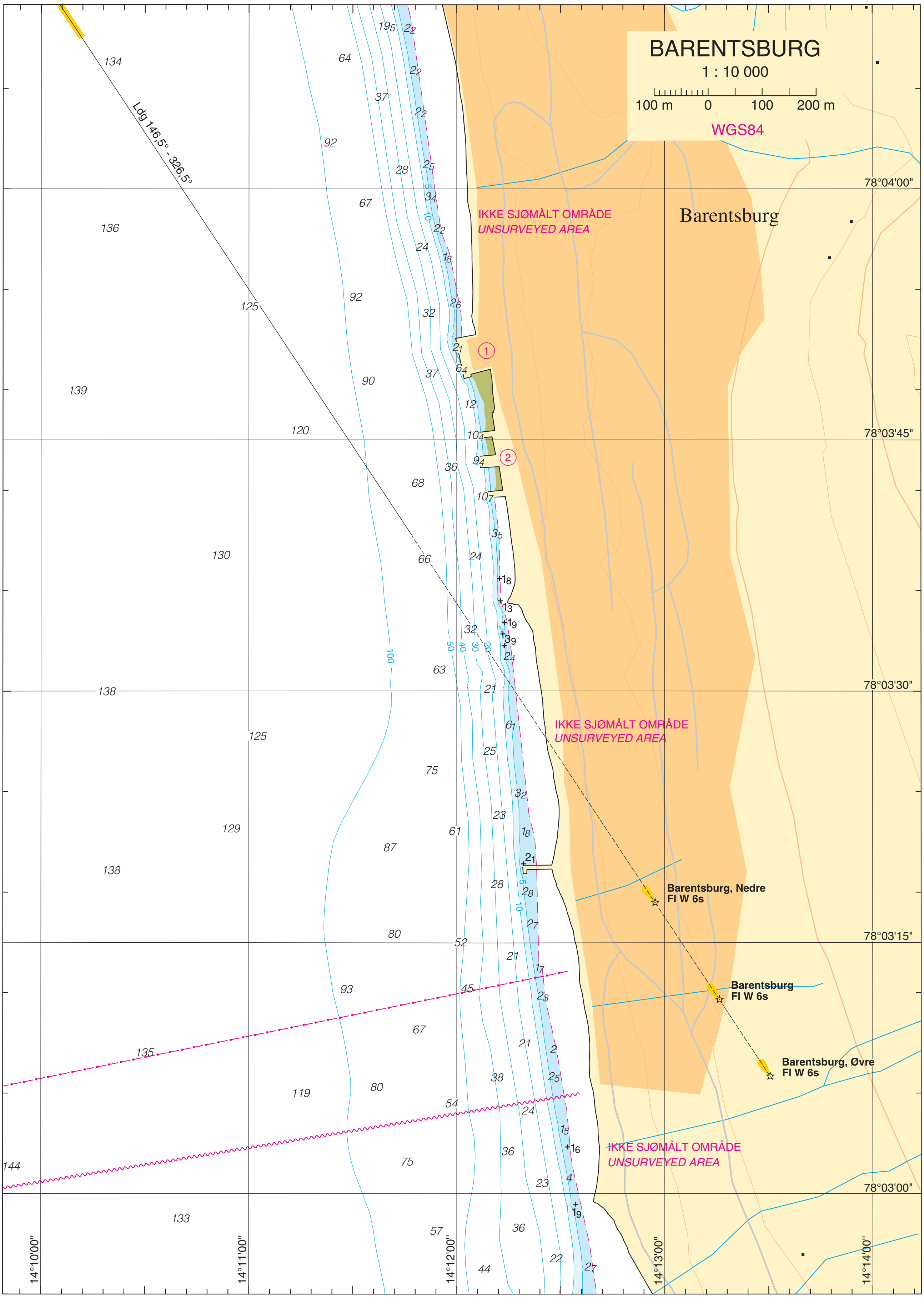
Contact personnel in Barentsburg:
Head of Tourism, Oleg Kostenko (speaks English)
Director of Mines, Nikolaj Mikitenko,

The harbour Office is in the green house which is marked by appropriate signs.

There are the following quays:

1. The main quay, 76 m, iron girder quay, depths from N (2.9)–(at the quay/fender front)1.6–2.1–4.0–6.4–9.1–(11.1) m. Crane. At the south end of the quay there is a small flo ting quay that sailing boats and smaller vessels can use.
2. Three concrete jetties in line, 10 + 21 + 10 m with 33 and 45 m between the jetties; combined berthing length 121 m, depths from north (11.4)–(at the quay/fender front)10.4–10.6–8.0–9.4–11.9–12.0–10.7–(10.9) m. Coal crane.

BARENTSBURG QUAY (1) and the harbour office (green building) Photo: NHS


BARENTSBURG
1 : 10 000
100 m 0 100 200 m
WGS84
Barentsburg
IKKE SJØMÅLT OMRÅDE
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IKKE SJØMÅLT OMRÅDE
UNSURVEYED AREA
Ldg 146,5° - 326,5°
Barentsburg, Nedre
Fl W 6s
Barentsburg
Fl W 6s
Barentsburg, Øvre
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78°03'45"
78°03'30"
78°03'15"
78°03'00"
14°10'00"
14°11'00"
14°12'00"
14°13'00"
14°14'00"

HEERODDEN helicopter station with Barentsburg in the background, viewed from N Photo: Eiliv Leren

The helicopter station on **Heerodden** serves Svalbard Airport and the transport of Russian researchers with duties on Svalbard.

Grønfjorden is relatively deep and small vessels must go quite close to the shore to find suitable anchorage depths. Frequently used anchorages have been in the bays on both sides of **Finneset**. However, it is best south of the ness in **Ankerhamna**, depth 15 m, mud bottom. The anchorage can be of little use when there is ice in the fjord, as there are strong tidal currents there. In such circumstances, there are better anchoring conditions across the fjord in **Kokerihamna**. Ankerhamna is designated as place of refuge against acute pollution. See Chapter 1 for further information. There was previously a Norwegian whaling station on Finneset, and it is also the site of Norway's firs radio station on Svalbard. The District Governor now has a service cabin there.

FINNESET, the station ruins Photo: NHS

The settlement in COLESBUKTA Photo: Eiliv Leren

On the stretch from Grønfjorden and inwards towards **Kapp Laila** a foul shoal area extends some way out from the shore but with care vessels can go in towards the shore to anchor in suitable depths.

There are good anchoring conditions for larger vessels in **Colesbukta** in the middle of the bay, depts. 30–40 m, while it is shoal along the shore, especially on the west side. On the east side of the bay there are the remains of a 30 m long quay, depth 6.0 m, which was earlier used as an exporting quay for the coal trains from Grumantbyen. Further inwards the south side of the fjord it has been built out as a harbour for Grumantbyen, further east. Both places, however, are now abandoned because of the lack of coal deposits. Colesbukta is designated as a place of refuge against acute pollution. See Chapter 1 for further information

FUGLEFJELLA Photo: NHS

GRUMANTBYEN viewed from W Photo: Eiliv Leren

On the stretch between Colesbukta and Adventfjorden it is deep in to the shore and there are no possibilities for anchoring.

Grumantbyen is about 3 nautical miles northeast of Colesbukta and is a disused Russian mining town where the loading of coal was previously carried out by the use of lighters.

The town, which was founded by the Anglo Russian Grumant Co Ltd, was operated until 1926, when there was a break until 1931. The place was abandoned in 1967 but is now owned by the Trust Arkikugol.

Adventfjorden (Chart nos. 513, 523)

Adventfjorden was probably named after the English whaling vessel «Adventure» which was there in 1656.

The fjord is deep and clear but there is an amount of shoaling on both sides of the entrance and innermost at the fjord head. The entrance to the fjord is well marked, as lights are established on Vestpynten and Adventpynten on the south side of the fjord. The whole of the plain inside this stretch is known as **Hotellneset**, and **Svalbard Lufthavn** is situated on this plain. There is a camping site between the airport and the fjord.

There is a coal store and a loading installation inside Adventfjorden.

Smaller vessels can anchor along the shore between **Adventpynten** and the old coal quay but the bottom falls away quite steeply. Mariners must be aware that there is a danger of drifting during strong offshore winds. Larger vessels can anchor throughout the whole fjord inside Adventfjorden, depths 40–60 m, clay and mud bottom. The anchorage is designated a place of refuge against acute pollution. See Chapter 1 for further information.

On the north side of the fjord conditions are about the same as on the south side but the bottom does not fall away as steeply. Vessels sailing from Adventfjorden and further into Isfjorden, or to enter Adventfjorden from the northeast, must keep well clear of the shelving **Revneset**. In the summer three spar buoys are positioned on the reef in the direction of Hotellneset but navigators should note that pack ice can easily alter the positions of the buoys.

It is difficult to find a suitable lead to run clear in Adventfjorden but vessels will be clear on the northwest side of the dangerous area around Revneset on the following lead; *a sharp spike high up on the mountainside on Platåberget southwest of the west point should be visible*. It stands out against a clear sky.

BJØRNDALEN viewed from W Photo: Eiliv Leren

SVALBARD AIR STRIP, Longyearbyen, viewed from E Photo: Eiliv Leren

LONGYEARBYEN viewed from N See also http://kystnor.no/ Photo: Eiliv Leren

Longyearbyen (78°13.5'N 15°37.1'E) is the centre of the local administration on Svalbard and has the following representatives of the Norwegian Administration: the District Governor, Mayor, priest and others. There is a post office for Svalbard also situated in Longyearbyen and Svalbard Radio has a telephony station on Kapp Linné. Also here are the usual telephony and broadcasting services and TV (NRK).

Longyearbyen was founded in1906 by the Arctic Coal Company of Boston. The principle owners of the company were John Munro Longyear and Fredrik Ayer. In 1916, Longyearbyen and other properties of the company were taken over by the newly founded Store Norske Spitsbergen Kulkompani AS (SNSK), state owned since 1976.

Since mine 3 was abandoned in 1996 there are now only mine 7, innermost in Adventdalen, operating coal extraction in the neighbourhood of Longyearbyen. In addition the company operates mining in Sveagruva. The combined extraction from the Norwegian coalmines on Svalbard (Gruve 7 and in Svea-Nord in Sveagruva) was 1.9 million tons in 1010.

From the middle of the 1900s a varying livelihood has emerged from tourism, research and education, but also with a wide spectrum of other service-related businesses.

THE CAMPING SITE on Hotellneset Photo: NHS

PEDESTRIAN SHOPPING STREET in Longyearbyen Photo: Eiliv Leren

The increasing number of jobs in other occupations has therefore compensated for the loss of positions connected with coalmining. There is also considerable activity within research and investigation. About 350 students participate annually in one or more of the available courses organised by The Universiy Studies on Svalbard (UNIS).

AnaccuratepopulationcountinLongyearbyenatanytime is somewhat uncertain because of its high mobility, but it can be estimated to be around 2130 inhabitants (2014). It is made up predominantly of Norwegians 1170, followed by Swedes 120, Thailand 111, Russians 45, Danes 38, Germans 28, from other countries in Europe 141 and other countries 75.

Today Longyearbyen is a varied family community with well built infrastructure. In recent years it has undergone activities that have resulted in considerable changes to the landscape picture, especially to be mentioned is the road to the top of Platåfjellet in connection with the operation of the satellite station and the new high basin of the drinking water source, Isadammen.

The town is divided into distinct areas, with regard to fi e safety. On the inner side of «Gamlekaia» there are also workshops, the power station and a number of warehouses. From here the road rises up to the State buildings, the District Governor's offic , Televerket, the mayor's office and the church. (Across from here is the old Longyearbyen which was burnt down during the war in an attack by the German battleship «Scharnhorst»). There is also the former piggery which in 1981 was converted to the Svalbard museum.

Further up the valley, on the same side, is the Assembly House which includes a refreshments kiosk, cinema, cafe and restaurant. On the other side of the valley, a little further in, is «Nybyen» with a huge block of apartments. From here the road then goes down again to «Haugen» with the school, hospital, office uildings and a number of family residences.

The town ends in the direction of the fjord head with a number family houses and fl ts along Hilmar Rekstenvei. The post office is also in this area, together with a bank, cafeteria, businesses, hotels and the new commercial buildings, including the District Governors Offic , the tourist offic , travel agents and the university.

Svalbard airport on Hotelneset has daily services to Tromsø and Oslo. The airport also serves the service planes from Murmansk, Ny-Ålesund and Sveagruva and small aircraft and helicopters that are used for communications within Svalbard.

The LOMPEN CENTRE in the pedestrian shopping street Photo: Eiliv Leren

LONGYEARBYEN HARBOUR See also http://portlongyear.kystnor.no/ Photo: Eiliv Leren

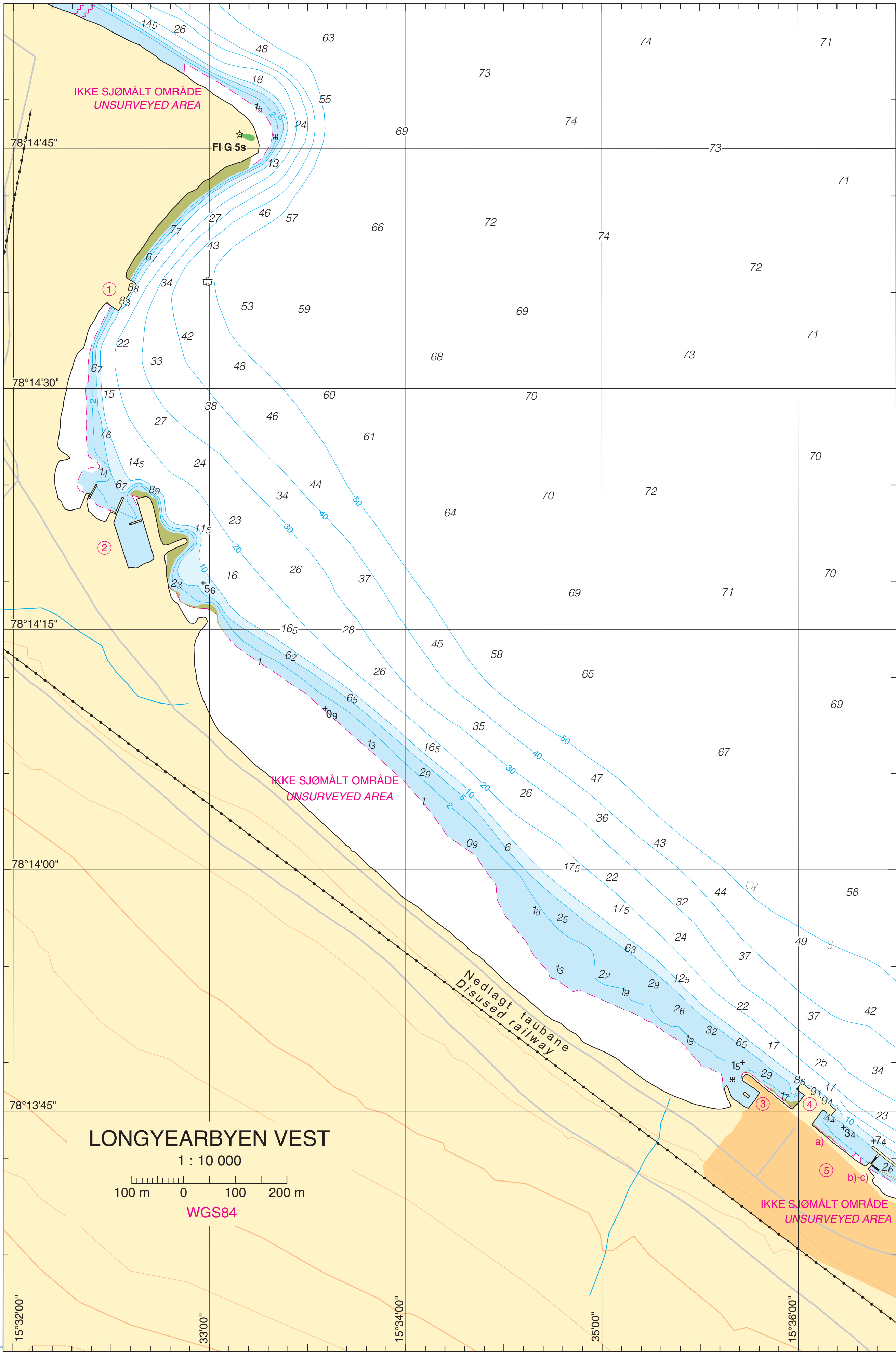
The harbour office stands on Bykaia, quay 4, VHF channels 12/16, phone +47 911 22 300.

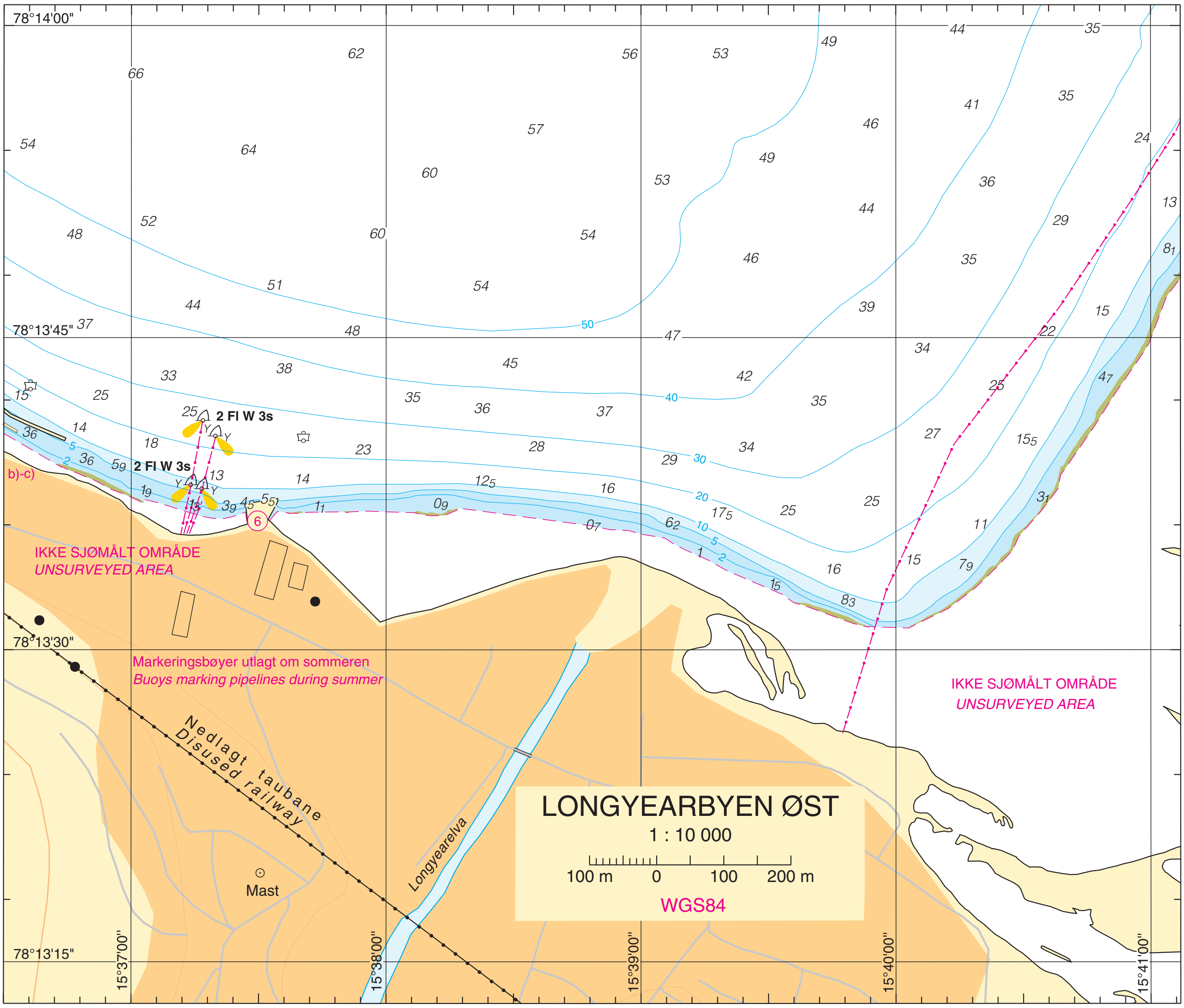
Navigators must be aware of the current along the quays that follow the tidal stream in and out of the fjord.

There are the following quays in Longyearbyen (see harbour plan):

1. Kullkaia, 62 m steal quay, depths, see plan. Conveyor belt for coal loading. The quay is comparatively small and to moor safely, coal boats must use a port anchor, a deployed handling buoy aft and mooring cables to the shore. Innermost in the bay two leading lights have been establis-hed to aid manoeuvring in to the quay.
2. Longyearbyen Small boat harbour (To-takteren). Water- oil- and petrol avilable (cashpoint) from floating stage. Floating stages for about 130 permanent places.
3. 12 m flo ting quay, depths 1.0-1.2 m. Quay for cruise ships tenders. ISPS terminal
4. Bykaia, 85 m concrete quay, depths (at the quay/fender front), se plan. The NW end 16.5 m with timber fenders, depths from NE (10.7)-8.4-6.1-4.6-(6.1) m and on the inner side (NW) 19 m, depths from NW (5.6)-4.4-3.8-1.3 m. The SE end 16.5 m, depths from NE (12,5)–8.7–7,3–4.7–(4.2) m, and the inner side (SE) 20 m with timber fenders, depth from SE (4.5) 4.5-1.3-0.0 m. Water and electricity. The point loading capacity is 80 tons, 4 tons per m^2. Cruise and loading quay. ISPS terminal.
5. Guest Docks:
   a) Yacht pier, 45 m floating quay, depth 3,2–2,1–0,8 m.

KULLKAIA (1), Longyearbyen (new quay 2013, se text) Photo: Eiliv Leren


IKKE SJØMÅLT OMRÅDE
UNSURVEYED AREA
Fl G 5s
78°14'45"
78°14'30"
78°14'15"
78°14'00"
78°13'45"
IKKE SJØMÅLT OMRÅDE
UNSURVEYED AREA
Nedlagt taubane
Disused railway
IKKE SJØMÅLT OMRÅDE
UNSURVEYED AREA
a)
b)-c)
LONGYEARBYEN VEST
1 : 10 000
100 m 0 100 200 m
WGS84
15°32'00"
33'00"
15°34'00"
35'00"
15°36'00"



5. Guest Docks:
   b) Tourist pier, 220 m floating quay, depth stated to 7,0 m. Electricity, water and diesel (credit card).
   c) Rib pier, 80 m floating quay, docking on both sides. Electricity and water.

   Service department in the harbour building with phone, washing/drying, showers and toilets.
6. «Gamlekaia», 53 m steal quay, depths, see harbour plan. Diesel and water filling. ISPS Terminal. Goods and personnel office. Advanced booking for the use of both the quay and workshop must be obtained in advance from SNSK. The same applies to those wishing to take on oil or water. There is a 70 ton mobile crane in Longyearbyen.

Bunkers at Tourist quay (2018) Photo: NHS

TOURIST QUAY (2018) Photo: NHS

The area between Adventfjorden and Sassenfjorden is covered by a mountain range with sloping valleys. The most conspicuous mountain peaks viewed from seawards are **Hiorthfjellet** (923) and **Konusen** (982).

DELTANESET light viewed from W Photo: NHS

Sassenfjorden and Tempelfjorden (Chart No. 523)

Sassenfjorden runs east-south-eastwards and then continues north-eastwards as Tempelfjorden, both of which are about 8 nautical miles long. From Revneset to Diabasodden the 20 m contour narrows to half of its 6 cables and continues in Sassenfjorden to Vindodden at 2 cables. The seabed falls away steeply along the whole stretch. From Vindodden the contour extends about 1 nautical mile and provides good anchoring facilities at least this distance from the shore in towards Sassendalen.

GIPSHUKEN, cabin Photo: NHS

There is a refuge cabin, built in 1928, on the north side of Sassenfjorden, in **Gipshuken**, north of Gipshukodden. See list of cabins in Chapter 1.

Gipsvika, about 2 nautical miles wide, is foul up to 1 nautical mile from the shore. Suitable anchorage depths are best found along the east side of the bay in 13-40 m, mud and clay bottom. The anchorage is open to westerly winds and swell Gipsvika is designated a place of refuge against acute pollution. See Chap-ter 1 for further information.

It is clear along the shore from here to Bjonapynten.

Off Gipsvika there is a shoal ridge, Hofstenflaget, w hich extends in a direction of northwest-southeast for about 2.5 nautical miles. The ridge lies approximately in the middle of Sassenfjorden with depth of less than 20 m. In the middle of the ridge there is the most dangerous shoal, **Ministergrunnen**, depth 6 m. Vessels go clear north of the shoal with *Fjordnibba*

TEMPLET, Sassenfjorden Photo: NHS

FREDHEIM Photo: NHS

(333) east of Sassendalen, *a little in on Bjonapynten* 110º, or south of on the line *Rejmyrefjellet* (614) *in line with Bjonapynten*, 086º.

From Gipsvika, Gipsdalen cuts into the middle of the peninsula between the fjord arms.

Off **Sassenelva** there is a delta with drying areas which extends right out to the 20 m contour and the area is therefore completely un-navigable.

On the passage between Sassenfjorden and Tempelfjorden the wide Sassendalen lies on the south side, and the mountain **Templet** (766) stands on the north side. Templet is a favoured tourist attraction with its peculiar formation and steep sides towards the sea. The name stems from the mountain's similarity with «temple ruins».

Fredheim, which consists of a main house, a refuge cabin, Danielbu, and an outside toilet, is situated near the river delta from **Nøisdalen**. This was the main station used by Hilmar Nøis (1891–1975) who stayed 38 wintering on Svalbard.

Danielbu was built by Hilmar's uncle Daniel in 1911–1912. The main house, Fredheim, was built by Hilmar Nøis in 1924. The cabin is now under the District Governors care and the main house is used as a service cabin, while the other building is a refuge cabin.

In **Tempelfjorden** the best harbour in the area is **Bjonahamna**, just on the east side of Bjonapynten on the north side of the fjord. There are shoals a little out from the shore on the east side of Bjonapynten and most northerly in the bay. Mariners must also be aware of calf ice from Von Postbreen innermost can cause problems in the fjord.

Bjonahytte, built by A B Spetsbergen Svenska Kolfält in 1910, stands by the harbour. The cabin is used by To-takter'n as a hire cabin. See the list of cabins in Chapter 1 for more information.

Inwards the fjord is clear on both sides until reaching halfway to the head of the fjords, to Kapp Murdoch. At this point there are shoals on both sides of the fjord. All the shoals lie less than 0.5 nautical miles from the shore.

The cabins in Bjonahamna Photo: NHS

SELBUHYTTA, Schoultzhamna Photo: NHS

GÅSØYANE with BILLEFJORDEN viewed from S Photo: Eiliv Leren

Selbuhytte, which LJFF uses as a hire cabin stands in **Schoultzhamna**. See list of cabins in Chapter 1.

Billefjorden (Chart No. 523)
The two fjords Sassenfjorden, and Billefjorden which is about 6 nautical miles long, are naturally separated by **Gåsøyane**. Gåsøyane consist of one large island (previously two) and a pair of smaller islets. Gåsøyane form a bird sanctuary and legal access to the islands is restricted because of the protection regulations. (See Chapter 1).

On both sides inwards into Billefjorden there are mountainous areas which fall steeply to the fjord, with the exception of the north-eastern part where there is a coastal plain about 1 km wide. The most distinctive mountain in the area is the previously mentioned Pyramiden (938).

SVENSKHUSET, Svalbard's oldest standing house Photo: NHS

Between Kappp Thorsden light and Rundodden light stands Svenskhuset, which is easily visible from the fjord. In the winter of 1872–73 seventeen young seal hunters lost their lives. The young men died after an unintentional over-wintering in Svenskhuset. For a long time it was a mystery surrounding their death. Later investigations suggested that poisoning from the lead in the canned food tins was the cause. Svenskhuset, from 1872, is considered Svalbard's oldest surviving house. It is now used as a refuge cabin. See list of cabins in Chapter 1.

KAPP EKHOLM, light Photo: NHS

SKANSEN mountain with the cabins in Skansbukta Photo: NHS

The entrance to Billefjorden is well marked by lights on Gåsøyane and Rundodden. In the outer part of the fjord, there are some shoal flats b et ween G åsøyane a nd P hantomodden light, which extend out towards the middle of the fjord, and which end with shoals of 5–8 m. On the most northerly flat there is a rock awash on the eastern edge about 1 nautical mile from the shore off Brisingefjellet. As an aid for entering Billefjorden, there is a light on Kapp Ekholm which shows a white sector be tween Rundodden and the mentioned shoal flats. There is an 10 m shoal with in the western edge of the white sector, and vessels with deep draught will go clear of all the shoals by sailing into the fjord on the line 1 nautical mile from Rund odden to 1 nautical mile from Narve neset light.

Smaller vessels can go into Billefjorden between Gåsøyane and Gåsodden by keeping in mid channel between the point and the most easterly small islet, where the depth is about 5 m. When passing round Gåsøyane, mariners must beware of a rock awash lying 3 cables west of the largest (most northerly) of the islands.

In **Anservika** inside Gåsøyane, vessels can anchor over the whole bay, but must watch for calf ice from Nordenskiöldbreen and heavy squall winds, the latter of which also applies to the fjord in general.

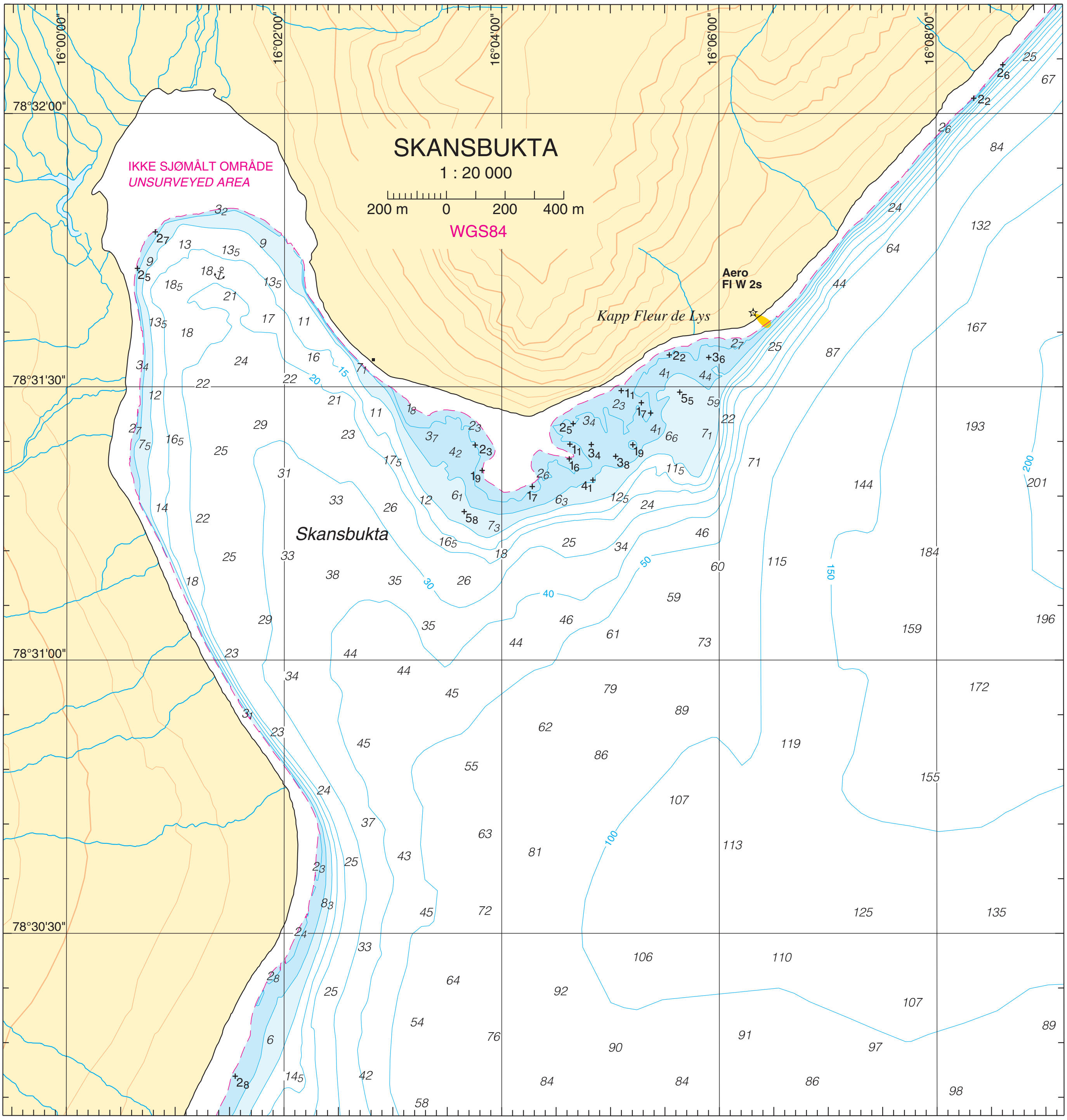
Further inwards along the east side of the fjord, except for a shoal fl t near **Phantomodden**, it is comparatively deep close inshore until right into Adolfbukta, where it is shallow along the shore on the south side.

The Spitsbergen Experience cabin is situated here in Adolfbukta.

Skansbukta lies outermost on the north side of Billefjorden and is about 1 nautical mile long. On the north side of the entrance it shoals out a little from the shore and innermost in the fjord a drying area extends about 2 cables. The bay offers good anchoring conditions including that for larger vessels. Skansbukta is designated as a place of refuge against acute pollution. See chapter 1 for further information.

On the north side of the bay there are the remains of an abandoned gypsum quarry. The cabin on Skansbukta is used by LJFF as a hire cabin. See list of cabins in Chapter 1.

Large vessels can anchor in **Mimerbukta** in depths of 30–40 m, while smaller vessels can moor further in on a depth of 15 m, good holding ground in both places. It is open to southerly winds due to swell and also to easterly winds from Nordenskiöldbreen. Mimerbukta is designated as a place of refuge against acute pollution. See Chapter 1 for further information.


SKANSBUKTA
1 : 20 000
200 m 0 200 400 m
WGS84
IKKE SJØMÅLT OMRÅDE
UNSURVEYED AREA
Aero
Fl W 2s
Kapp Fleur de Lys
Skansbukta
78°32'00"
78°31'30"
78°31'00"
78°30'30"
16°00'00"
16°02'00"
16°04'00"
16°06'00"
16°08'00"

PYRAMIDEN viewed from SE Photo: Eiliv Leren

Pyramiden (78°39.3'N 16°21.0'E) lies innermost in Mimerbukta and was until 1998 the other main place of Russian mining on Svalbard. A Swedish company originally established the place. In 1921 Svenska Stenkolsaktiebolaget Spitsbergen took it over and then it was taken over by Russky-Grumant in 1926. From 1931 Trust Arktikugol operated the place, which annually exported a good 200 000 tons of coal.

In April 1998 Trust Arktikugol closed the coal mining operation in Pyramiden after 53 years of continuous production. At the most there were 1000 Russians and Ukranians in Pyramiden and the inhabitants had a school and an active community life. It is uncertain what plans Trust Arktikugol have for the future of the place. Plans for extending tourism have been mentioned. Buildings and installations in Pyramiden are important cultural historic documentation and the District Governor has concluded that the place should be preserved for posterity. The District Governor has also ordered that the site should be cleared of any pollutants left by the mining operations.

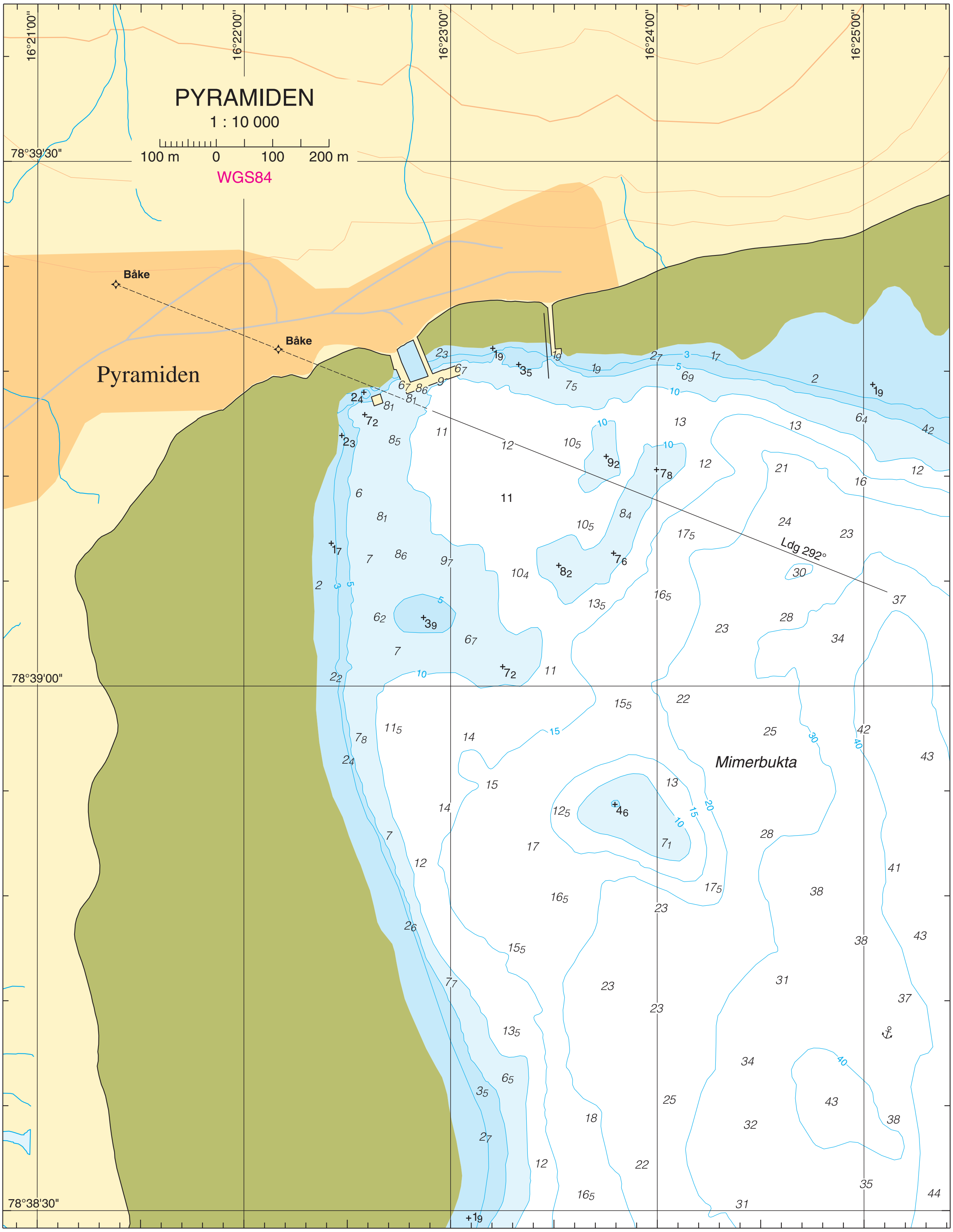
PYRAMIDEN, the kindergarten Photo: NHS

Now, in 2011, there are 3–4 people who function as watch keepers of the place, work as guides and collect harbour dues.

There are the following berths (see harbour plan):

1. 103 m timber quay, depths from E (8.5)–(at the quay-fender front)8.7–10.0–9.0–8.2–8.6–8.1–(8.2) m 45 m west from the quay and in line, 16.5 m detached timber berth, depths from the main quay (8.2)–(8.1) at the quay-/fender front)6.6–7.0–(8.0) m. The east end of the main quay, 18 m, depths from S, 8.1–5.6–(4.5) m. The inner side, 46 m, depths from E (5.0)–4.7–5.1–4.5 m. The west end, 47 m, depths from S, 9.0–8.3–2.0 m. There is a conveyor belt for the former loading of coal on the quay.

Approach to the quay can be by going in on the sector boundary of *the white-green of Kapp Ekholm light*, 156°, and further in there are two leading marks in line on 292°.


PYRAMIDEN
1 : 10 000
100 m
0
100
200 m
WGS84
16°21'00"
16°22'00"
16°23'00"
16°24'00"
16°25'00"
78°39'30"
78°39'00"
78°38'30"
Båke
Båke
Pyramiden
Ldg 292°
Mimerbukta

BRUCEBYEN 2007, Russehytta, the refuge cabin on the right of picture, was burnt down in 2010 (reconstructed in 2012–2013) Photo: NHS

SKOTTEHYTTA, Petuniabukta Photo: NHS

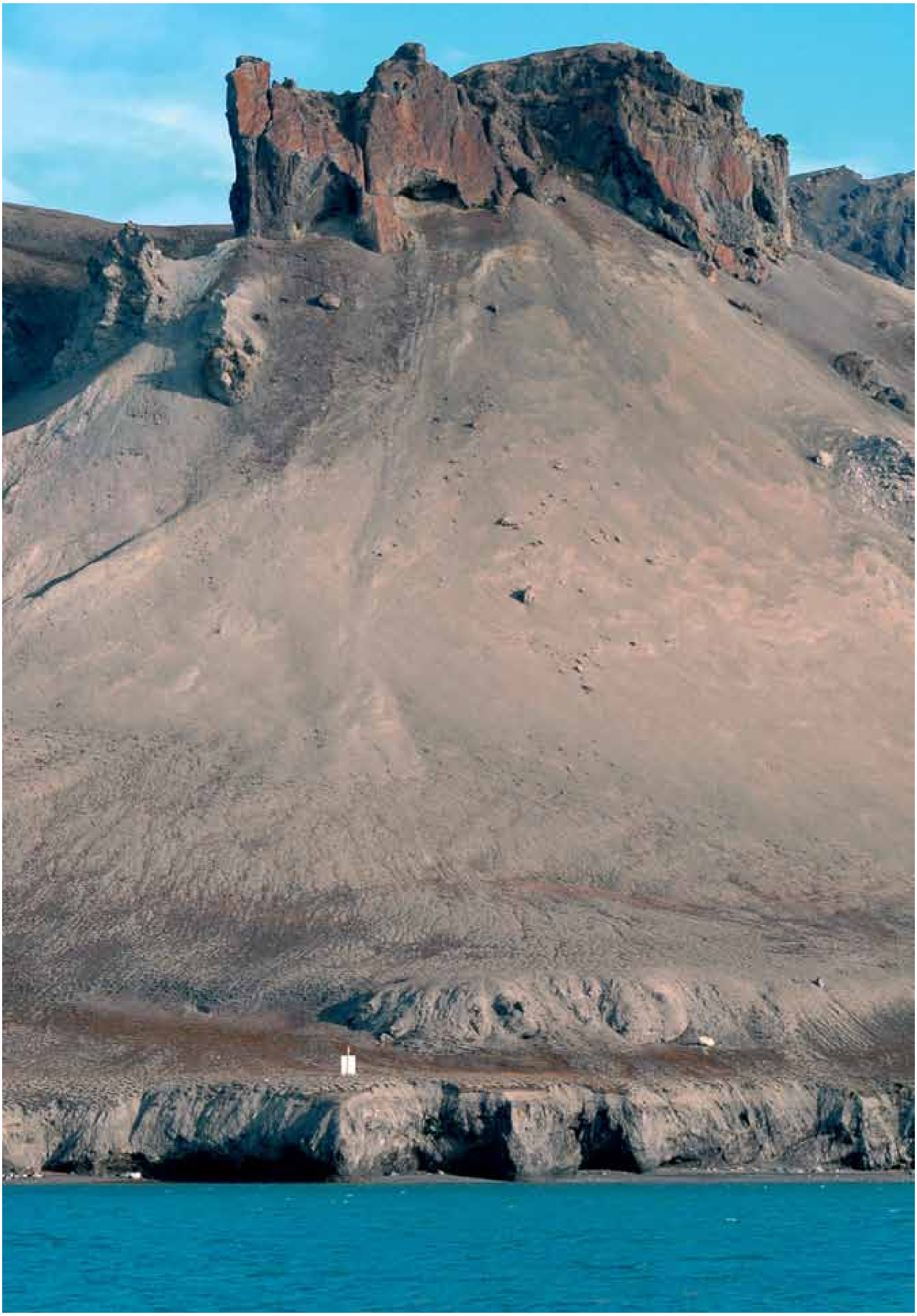
Brucebyen, a small collection of houses, stands on the east side of Billefjorden, near **Kapp Napier**. The town takes its name from the Scottish oceanographer and polar researcher William Spiers Bruce (1867–1921). The place, which is one of the best preserved under The Scottish Spitsbergen Syndicate Ltd, consists of a works barracks and outhouse. The remains of the rail track for transporting freight between the buildings and the shore are still there. Today the barracks are used by the District Governor as a service cabin. See list of cabins in Chapter 1.

Adolfbukta is not useful as an anchorage due to the great depth and large amount of pack ice that comes from Nordenskiöldbreen.

A long bank extends about 1 nautical mile out from **Rudmosepynten** between Adolfbukta and Petuniabukta, and it is also shallow along the eastern shore further inside Petuniabukta. The innermost part of the bay is filled by a large drying area, although it is deep again close inshore outwards along the western shore. There are two shoals, 12 m and 13 m in the middle of **Petuniabukta** but otherwise there are very suitable anchoring depths in the bay. Skottehytte, for many years a shelter for Polish researchers, stands on the east side of Petuniabukta. The cabin is owned by Longyearbyen Jeger and Fiskeforening (LJFF) who hire it out. See list of cabins in Chapter 1. Ebbahytte, a refuge cabin, is situated a little further up in Ebbadalen.

On the west side of the entrance to Billefjorden are **Høgskulefjellet** (666) and **Saurieberget** (659), glacier-covered and easy to recognise. At the foot of the mountains there is a narrow coastal plain that extends westwards to Tschermakfjellet (422) where it almost vanishes, only to then widen again northwards towards **Kapp Wijk** in Nordfjorden.

ADLOFBUKTA and NORDENSKJÖLD GLACIER viewed from W Photo: Eiliv Leren



RUDMOSEPYNTEN light with FORTET Photo: NHS

The inner part of PETUNIABUKTA, viewed from S Photo: Eiliv Leren

Nordfjorden, Dicksonfjorden and Ekmanfjorden

(Chart No. 523)

Nordfjorden is the joint mouth of Dicksonfjorden and Ekmanfjorden. It is nine nautical miles wide and runs northwards to Kapp Wærn where it parts and continues as Dicksonfjorden and Ekmanfjorden.

It is more or less shallow along both sides of Nordfjorden but otherwise the fjord is deep and clear. It is stony around the whole of the Kapp Thordsen area and the stony, shelving area extends out by about 1 nautical mile from shore due south from the ness. Further in the fjord becomes deep close in with a steeply sloping bottom off Tschermakfjellet and inwards until the wide bays south of Kapp Wjik are encountered. At this point it shelves with fin , even sand bottom and vessels can anchor in suitable depths.

Hagahytte, built in 1923 by Oxaas-P. Pedersen stands outermost on the east side of the fjord. It is used by Harald Solheim as a secondary base while hunting, see list of cabins in Chapter 1.

KAPP THORDSEN, light Photo: NHS

KAPP WIJK Photo: NHS

KAPP WIJK viewed from W Photo: Eiliv Leren

Kapp Wijk is a hunting station that is still in use. The surrounding area has a network of secondary bases which shows the hunters' use of the terrain. The place has long traditions, with three generations of hunting cabins. Two of the cabins were used by the legendary huntsman Arthur Oxaas. The third was built by the present and similarly legendary hunter, Harald Solheim. The place illustrates the good development from the completely plain to the more comfortable (Cruise Guide).

Oxaashytta on Kapp Wijk was renovated in 2007, which included raising it from the hill to avoid decay.

Dicksonfjorden cuts northwards from Kapp Wijk and Kapp Wærn. From Kapp Wærn and along the west side of entrance to the fjord it is stony and shelves out to 5–6 cables from the shore. In the large bay on the inner side of the point, the shoal area extends a good 1.5 nautical miles from land, although there the bottom is even sand. On the east side of the entrance, mariners must beware of a 6 m shoal which lies 6 cables southwest of Kapp Wijk, and there are the same conditions inside the point as on the west side, with shoal areas extending out about 5 cables from the shore. There is a large shoal fl t, **Bockbanken**, in the middle of the fjord inside Kapp Wijk, with depths largely between 0–4 m. Further inwards, the fjord is deep and clear along shore until half way in, to approximately opposite Ramusdalen. From there and inwards there are large shoal areas extending to 1.5 nautical miles from the shore on the east side, while there are some narrower shoal areas on the west side.

Larger vessels should take care when visiting the fjord. When entering, they can sail on a northerly course and keep in mid channel until past the narrowest area near Kapp Wijk, after which they can steer directly towards on **Lykta** (854). On this course vessels will pass a ridge in about 13 m, and then to maintain a slightly more northerly course, following round the bay about 0.75 nautical miles off to run clear of the dangerous Bockbanken.

Vessels can anchor in 30–35 m of water, sand bottom, in the bay on the south side of **Kapp Smith**. It is a fi e area for disembarking and is luxuriant and green. The cabins on the ness and on Blomesletta are both used as secondary bases.

It is luxurious and green inwards along Dicksonfjorden, especially on the west side. There are cabins at Fløielenga and below Gangerolvfjella and there are several places for water filling

The cabin on Kapp Smith Photo: NHS

LYKTA (854) Photo: NHS

Tåkefjellhytta stands on the north side of northern **Bolle-neset**, and is as a secondary base.

Perhaps the best anchorage in the fjord is the basin inside **Kapp Nathorst**, where there is good holding ground with depths of 20–40 m. However, as previously mentioned, mariners must beware of the large shelving areas innermost in the fjord.

With ice in or outside the fjord mariners must beware of the danger of the entrance becoming blocked by ice. This situation, combined with the large shoal areas in the entrance, can make safe navigation very difficult

The large Blomsletta is outer-most on the peninsula between Dicksonfjorden and Ekmanfjorden, with **Tolmodryggen** as an outlier from the western slope of **Kapitol** (857) further in on the penisula.

TÅKEFJELLHYTTA, Bolleneset Photo: NHS

Ekmanfjorden extends about 11 nautical miles northwards between Kapp Wærn and Sveaneset. Two island, Flintholmen and Coraholmen, lie in the fjord and both consist mainly of moraine laid down over time by Sefströmbreen.

Landing can be made on the outermost point of **Kapp Wærn** but otherwise it is shallow by the headland. About 3 nautical miles inside Kapp Wærn, a shoal fl t extends about 1 nautical mile from the shore, with depth of 3–4 m and a 1 m shoal outermost.

Along the shore from **Sveaneset** and northwards to Flintholmen, there is a fine low plain with good access for landing. The river from Bertilryggen provides possibilities for water filling A little further in on the west side of the fjord is **Flintholmen** with a wide shoal fl t that extends about 1 nautical mile out into the fjord, with depths of 0–3 m. Vessels go clear of both of the named shoals by keeping *the shore under the mountain* **Kolosseum** (603) *up to Coraholmen*. When on this course vessels are abeam of Flintholmen, they can be steered north westwards towards the moraine off Sefströmbreen. The water is shallow around Coraholmen and mariners must be especially aware of a rock awash that lies midway between the islet and the moraine off Sefströmbreen. To enter the basin on the inner side of Coraholmen vessels must therefore keep closer to the westerly shore than to the islet. Vessels can also go in on the southern side of the islet but the depth here are shallow, 3–4 m. Vessels can anchor here off **Tolmodbukta**, 8–15 m, sand and stone bottom.

In the western fjord bay there is a basin close in towards the glacier where the depth is about 30 m. The basin, however, is closed by a moraine ridge that crosses the bay but vessels can go in along the northern shore in depth of 3 m.

Vessels can anchor in Ekmanfjorden north of Flintholmen, 30–40 m, sand and stone bottom.

FLINTHOLMEN viewed from NE Photo: NHS

Vessels can anchor north of Coraholmen in 30–40 m, sand bottom. This landscape in this area contrasts greatly, from desolate and barren to luxuriant green areas.

The whole of the waters surrounding the innermost, western part of the fjord has moraine ridges deposited by **Sefströmbreen**. **Coraholmen** has a particularly remarkable appearance with its western half looking like a «moon landscape» with hardly any vegetation, while the east side has a relatively rich flo a.

Along the west side of Nordfjorden and further round **Bohemanflya** and Erdmannfl a it is shelving and stony up to 1.5 nautical miles from the shore. In the large bays that reach in to the glaciers there are sills across the entrance that can be crossed in reasonable depth to enter the deep basins inside. **Tvillingholmane** and the islets east of Øienbukta are bird sanctuaries and legal access to the islands is restricted under the protection regulations (Chapter 1). A refuge cabin, built by the Kullkompani Isefjord in 1900, stands on Bohemanneset, on the inner side of Tvillingholmane, See list of cabins in Chapter 1.

KOLOSSEUM (603) viewed from S Photo: NHS

ESMARKBREEN, Ymerbukta with the summits Knasten, Spiret and Polhøgda, from left to right Photo: Eiliv Leren

Further south-south-westwards towards the mouth of Isfjorden, a number of large glaciers terminate in the sea. They are **Sveabreen**, **Wahlenbergbreen**, **Borebreen**, **Nansenbreen**, **Esmarkbreen** and **Kjerulfbreen**. A number of large ridges with coastal plains project between the glaciers. The most remarkable mountain is **Syltoppen** (680) which stands inside the largest coastal plain, Bohemanfl a, with its entrance in Nordfjorden.

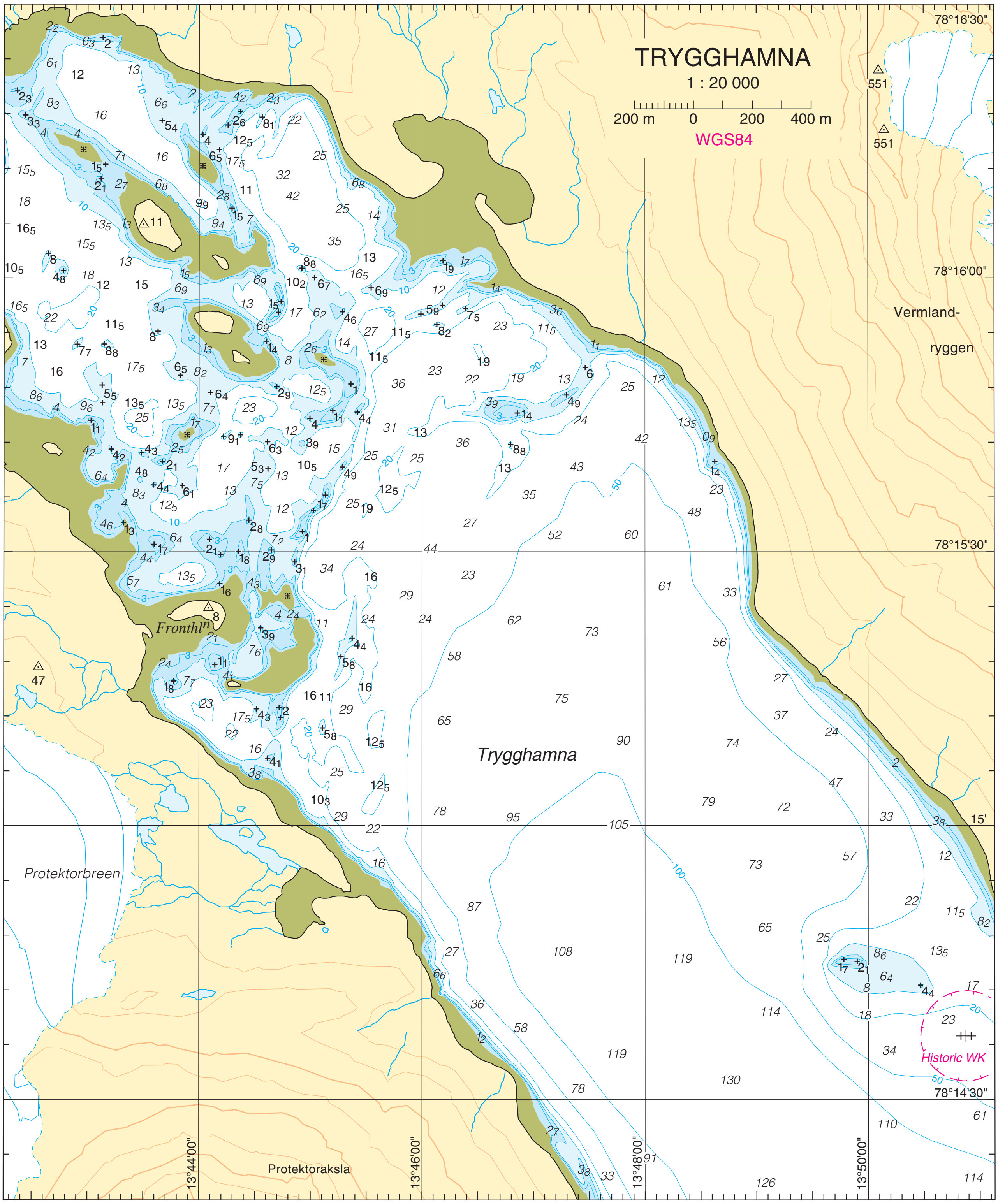
The shallowest sill, off **Sveabreen** and in **Borebukta**, has shoals respectively of 6 m and 8 m. The sills are good anchorages as they consist of moraine masses which provide good holding ground.

Floskjeret, off Borebukta, will normally be visible (ripples) but it can easily be mistaken for an ice block. It is deep on all side of the rock and it represents a danger to shipping as it lies isolated about 2.5 nautical miles out in the fjord, east of Erdmannfl a.

Ymerbukta lies on the west side of Erdmannfl a. The bay extends 4 nautical miles northwards towards Esmarkbreen. It shelves along the east side of the bay but otherwise the water is clear. Vessels can anchor on the sill within the bay in depths of 12–15 m, with good holding ground.

Sagaskjeret, 7 cables south of Selmaneset, is small but with deep water on all sides.

Värmlandryggen, on the east side of Trygghamna, has a comparatively even height of between 500 m and 575 m, and falls very steeply to the sea at the tip of Selmaneset.



Trygghamna extends about 3.5 nautical miles northwards on the west side of Selmaneset. The innermost part of the bay is a shallow area from the glacier and about 1 nautical mile outwards; while elsewhere it is deep close to with depth decreasing from 180 m at the mouth to about 20 m further in, with good holding ground. Mariners should beware of a 1.7 m shoal about 3 cables northeast of the shore about 2 nautical miles into the fjord. There can be strong down winds but as the glacier ends on the land there is no threat from calf ice. Trygghamna has in its time been used much by whale hunters who considered it a safe haven – hence its name – because pack ice does not usually enter it. The harbour is designated a place of refuge against acute pollution. See Chapter 1 for further information.

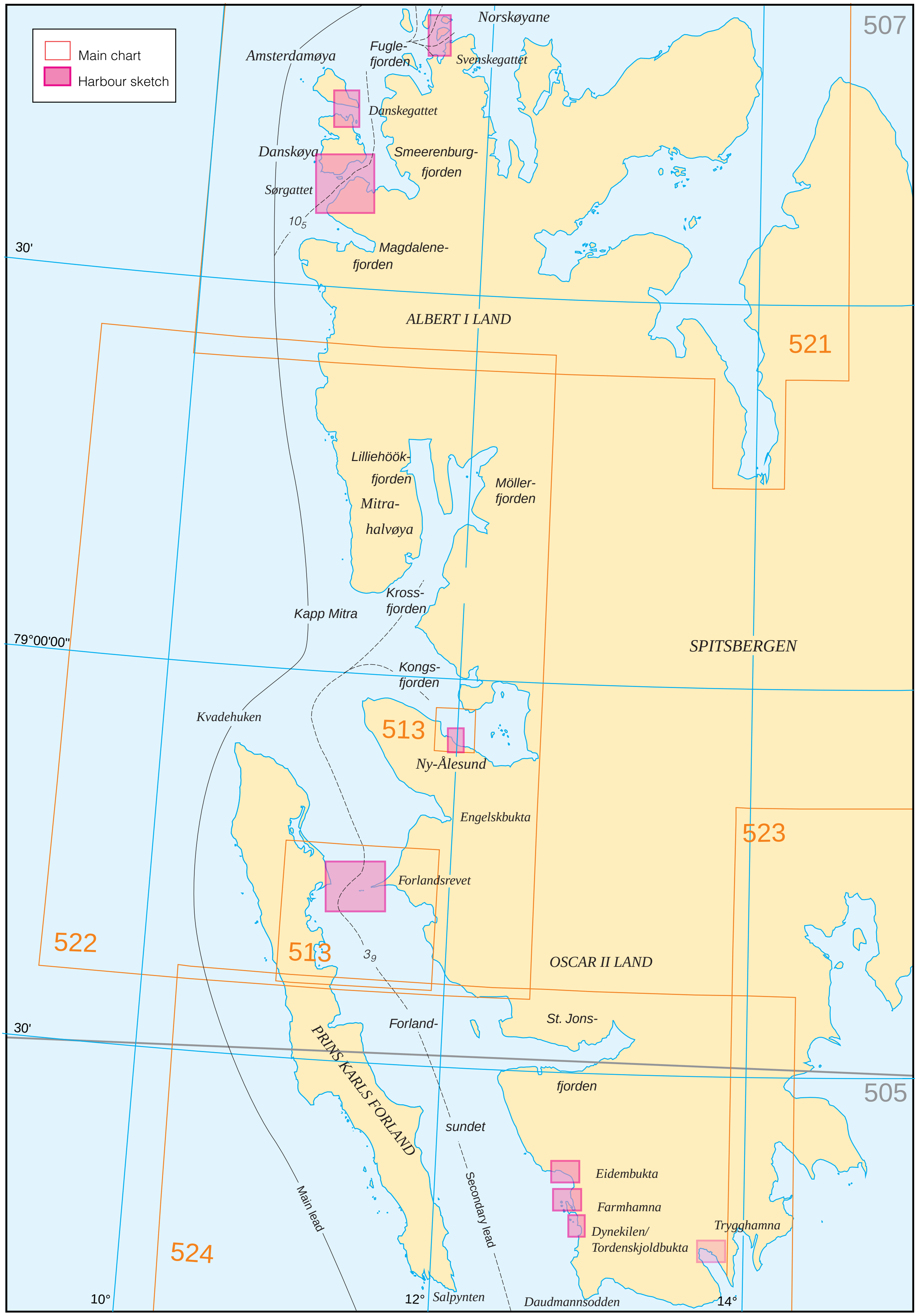
TRYGGHAMNA with ALKEPYNTEN and ALKHORNET viewed from S Photo: Eiliv Leren

The remains of KARL ELIASSEN CABIN Photo: NHS

DISTRICT GOVENOR'S SERVICE CABIN Photo: NHS

On the west side, at the entrance to Trygghamna, are the remains of the cabin that Karl Eliassen built during the First World War. It was sold to Halmar Nøis in 1920 and is now (2011) on the point of collapse. A little further inwards is the District Governors cabin which is used in the summer by fiel inspectors.

Protektorfjellet (847) is part of a great massive and has a very conspicuous projection towards the south, **Alkhornet** (428). Further westwards stand Daudmannen (770) and the pointed **Lexfjellet** (997), which are the highest in the whole of this area.


Main chart
Harbour sketch
507
Norskøyane
Amsterdamøya
Fugle-
fjorden
Svenskegattet
Danskegattet
Danskøya
Smeerenburg-
fjorden
Sørgattet
Magdalene-
fjorden
30'
ALBERT I LAND
521
Lilliehöök-
fjorden
Mitra-
halvøya
Möller-
fjorden
Kross-
fjorden
Kapp Mitra
79°00'00"
SPITSBERGEN
Kongs-
fjorden
Kvadehuken
513
Ny-Ålesund
Engelskbukta
523
Forlandsrevet
522
513
OSCAR II LAND
Forland-
St. Jons-
30'
PRINS KARLS FORLAND
fjorden
505
sundet
Eidembukta
Farmhamna
Main lead
Secondary lead
Dynekilen/
Tordenskjoldbukta
Trygghamna
524
10°
12°
Salpynten
Daudmannsodden
14°

The west coast of Spitsbergen from Isfjorden to Norskøyane

(Chart nos. 505, 507, 513, 521, 522, 524)

Isfjorden–Kongsfjorden

(Chart nos. 522, 524)

Prins Karl Forland (Chart nos. 522,524)
Off the west coast of Spitsbergen lies the large island of **Prins Karl Forland** which extends from north of the mouth of Isfjorden about 85 nautical miles northwards, with a width of between 5 and 11 km. (The island is named after Charles, son of James VI of Scotland and James 1 of England).

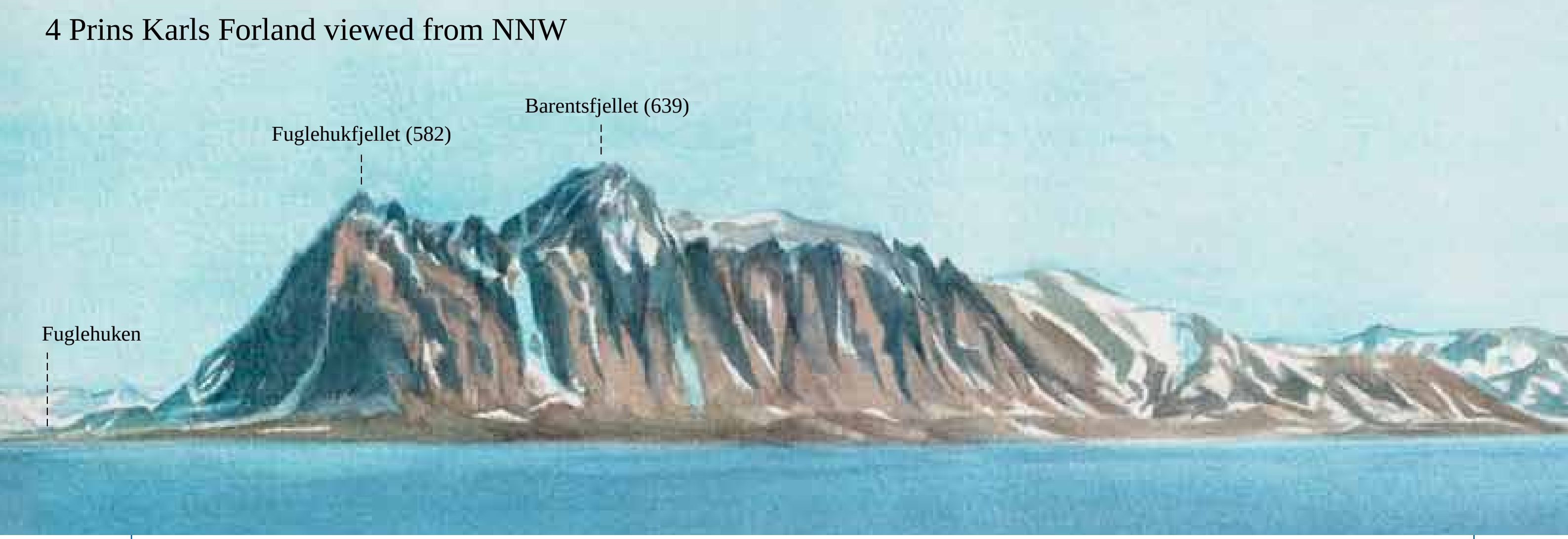
There is a mountain area about 4.5 km long in the south of the island, with **Salfjellet** (431) as the most prominent mountain. It is a good landmark with its characteristic saddle-like shape.

Forlandsletta, about 15 km long, is a low plain only about 19 m above sea level at the highest point, lies north of this mountain area. Further northwards a mountain chain extends right up to the north point of the island. Due to the low plain lying between the mountain areas, at any distance there is an impression that there are two islands.

The most conspicuous mountains in the range northwards from Forlandsletta are **Methuenfjellet** (525), **Jessiefjellet** (1031), who's highest, pointed peak raises the mountain ridge by 400–500 m, to the rounded **Monacofjellet** (1084) which is the highest mountain on the west coast.

SALPYNTEN LIGHT viewed from E Photo: NHS

PRINS KARLS FORLAND viewed from S Photo: Eiliv Leren



FORLANDET over DUADMANNSODDEN Photo: NHS

Further northwards, the mountains are again lower, with a deep pass running through. **Fuglehukfjellet** (582), a well known bird-nesting mountain, falls steeply down furthest to the north. (See view No. 4).

Along the west coast of the island and down towards **Forlandsrevet** on the east side, there is a plain of varying extent in front of the mountains. The widest coastal plain, Aberdeenfl a, is on the northeast side and is about 4 km wide.

On the east side of Prins Karls Forland, from Forlandsrevet and southwards to Andeneset, the mountains are mostly covered by glaciers, which have an almost continuous front to the sea. Further southwards, to a large extent the glaciers terminate on land, in parts with level plain between them.

INCHCOLMHYTTA Photo: NHS

FUGLEHUKEN LIGHT Photo: NHS

Sven Poulsson

On the west side of Forlandet, as the island is now known, the water are very foul within the 20 m contour which extends up to 3 nautical miles from the shore. It is especially shoal southwards from Salpynten and from Kaldneset. To go clear of the shoals south of Salneset vessels keep *the lattice beacon on Daudmannsodden closer to Lexfjellet* (997) *than to Daudmannen* (770). Vessels go clear of the 3 m shoal and Haukesteinen near Kaldneset with *Jessiefjellet* (1033) *west of Tvihyrningen*.

Plankeholmane, east of Salpynten, form a bird sanctuary and legal access to the island is restricted by the protection regulations (See Chapter 1).

There are no sheltered anchorages on the west side of Forlandet. Smaller vessels, however, can go in on the inner side of the most northerly of **Forlandsøyane** midway off Forlandsletta. Vessels enter best about 1 nautical mile north of the island and steer in mid-waters in a depth of 5 m. Forlandsøyane are a bird sanctuary and legal access to the island is restricted by the protection regulations. (See Chapter 1)

The waters west of Forlandet are otherwise evenly shelving and vessels can sound up towards the shore and find suitable anchorage off the 20 m contour.

Kapp Sietoe gives a fine radar image and is therefore a good fixing point hen approaching from west.

FUGLEHUKEN cabin and radio mast Photo: NHS

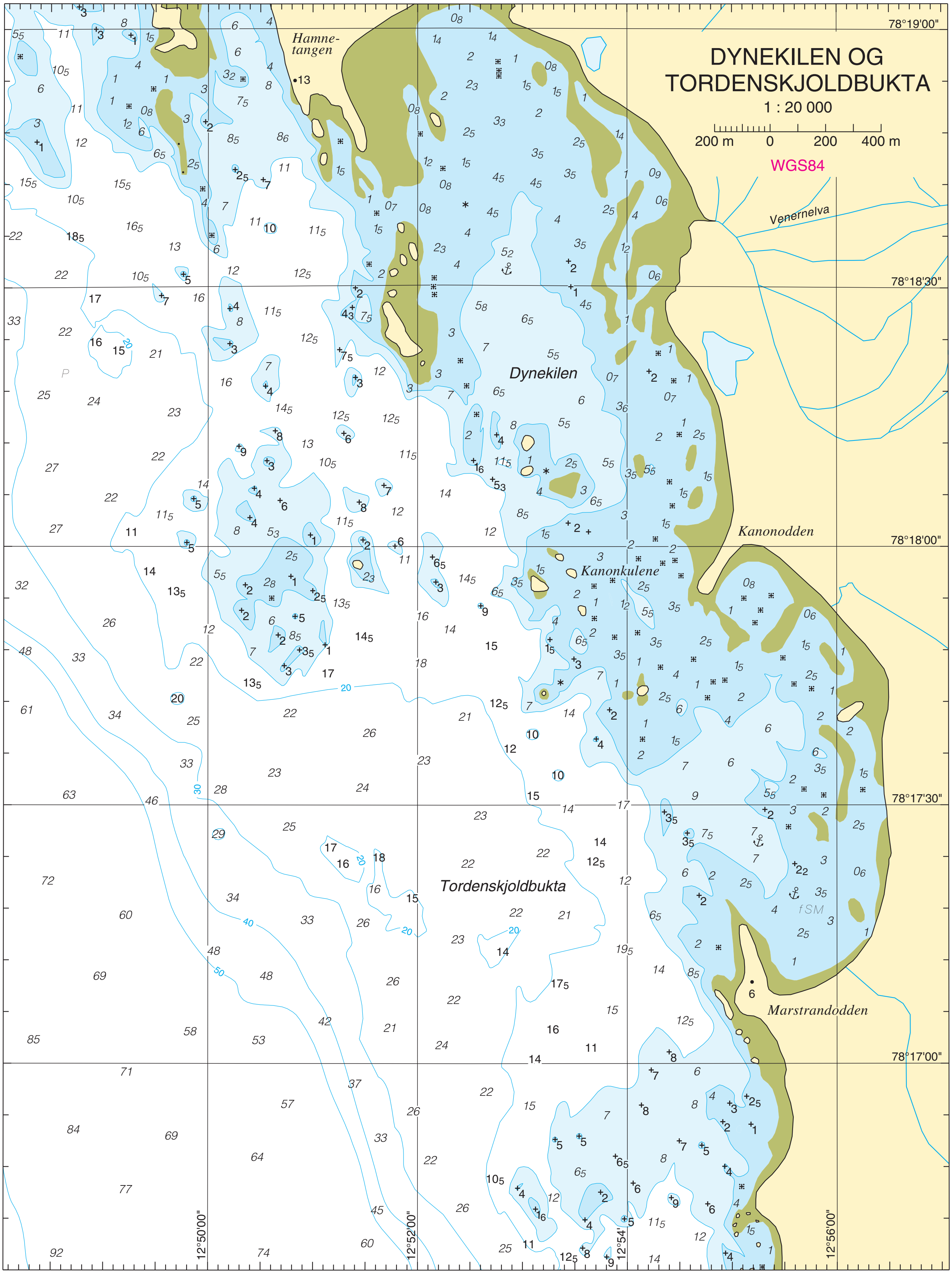
A light has been established about 70–80 m in on the shore on the north of the island, near **Fuglehuken**, (78°33.6'N 10°30.0'E). The light is well visible as it stands on 20 m high knoll. The danger line on the west side of Fuglehuken is only 0.5 nautical miles from the shore but it widens greatly north-eastwards.

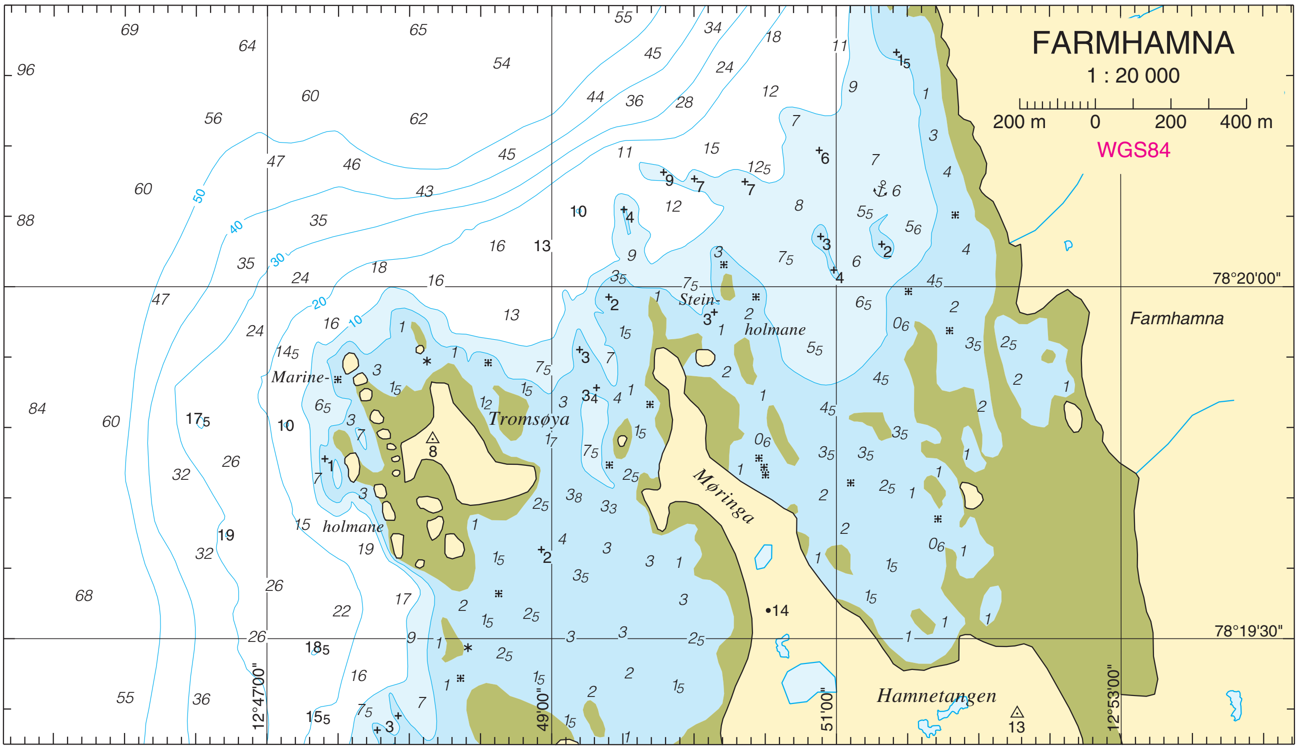
It can be difficult to land here because of the current conditions which create choppy seas in the foul area.

FUGLEHUKFJELLET, SUTORFJELLA and KAPP SIETOE Photo: NHS

Forlandsundet (Chart nos. 513, 522, 524)
Forlandsundet 48 nautical miles long and 6–10 nautical miles wide had, during the whale-hunting times, the name of «Foul Sound», as it referred to mariners being deceived when trying to navigate, whenlarger vessels were forced to turn back at Forlandsrevet.

Vessels that draw more than 3.5–4 m must sail on the west side of Prins Karls Forland. It is fl t over the reef itself but





mariners should not reckon on depths greater than 3.9 m in line across the reef.

Northwards in Forlandsundet the waters are clear with comparatively deep water (100–260 m) right up towards Forlandsrevet, where vessels keep away from the danger line that extends out to 1–1.5 nautical miles from both sides of the sound.

PACK ICE IN FORLANDSUNDET

As mentioned previously, the pack ice can make quite large changes on both sides of the channel across Forlandsrevet, and this occurs particularly in the spring in connection with storm and tidal streams.

The navigational channel itself, however, remains stable. The pack ice in the sound south of the reef usually fl ws northwards along the east side of the sound while it can be ice-free in the middle of the area. With large quantities of ice it can press heavily against Murraypynten, where a 3–4 m high ice barrier has been known to build up on the south shore during the course of twenty minutes.

If there is ice north of the reef in the summer, it will normally be small amounts which have come from the south.

Around Daudmannsodden and northwards towards Eidembukta, the coast is incised by small bays, outside of which there are smallish islets and rocks. This makes the waters so foul that it is difficult to get to the shore. On the east side of Forlandsundet there is the large plain, Daudmannsøyra, which narrows northwards until it reaches the moraine ridge off **Eidembreen**, before turning into a new, wide plain, about 2 km wide, up towards **St. Jonsfjorden**. On both sides the fjord is surrounded by 600–800 m high mountain summits separated by glaciers. On the north side the glaciers, which to a large extent run into the sea, while on the south side they end on land.

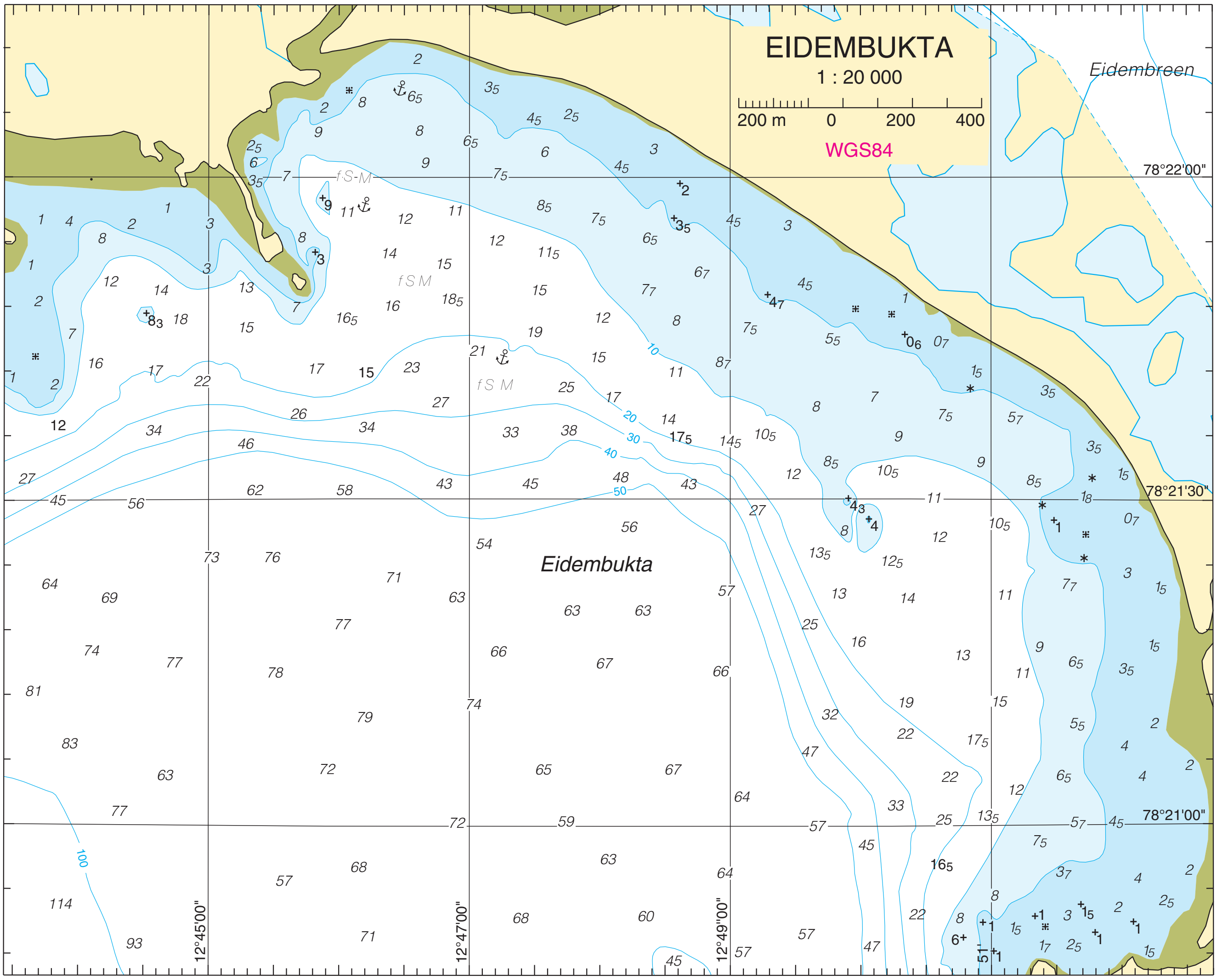
Smaller vessels can anchor in **Tordenskjoldbukta** in a depth of 5–8 m, sand and mud bottom (see harbour plan) but in similarity with the coastal stretch elsewhere, the waters are foul and navigators must exercise great care when anchoring.

Larger boats can anchor in **Dynekilen** (see harbour plan) but entering is difficult. The best approach is from south, west of Kanonkulene and then due west of the two islets to the north. It is well sheltered in northerly winds, depths 40–50 m, mud bottom.

Vessels can anchor in the mouth of **Farmhamna** (see harbour plan) but here the bottom rises up steeply and it is stony within the 10 m contour. It is a good harbour in southerly winds.

FARMHAMNA Photo: NHS

The hunting station in Farmhamna Photo: NHS



Cabin remains on Müllerneset Photo: NHS

Within the 10 m contour the depths are shallow and mariner wishing to go further south in the harbour must be very careful.

In northerly winds, mariners should seek anchorage on the north side of **Eidembukta**, across by the islets south of the glacier river on the west edge of the glacier moraine (see harbour plan). The depths are 6–12 m, sand and mud bottom. Here the bottom is easier and sandy and the 10 m contour is about 2 cables from the shore.

Langgrunnen project to the west of the bay, with a number of small islets and rocks about 1.5 nautical miles south-westwards, contributing shelter to the bay from north-westerly winds.

Two nautical miles north are **Småskjera** which change to a narrow and stony shoal area further up towards St. Jonsfjorden.

The ruins of an old cabin stand on the south of **Müllerneset**.

St. Jonsfjorden (Chart no. 524)

From Forlandsundet, St. Jonsfjorden cuts eastwards inland about 13 nautical miles with a width of 1.5–3 nautical miles. It is comparatively deep near the shore along both sides of the fjord.

On the north side of the fjord mouth, about 1 nautical mile south of Ankerneset, there is **Farmgrunnen**, a stony ridge with rocks awash, about 3 cables long, which is dangerous to shipping. Of other shoals there is an 8 m shoal about 6 cables from the shore on the south side of the fjord, about 2 nautical miles inside the fjord mouth, and also a 7 m shoal in the mouth of the bay off Gaffelbreen.

The remains of Copper Camp, from earlier copper extraction, stand on the south side of the fjord.

Gjertsenhytta is located on **Gjertsenodden**. It was built in 1962 and functions as a refuge cabin. See list of cabins in Chapter 1.

It is particularly deep on north side of the fjord and the best

Cabin remains near COPPER CAMP Photo: NHS

POOLEPYNTEN lattice beacon and cabin Photo: NHS

anchorage here is on a «shelf» in the bend under **Konowfjellet** (758).

Across the fjord from here vessels can anchor along the shore off Charlesbreen and this is perhaps the best anchorage inside the fjord.

When selecting an anchorage, account should be taken of calf ice from the glaciers and pack ice from Forlandsundet in the fjord. St. Jonsfjorden is designated a place of refuge against acute pollution. See Chapter 1 for further information.

North of St. Jonsfjorden, Dahlbreen and Aavatsmarkbreen run out into the sea in two bays on each side of Kaffiøy a. In all, six glacier tongues push forward between the sharp mountain ridges to end on this plain.

From Ankerneset and inwards to Dahlbreen it is foul and stony 2–3 cables from the shore. However, it is clear innermost on the north side off the glacier. Further north along the shore by Kaffiøy a the fjord widens to a shoal area up to 2 nautical miles from the shore furthest south.

Hermansenøya (39), which lies 1.5 nautical miles west of the entrance to St. Jonsfjorden, is a bird sanctuary and legal access to the island is restricted by the protection regulations. (See Chapter 1).

It is quite deep close to on the northwest side of the island but around the southern end it is shallow and stony. Midway between Hermansenøya and the shore to the north there is a dangerous rock awash, **Bregrunnen**, but the rock can be passed on both the north and south sides. Between Hermansenøya and

GJERTSENHYTTA, Gjertsenodden Photo: NHS

Ankerneset, **Farmsundet**, the waters are clear, although a look-out must be kept for a 6 m shoal that lies about 1.7 nautical miles north-northwest of Ankerneset.

Northwards along Kaffiøy a towards Hornbækbukta, off Avatsmarkbreen the depth contour gradually narrows to about 6 cables from the shore.

In **Hornbækbukta** there is anchorage on the moraine ridge in the entrance and in towards the shore, depths 20–40 m, clay bottom. Mariners must be aware of pack ice from the glacier in the bay. The depth diminishes rapidly across to Revfla et.

North of Avatsmarkbreen the land goes over to Sarsøyra, a broad plain about 5 km wide that narrows northwards towards Engelskbukta. From the widest part of Sarsøyra, Sarstangen extends halfway out to Forlandsundet.

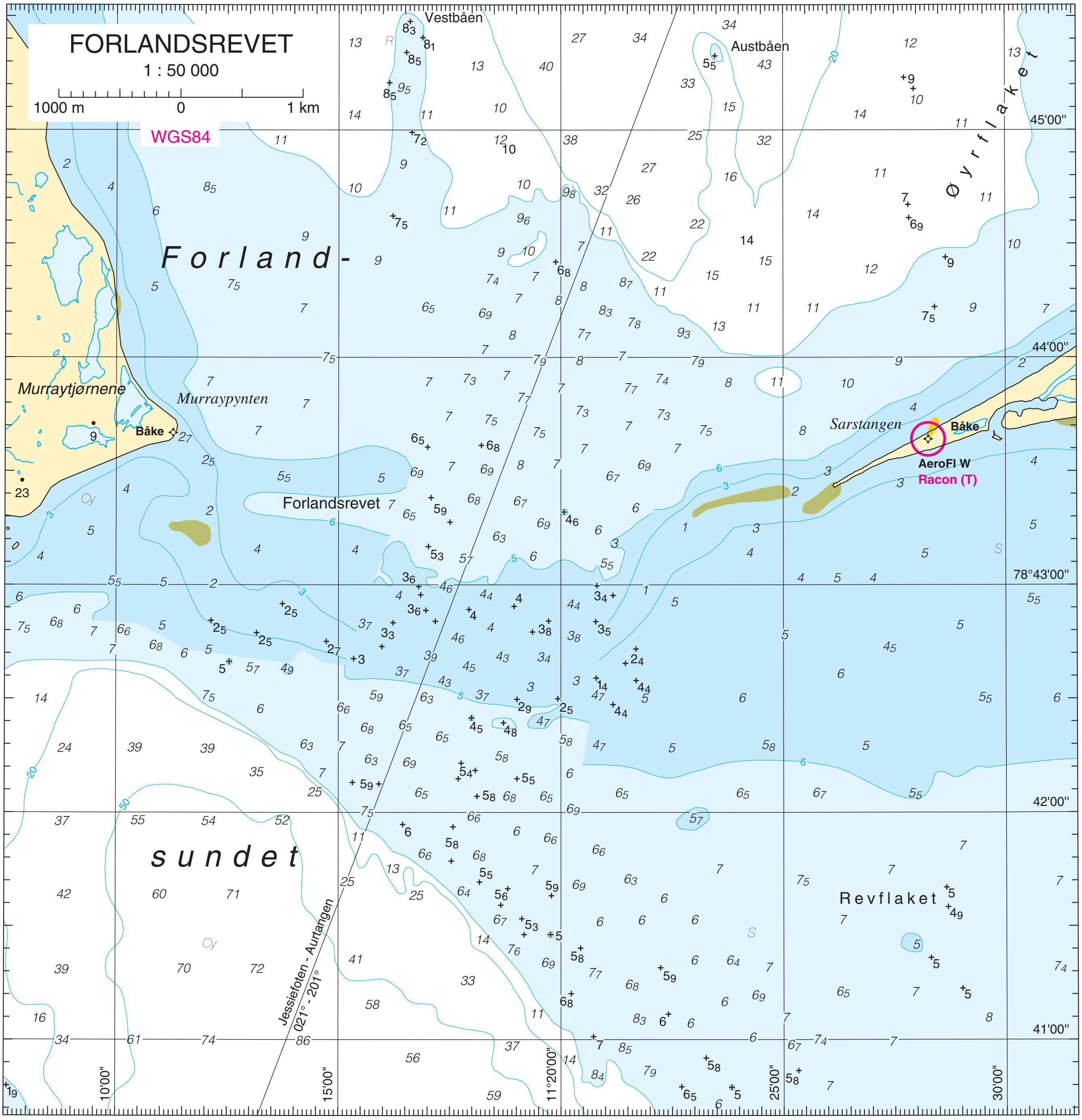
The large **Revflaket** extends south westwards from the moraine on the north side of Hornbækbukta midway out into Forlandsundet where it then swings northwards. The depth on the fl t is 4 m with even sand bottom right up towards Sarstangen.

Along the west side of Forlandsundet from **Salpynten** fully south on Forlandet and northwards to Malmeskjeret it is mainly shallow and stony along the shore and is un-navigable even by smaller boats. Along the whole stretch northwards towards Forlandsrevet the seabed falls relatively steeply away off the 10 m danger line, but it extends in some places out to about 1.5 nautical miles from the shore, while off **Poolepynten** it is deep close to. The District Governor has a service cabin here. See list of cabins in Chapter 1.

It is possible for small boats to take on water directly from the glacier rivers on the beach off **Geikiebreane**.

It is shallow around Dawespynten well out to 1.2 nautical miles from the shore. Further into Selvågen it is also shallow along the shore, especially on the south side. The innermost part of **Selvågen** is closed by a reef which extends across the bay with depth of less than 1 m. The bay on the inner side of the reef is known as Kulpen, as the depths here go down to 45 m. It is easy to for pack ice to accumulate in Selvågen and the bottom is uneven, but vessels can anchor off the sharp Reinhardpynten on the north side of the bay and in towards the reef, clay and mud bottom. Selvågen is designated a place of refuge against acute pollution. See Chapter 1 for further information.

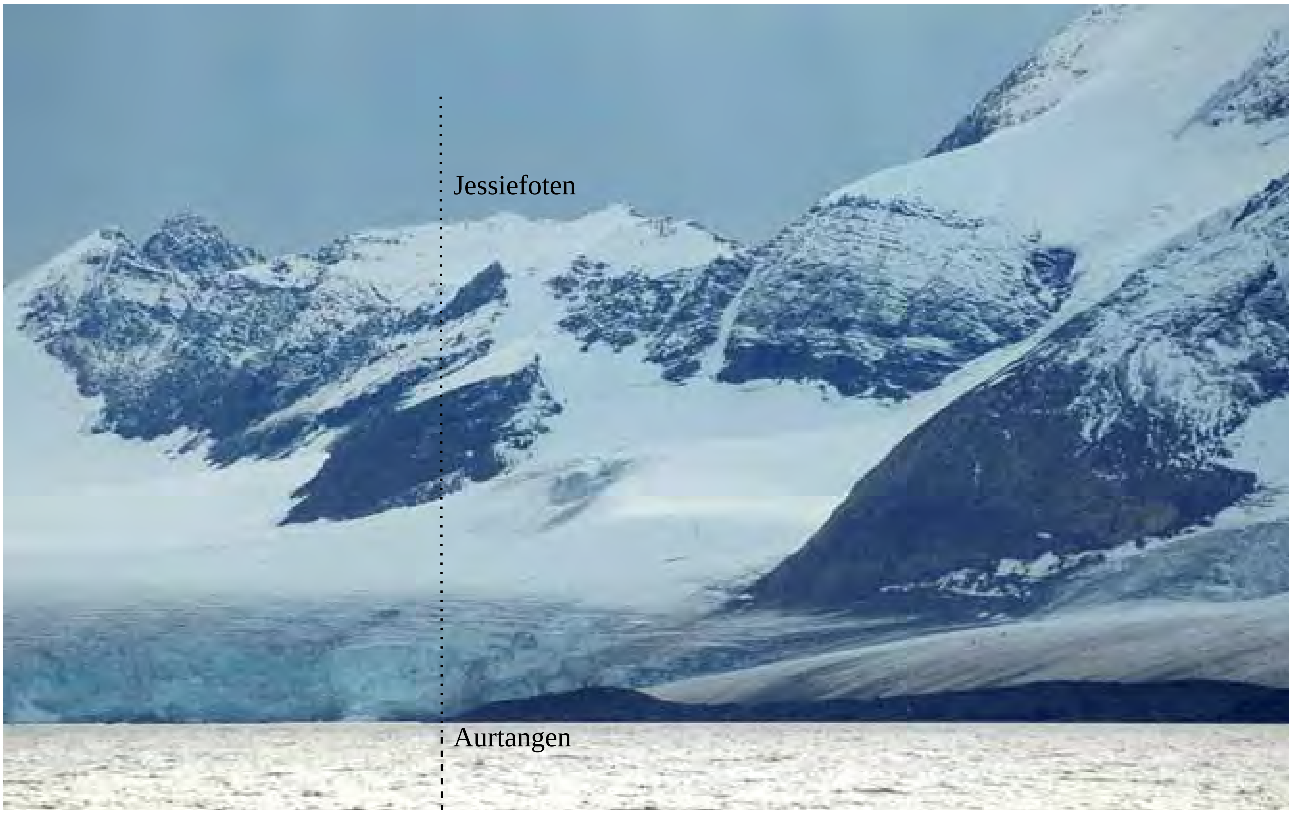
Northwards towards Andeneset the depth contour widens mostly to a breadth of 1.5 nautical miles, while the bays further northwards to Murraypynten (lattice beacon) are un-navigable, with drying areas that stretch 1 nautical mile outwards. In this area Aurtangen is the only place where landing is possible.



There is a good anchorage in **Grimaldibukta** in depths ranging from 10 to 39 metres, clay bottom. The glacier has retreated considerably and no longer calves into the sea but the bay is exposed to southerly winds which typically blow northwards across the sound. It is foul towards the shore and landing is practically impossible.

Forlandsrevet (see harbour plan) extends across the whole of Forlandsundet and has depths between 1–3 m, except for a 5 cables wide passage with 4 m water. *Jessiefoten in line with Aurtangen*, 021.5°–201.5°, leads in the middle of the passage. In difficult conditions, for example with pack ice, mariners should consider well before getting too far west as there it is stony, while there is even sand bottom on the east side. There can be relatively strong tidal streams in the sound, 2–4 knots, and mariners should take care when going through the passage,

MURRAYPYNTEN LATTICE BEACON Photo: NHS



JESSIEFOTEN in line with AURTANGEN Photo: NHS

particularly with regard to the stream, as vessels can easily be forced on to the shoal areas on both sides.

Lattice beacons are erected on both sides of the reef, on **Murraypynten** and on **Sarstangen**. On Sarstangen particularly, the lattice beacon is very liable to damage from pack ice. During conditions with strong winds and currents it can be forced far up on to the shore. In 1984 the lattice beacon was therefore moved about 200 m in on to a drilling platform. Sarstangen Lattice beacon has a light, Fl W. The whole tongue is only a narrow band of gravel and sand with a lagoon inside, and the outermost area may therefore be shifted somewhat outwards or inwards from one year to the next.

From Forlandsrevet and northwards, the shelving bank on the west side of the sound varies from about 1 nautical mile off the south end of **Richardlaguna** to about 3 nautical miles on **Forlandsflaket** off Aberdeenfl a. The seabed is even sand in towards the shore and this provides good anchoring facilities in **Ferskvassbukta** and on Forlandsfla et. Outermost on the fl t, almost in the middle of the fjord, there are shoal points with depths of 12–14 m. The wide danger line area then continues further to north of Fuglehuken. Along the shore, mariners can reckon on it being fouland only 3 m deep out to 5 cables off. It is possible to land from small boats on Murraypynten and northwards along Ferskvassbukta.

SARSTANGEN LIGHT (2009) Photo: NHS

SARSTANGEN and SARSØYRA, Forlandsrevet, viewed from WSW Photo: Eiliv Leren

The cabin in Engelskbukta Photo: NHS

The glaciers further northwards on the east side of Forlandsundet end up in the mountains, however, with the exception of Comfortlessbreen which reaches the sea in the innermost part of Engelskbukta.

From north of Sarstangen and up towards Engelskbukta the glaciers have also laid out a large shoal area. The northerly part of the shoal area extends 3.5 nautical miles from the shore and on the outer areas of the fl t there are some shoals with depths of 4–7 m. The sand bottom is otherwise even in the area which has good anchoring conditions.

Engelskbukta is clear and offers the best anchoring conditions on the north side of the bay. Even if there is pack ice in Forlandsundet, little of it enters here. Depth 10–20 m, mud bottom. Engelskbukta is designated a place of refuge against acute pollution. See Chapter 1 for further information.

In the 1600s Engelskbuta was an important harbour for the English hunters. The main disputes on whale hunting rights and the rights to the best hunting grounds stood between England and Holland. Under an agreement the hunting grounds were divided between them. The Englishmen should operate southwards from Magdalenefjorden, while the Dutch controlled the areas north of the fjord that lies in the northwest corner of Spitsbergen. In a section of the agreement, Engelskbukta was dealt to the Englishmen. (Source: Cruise handbook for Svalbard).

From Engelskbukta and further northwards the land is known as Brøggerhalvøya (peninsula) and separates Forlandsundet from Kongsfjorden. The mountains here are also about 600–800 m high, with glaciers that terminate on the land, and with a coastal plain of varying width from about 1 km to about 4 km up towards Kvadehuken.

North-westwards along Brøggerhalvøya, it is deeper close to, until the 20 m contour widens again to about 1 nautical mile around Kvadehuken.

Kongsfjorden–Krossfjorden

(Chart nos. 507, 513, 522)

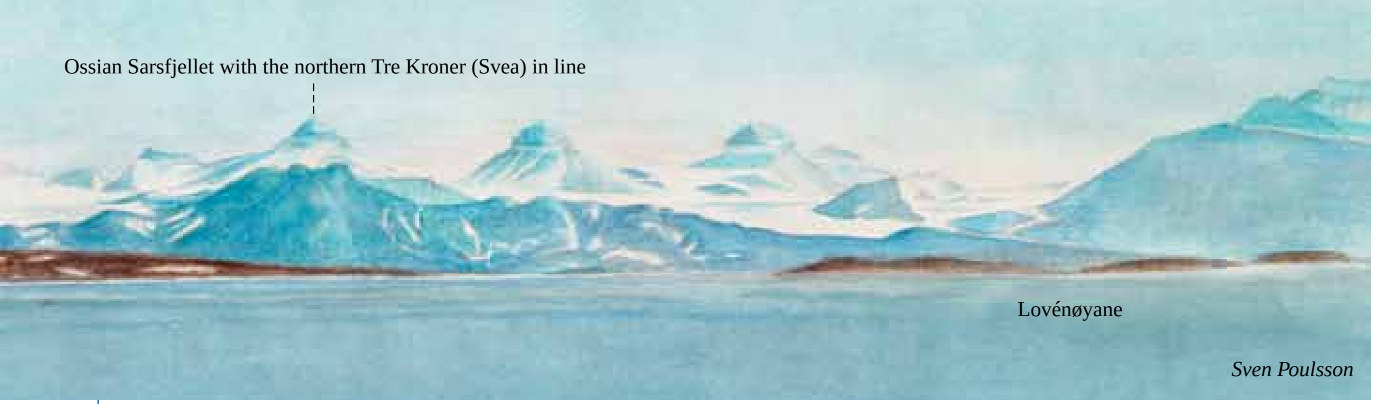
Kongsfjorden and Krossfjorden cut into the land between Kvadehuken (78°57.8'N 11°21.2'E) and Kapp Mitra as two large fjord arms. Kongsfjorden runs in a south-easterly direction with a length of about 13 nautical miles, while Krossfjorden with its innermost branches extends about 16 nautical miles northwards.

On the west side of **Kongsfjorden**, there is **Brøggerhalvøya** with a mountainous landscape with 600–800 m high summits and seven glaciers inside the fjord, all of which end on land. In the north, the high land falls off to the broad Kvadehuksletta. The plainland narrows inwards in the fjord to widen again to about 2 km in the middle of the peninsula where the former mining town of Ny-Ålesund is situated. The Norwegian Polar Institute now has its research station there.

On the north side of Kongsfjorden, the mountains largely rise to the same height as on the south side, but the highest **Feiringfjellet**, towers up to 1054 m. Across the fjord from Ny-Ålesund there is Blomstrandhalvøya which divides Blomstrandbreen into two fronts towards the sea. Blomstrandhalvøya restricts the fjord to its narrowest, 2 nautical miles. A belt of islands, islets and shoals inside the fjord were partly deposited here laid down by Kongsbreen.

This enormous glacier runs with high fronts into sea on both sides of Ossian Sarsfjelet (366). South of this mountain, the glacier has retreated so far back that the north point of **Colletthøgda** (612) is now uncovered. This is a coffin-sh ped and sloping feature with earlier stratific tion. About 20km up into the glacier, the stratified and pyramid-shaped **Tre Kroner** reach up to 1200 m (**Svea**, **Nora** and **Dana** ranging from N). Viewed from the fjord, this area is one of the most beautiful scenes on Svalbard.

TREKRONER, SVEA, NORA and DANA viewed from WSW Photo: NHS



Krossfjorden runs in between Kapp Guissez and Kapp Mitra. A good 8 nautical miles inside the fjord, it is divided into two arms by **Kong Haakons Halvøy**, about 11 km long and 2 km wide. The peninsula consists of a mountain massif, about 700 m high over its whole length. Together with the other glaciers and mountains round the fjord, this peninsula has been a picturesque object for the tourist ships in Svalbard. There are four smaller fjord arms on the eastside of the fjord, and in all places the glaciers run into the sea between high mountains of 800–1200 m.

The huge Lilliehöökbreen emerges at the head of the most westerly fjord arm, **Lilliehöökfjorden**.

Kongsfjorden (Chart nos. 513, 522)

Kongsfjordrenna, **Kongsfjorddjupet** and then Kongsfjorden cut in from the sea between **Fuglehukflaket** and **Mitragrunnen**, both shallow areas with depths of 30–50 m. North of Forlandsundet the depths go down to more than 300 m (Kongsfjorddjupet), and similarly Kongsfjorden to off Ny-Ålesund.

It is foul along the shore around **Kvadehuken** (78°57.8'N 11°21.2'E) and the shelving seabed extends 1 nautical mile westwards and north-westwards, while inside the fjord to Brandalpynten, it is deeper close to with steeply falling away bottom. Vessels are out in deep water north of Kvadehuken with *the northern Tre Kroner* (Svea), *Ossian Sarsfjellet and the south Point of Blomstrandhalvøya in line* 103°–283° (see view No 5).

A light has been established outermost on **Brandalpynten**, a low sandy point around a lagoon.

KVADEHUKEN LIGHT viewed from SSW Photo: NHS

BRANDALPYNTEN LIGHT Photo: NHS

BRANDALPYNTEN viewed from S Photo: NHS

Between Brandalpynten and Gluudneset, 3 nautical miles further in, there is a wide and shallow bay which is divided into two by a projecting area where Ny-Ålesund is situated. Smaller vessels can enter the most northerly part of the bay, **Kolhamna**, to anchor in depths of 4–5 m, but care must be taken as there are several shoals of 3 m there, as well as a 2.3 m shoal about midway on a line between Brandalpynten and the quay in Ny-Ålesund. There are drying banks at the head of the bay, and in particular off the river mouths.

Ny-Ålesund (78°55.5'N 11°56.01'E) was established in 1917 by Kings Bay Kull Compagnie A/S in connection mining operations. In 1929 there was a pause after several minor accidents but operations were resumed after the war as the demands for coal were high. In 1962 there was a huge mine explosion in which twenty-one men died, and this tragedy lead to the full closure of mining activity in 1963.

Since the Kings Bay accident in 1962 no mining has taken place. The Government has decided that Ny-Ålesund shall be the main centre of international research on Svalbard. Currently there are about one hundred projects within natural science subjects and environmental supervision involving some twenty nations.

Kings Bay AS are the mine owners and own most of the buildings in the place. The company arranges the necessary infrastructure for the research stations and organises communications, accommodation and provisions. There are approximately thirty-fi e people living in Ny-Ålesund throughout the year. During the high season in the summer there are over 120 people in the town, most of them employed in research activities. The place is popular as a tourist attraction – especially in the cruise season – which can cause conflicts of interests between tourism and research that requires the least possible disturbance of the area's environment.

Ny-Ålesund, which is the world's most northerly permanent settlement, has a souvenir shop «Kongsfjordbutikken», postal connections and direct telephone links via satellite, an 800 m long air strip with flight connection to Long earbyen.

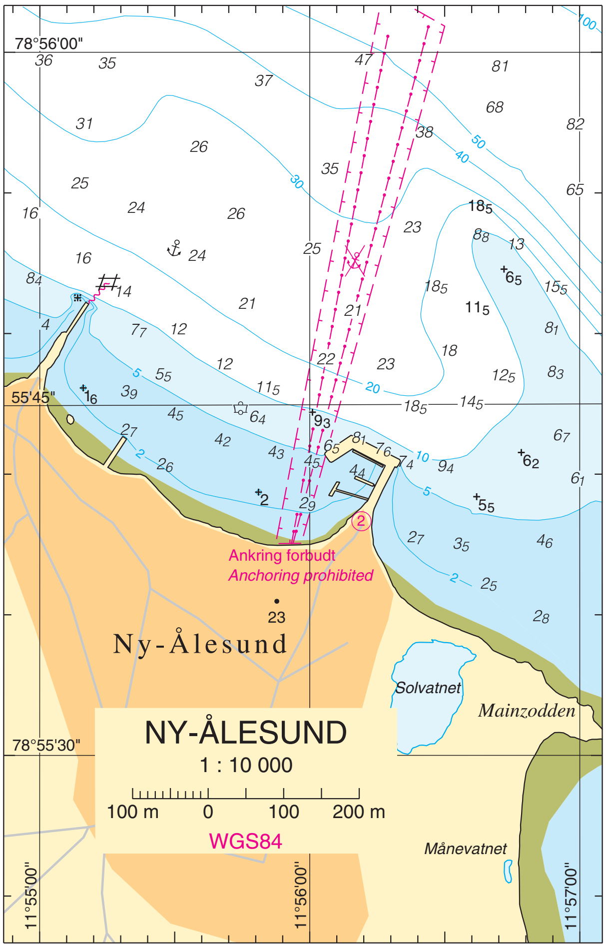
NY-ÅLESUND with THE AIRSTRIP viewed from E Photo: Eiliv Leren ellet (556)

The GEODETIC OBSERVATORY, Ny-Ålesund
Photo: NHS

The old COAL TRAIN with the air balloon mast in the background Photo: NHS

NORDPOLHOTEL, Ny-Ålesund Photo: NHS

KONGSFJORDBUTIKKEN, Ny-Ålesund Photo: NHS



Harbour contact and bunkering arrangements, Kings Bay, Telephone +47 79 02 72 00. VHF channel 16 (summer season 0800–2200), harbour@kingsbay.no

There are the following berths:

1. Stenekaien, angled concrete quay, NW side 42 m depths (at the quay/fender front), see harbour plan and NE side, 72 m, depths (at the quay/fender front), see harbour plan. SW end, 14 m, depths from NW (6.4)–4.7–4.6–(4.4) m and on the inner side (the SE side), 33 m, depths from SW (4.3)–4.4–4.8–4.6 m.

2. 3 flo ting quays on the inner side of the quay mole:
   a) Most southerly, 20 m berth on the end, depths 2.6–3.9 m.
   b) Middle, 30 m with cubicles.
   c) Most northerly, 44 m, depths 5.1–4.2–0.0 m.

Diesel and water filling. Petrol in cans. There is a telephone kiosk on the quay.

Zeppelinhamna, is situated south of Mainzodden and is shallower than Kolhamna. There is also **Prins Heinrichøya** plus a couple of islets in the middle of the bay. North and east of the islets there is a pair of 2 m shoals right out to the edge of the 10 m contour. Smaller vessels anchor best north and east of Prins Heinrichøya, sand bottom. Prins Heinrichøya and the islets on the inner side form a bird sanctuary, and legal access to the islands and islets is restricted by the protection regulations (see Chapter 1).

From Gluudneset and inwards to Kongsbreen it is clear and relatively deep towards the shore. To enter the inner basin east of Lovénøyane, the coast should be followed until Breskjera bear approximately north , and then turn east and northwards into the basin. Vessels must be kept about 5 cables south of Breskjera to go clear of the shoal area that extends southwards from the rocks. Vessels can enter the inner basin between Lovénøyane and the small islets Eskjeret and Rundholmen, and

THE HARBOUR in NY-ÅLESUND viewed from SW Photo: Eiliv Leren

KONGSBREEN Photo: NHS

hold course for about 4 cables south of the two named islets. A shoal fl t extends from Eskjeret, with the rock awash northeast from it, and northwards to Blomstrandhalvøya, Lovénøyane which makes it difficult to navigate. There is also a 2 m shoal, and a rock awash to its north between Gerdøya and the peninsula. The inner basin is otherwise clear, with the exception of a shoal ridge that extends about 5–6 cables south-westwards from the moraine ness in the north of the bay. **Lovénøyane** is a bird sanctuary and legal access is restricted by protection regulations (See Chapter 1).

Calf ice from the large **Kongsbreen** collects readily in the inner basin due to a collection of islands, islets rocks that shelter it towards the fjord. A channel which has been used as an anchorage runs northwards between the islands on the east side of **Storholmen** in Lovénøyane.

Vessels can anchor in suitable depths and good holding ground, clay, in the bay which forms between the shoal fl t from Eskjeret and **Blomstrandhalvøya** where vessels are relatively well sheltered from wind and ice.

Peirsonhamna is situated on the south of Blomstrandhalvøya and is the bay into the disused mining site, London. Vessels can stay in mid-channel or a little westerly into the bay, and then go into a clear area with 4–6 m of water close to the rock face. It shoals up evenly innermost in the bay. There are the remains of a locomotive and two cabins in the mining town. The cabins were constructed by «The Northern Exploration Company» in 1911 and function today as welfare cabins for Kings Bay in Ny-Ålesund. The nearest cabin goes under the name of Camp Mansfield, after the head of the company, Ernest Mansfield Marble exports 1911–1920. (Source: The Cruise Handbook for Svalbard).

From MINING TOWN, LONDON, Camp Mansfield to the right Photo: NHS

THE STEAM LOCOMOTIVE Photo: NHS

LOADING CRANE Photo: NHS

GROTTEN LIGHT Blomstrand halvøya with one of the grottoes Photo: NHS

BLOMSTRANDHALVØYA and BLOMSTRANDBREEN viewed from SW Photo: Eiliv Leren

Grotten light stands on the west side of Blomstrandhalvøya.

The entrance from west, on the north side of Blomstrandhalvøya, is clear with good depth. Vessels can anchor both north and south of **Breøyane**. Some ice from the glacier drifts through to the sound. Large icebergs fl w westwards. The anchorage is exposed to westerly winds. Smaller boats can go closer to the glacier on the west edge and find a more sheltered anchorage. Breøyane form a bird sanctuary, and legal access is restricted by protection regulations. (See Chapter 1).

The depths in the eastern channel are less but smaller vessels can sail through the sound (survey planned for 2011).

Vessels can also anchor in **Blomstrandhamna**, on the north side of Blomstrandhalvøya.

Further out along the north side, vessels can anchor in towards the shore where there is shelter from winds out from Krossfjorden. Right out towards **Kapp Guissez** it is shallow along the shore, and the 20 m contour goes about 1 nautical mile from land on the south side of the ness. **Guissezholmen** is a bird sanctuary, and legal access is restricted by protection regulations (See Chapter 1).

Krossfjorden (Chart no. 522)

When sailing from west to Krossfjorden, course must be held well clear of the shoal fl t south of Kapp Mitra, with special attention given to the rock awash, Kroneflua, which lies 1.7 cables south of the ness on the edge of the danger line.

A good 1.5 nautical miles west-southwest from this is **Kronegrunnen**, 9 m, just 2 nautical miles from shore. To go clear south of the shoal area vessels are sailed on the line *Blomstrandsalen under the most southerly of Tre Kroner*, bearing 116º–296º (the saddle is the hollow between the two peaks of Blomstrandhalvøya. See view No. 7). Vessels are clear of the shoal area on the east side and can sail into Krossfjorden when *the south-*

WILLEBERGET (541), Kapp Mitra, viewed from SSE
Photo: NHS

east point of Kong Haakons peninsula appears over the beach on Mitrahalvøya, bearing 036 º –216 º.

It is mainly deep close inshore in towards Krossfjorden with steeply sloping seabed.

Northwards from Kapp Guissez along **Krossfjordflya** there are bays providing possibilities for anchoring, sheltered from winds that set out of Krossfjorden.

Fjortende Julibukta and the area into it have been freshly surveyed, and where a well sheltered harbour can be found. Depths in the inlet are 10–30 m in the inlet, mud bottom, and 10–12 m in the entrance. Fjortende Julibreen is a fine glacier which calves occasionally but as there is no current in the bay, no great problems arise.

On the opposite side of Krossfjorden is **Ebeltofthamna** which has been used as an anchorage from older days. A rock awash lies approximately in the middle of the entrance, and between this and the north side vessels can anchor in a depth of 7 m. Larger vessels can anchor off **Ebeltoftodden**.

FJORTENDE JULIBREEN Photo: NHS

«CAMP ZOE» Photo: NHS

The innermost part of the bay is stony along the shore; with only 2 m deep midway out. It is here that Haugenhytta was constructed in 1925–30. It is now used as a hire-welfare cabin for Kings Bay in Ny-Ålesund. See list of cabins in Chapter 1.

«Camp Zoe», built by Henry Rudy and August Olofsson for the «Northern Exploration Company» in 1911, is situated southwest of **Fanciullipynten**. The cabin now functions as a hire-welfare cabin for Kings Bay in Ny-Ålesund.

KONGSHAMAREN (583) Photo: NHS

Further inwards the seabed falls sharply right up to the peninsula which marks the crossing point between **Möllerfjorden** and the inner arm, Kollerfjorden. Westwards from this peninsula a shoal fl t extends barely 1 nautical mile out of the fjord to an area with stones and rocks awash, and most westerly, an islet, **Kohnøya**, there is an isolated 2.2 (2) m. shoal, Gallopingrunnen, about 4 cables westwards from the islet.

TINAYREBUKTA viewed from SW Photo: Eiliv Leren

«Nordstjernen» on the way into Tinayrebukta, FALLIÈRESFJELLA (1039) in the background Photo: NHS

LOYDS HOTEL Photo: NHS

Mariners intending to enter **Kollerfjorden**, preferably steer between Kohnøya and the two shoals by keeping 2 cables west of the islet. Vessels can also go in between the peninsula to its east and the area with stones and rocks awash, and then keeping about 2 cables east of the stones where the depth is 16 m.

There are possibilities of anchoring in Kollerfjorden along the south side and in the inner part on the north side.

There are good anchoring conditions on both sides of Regnarneset and in **Möllerhamna**, but in the harbour it is shallow with a steep slope and at least 18 m of water should be ensured before anchoring, mud bottom. It is a good harbour for larger vessels. The place is designated a place of refuge against acute pollution. See Chapter 1.

There is a cabin, «Lloyds Hotel», which was erected by Hamburg Amerikalinje in 1925–30 on **Regardneset**. It is now used as a hire-welfare cabin by Kings Bay in Ny-Ålesund. See list of cabins in Chapter 1.

LILLIEHÖÖKBREEN viewed from SW Photo: Eiliv Leren

The western arm of Krossfjorden, **Lillehöökfjorden**, is about 8 nautical miles long and is deep and clear. Innermost on the western side of the fjord, however, the retreat of the glacier has exposed a pair of shoal areas off **Øyenrabben**. The glacier also calves frequently, especially in August, so vessels should keep a good distance from the glacier front.

The only harbour in this fjord is **Signehamna**, which is about 1 nautical mile long and almost as wide outermost. About halfway in, a ness extends outwards, dividing the bay into two parts. There is an excellent harbour for smaller vessels on the north side of the ness, Gunnarpynten, as the pack ice grounds before it can enter. When there is little ice from the glacier vessels can anchor further out in 15–25 m of water, mud bottom. Signehamna is designated a place of refuge against acute pollution. See Chapter 1 for further information.

The German navy had a weather service station here during WWII. Today there are only ruins after Norwegian forces blasted the station in 1943.

SIGNEHAMNA viewed from E Photo: Eiliv Leren

FØRSTEBREEN Photo: NHS

SJETTEBREEN Photo: NHS

Mitra to Magdalenefjorden

(Chart nos. 507, 521, 522)

From **Kapp Mitra** (79º07.0'N 11º12.0'E) the coastline runs 28 nautical miles approximately northwards without significan bays before Magdalenefjorden is reached. The wide Diesetsletta is passed for the first 8 nautical miles, which also extends an arm across Mitrahalvøya to Signehamna in Lillehöökfjorden. Behind the plain there is a mountain range with heights of up to 600–700 m and with the appropriately named Mitra (393) which is the most south-westerly.

Further north towards Magdalenefjorden the coastal stretch is distinguished by «dei Sju isfjella» (In olden days glaciers were known as icebergs). The First and Third glaciers end on the land but the other fi e run out to the sea. The glacier tongues push down between the mountain ridges from the glacier landscape within, making up a beautiful panorama. South of the entrance to Magdalenefjorden the pointed summit of Hoelfjellet (687) stands out on Hoelhalvøya.

It is mainly foul along the shore over the whole stretch. Larger vessels should keep outside the 20 m contour, i.e., 1.5 to 2 nautical miles offshore, and satisfactory anchoring ground can be found here along the whole coast.

At **Diesetelva** in the middle of Diesetsletta it is clear into the shore, with the exception of a 3 m shoal situated 4 cables from the shore about 8 cables south of the river mouth. Here stands the cabin «Laksebu» erected in 1925–30 and functions as a hire-welfare cabin for Kings Bay in Ny-Ålesund. See list of cabin in Chapter 1.

Kvedfjordbukta, off Femtebreen, is clear well in and vessels can lie well sheltered in southerly and easterly weather, while **Rekvedbukta** off Sjubreen is better in northerly weather. Vessels can anchor in both places in 8 m of water. In this area watch must be kept for the 3 m and 4 m shoals about 2 nautical miles off the central front of Sjettebreen.

Hamburgbukta cuts 7 cables in, southwest of Hoelfjellet. The entrance is only 250 m wide with a sill of 2 m and inside there is a basin about 800 m in diameter with depth of 8–16 m. In calm weather there is an excellent anchorage here for smaller vessels. During the whaling period the bay was used as a base, and later also by other huntsmen.

Along the west side of Hoelhalvøya to Magdalenefjorden, the 20 m contour decreases to about 5 cables from the shore, with clear water.

HAMBURGBUKTA Photo: Eiliv Leren

Magdalenefjorden (Chart no. 521)

Magdalenefjorden, which takes it name from the Bible, cuts eastwards into the land between Hoelhalvøya and Reuschhalvøya, and has a length of about 5 nautical miles. During the whale hunting era it was one of the most important harbours, and today it is a well-known tourist attraction. The fjord is surrounded by 600–800 high mountains, on the south side jagged and on the north side more pyramid shaped.

A number of glaciers press down between the peaks but only four of them reach the sea, Adambreen, Gullybreen and Brokebreen on the south side, **Waggonwaybreen**. The latter fil the whole head of the fjord with a high ice front, and it calves heavily. The glacier has in parts parallel moraine strips which appear as wheel ruts, hence the name.

On the north side of the fjord, Alkekongen (810) is innermost and Høystakken (666) lies further out. High numbers of razorbills populate the foot of Alkekongen. Further westwards the landscape consists of long, high mountain ridges. The high mountains here shade the south side of the fjord, which has sun for only a couple of hours of the mid-summer sun. It is therefore cold and little vegetation on that side, but on the north side it is relatively warm and fertile.

When following Magdalenefjorden inwards in mid fjord the depth are generally greater than in the nearest 10 nautical miles out to sea. The innermost basin in the fjord is the deepest with depths down to 130 m.

Midway out in the fjord mouth, 1.8 nautical miles north-northwest from Magdalenehuken, there is a 6 m shoal, **Magdalenebåen**, and about 1 nautical mile south of this lies **Hukgrunnen** with depths of 8, 9, 11 and 13 m.

Close to the shore near Magdalenehuken there is a small rock, **Kvalryggen** which was well known as a landmark in earlier times. Both here and off Adambreen further in the 20 m contour runs about 5 cables from the shore. Otherwise it is deeper close to the shore and with shallow glacial bays along the south side of the fjord. The same applies to the north side from the fjord head outwards to **Fugleholmen**. This islet is only 1.5 m high and lies about halfway into the fjord about 6 cables south of the northern shore. Both south and east of the islet the water is foul with stones and rocks awash which extend right out to the middle of the fjord. From Fugleholmen and further out towards Knattodden the 20 m contour extends about 5 cables from the shore.

Larger vessels should not sail between Fugleholmen and the northern shore, even though the depth is good, about 17 m, as it is not easy to sail between the shoals that exist further in.

Larger vessels can find suitable anchoring depths of 15–40 m, sand and mud bottom, on the bank north of Adambreen and further towards Gullybreen. The area is open towards the west but has always been considered to be one of the best anchorages on the west coast.

Vessels can also anchor in **Gullybukta** in 15–20 m, clay and mud bottom. There is a 60 m opening a little west of the centre of the entrance where the depth is about 6 m. It is a well sheltered harbour. A small amount of calving from Gullybreen occurs but there is no current. The harbour is designated a place of refuge against acute pollution. See Chapter 1 for further information.

There is better anchorage for larger vessels in westerly to north-westerly weather along the north side of the fjord southwest of **Høystakken** (670).

The best harbour for smaller vessels is **Trinityhamna** on the east side of Gravneset where the depth is 20 m. The bottom, however, is steep and vessels should sound carefully into suitable depth. Westerly winds are not strong here but during easterly winds there will be a danger from calf ice. Landing is very easy on the sandy beach in the bay along the peninsula. Smaller vessels can pass through the sound, about 1 cable wide, between Gravneset and Donkerholmen north of the ness, depth 4–6 m. The harbour is designated a place of refuge against acute pollution. See Chapter 1.

WAGGONWAYBREEN, Magdalenefjorden Photo: Eiliv Leren

THE DISTRICT GOVERNOR'S SERVICE CABIN, Graveneset with the grave yard and mountain peak Høystakken in the background
Photo: NHS

On **Gravneset** are the graves of the old whale hunters who died at sea. As a monument to this the Norwegian Government erected a plate with the inscription «Svalbard Explorers 1600–1750, erected by the Norwegian State, 1930». Entry to the graveyard is prohibited. The District Governor has a service cabin here, See list of cabins in Chapter 1.

Magdalenefjorden has from whaling times been regarded as one of the best, and therefore one of the most used harbours on the west coast. Although the fjord is open to the west, there are no real seas here. The main reason for this is that there is a comparatively short distance to the pack ice in the west. Of the glaciers that reach the fjord, only Waggonwaybreen sheds calf ice but never enough to create problems. A little way inside Adambreen there is a fine place to ta e on water.

THE TIDAL STREAM
The tidal streams fl w very strongly off Magdalenehuken. It sets northwards on the flood tide and south ards on the ebb.

Magdalenefjorden to Norskøyane
(Chart nos. 507, 521)

The area between Sørgattet and Norskøyane is known as «NW corner» in the vernacular, and it is a fact that it is the only part of Svalbard that can be regarded as an archipelago. It was here in Barents time that the archipelago was rediscovered when his vessel was driven southwards from the edge of the ice pack. He named the land Spitsbergen after the mountain formations. The whalers settled first in this area and there are traces of their activities in many places.

Outer areas around «The Northwest Corner» (Chart nos. 507, 521)
Vessels on the way northwards and are too large to use Sørgatten, must round «The NW Corner» at a good distance. With *the most westerly summit* (465) *of Nissenfjella* (south of Femtebreen) *touching the outermost point on Hoelhalvøya*, vessels are clear west of Magdalenebåen, 6 m, and the 9 m shoal west of Harpunodden on Danskøya. Another line to keep clear west of the same 9 m shoals is *Astrupneset visible outside the point near Bikuben* (west side of Amsterdamøya).

Skorpa, on the west side of Danskøya, is a bird sanctuary, and legal access to the island and islets surrounding it is restricted by the protection regulations (Chapter 1).

The water is shallow along the west side of Danskøya up to 0.5 nautical miles from the shore. The two rocks awash, **Lyngaassteinane**, 1.2 nautical miles west of Haråunodden, can also be passed on the inner side by keeping relatively close up to the rocks awash.

Kobbefjorden, on the west side of Danskøya, is about 2 nautical miles long and 1 nautical mile wide outermost. Vessels should preferably enter the fjord along the north shore, as there are two shoals midway off the mouth of the fjord, and it is also foul off the southern ness in the fjord mouth.

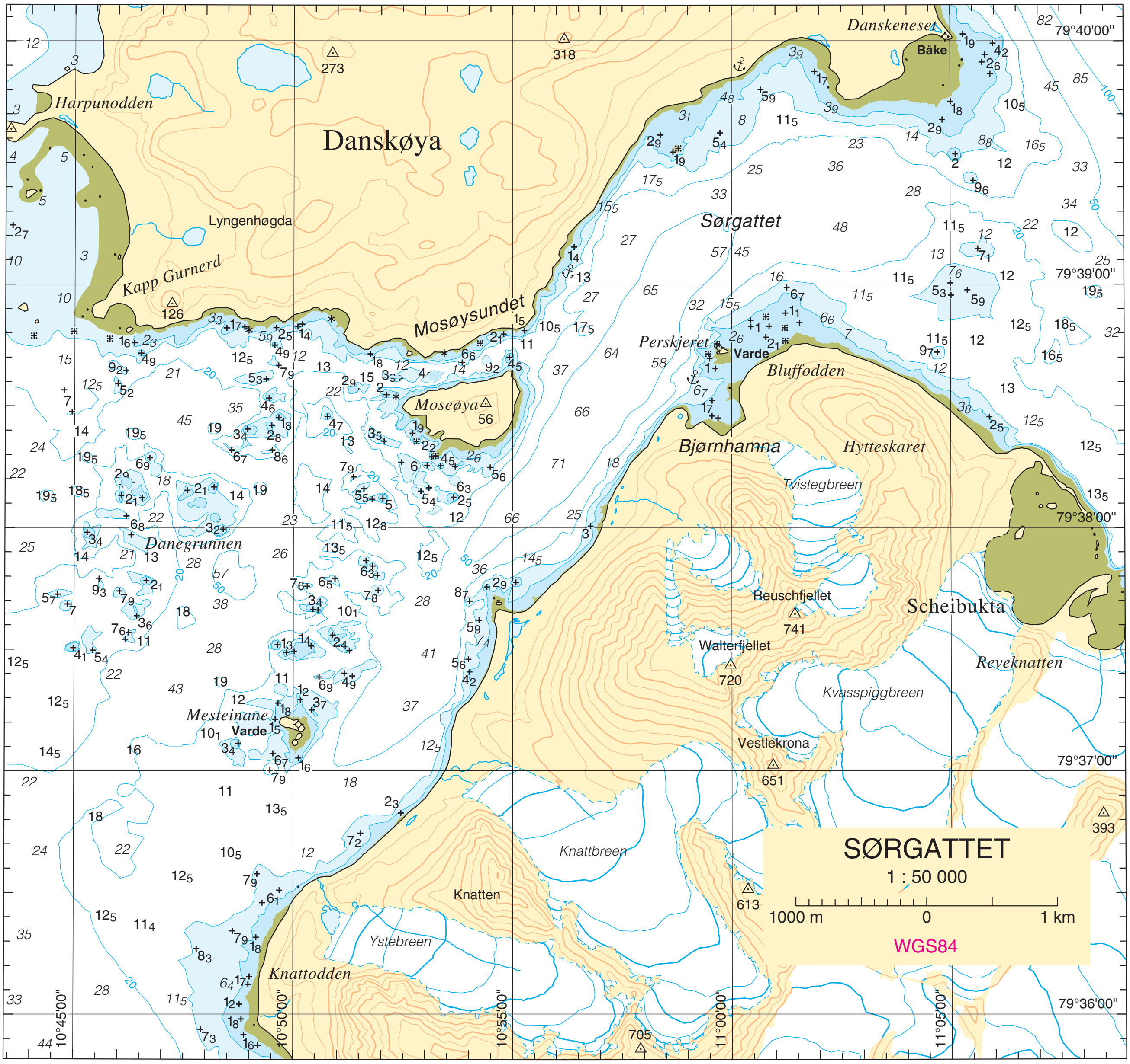
The little, low islet of **Postholmen** lies within the fjord. During the whaling period, when vessels had returned from home, they left letters here for the other whale hunters in the area, and vessels returning home also went in to take any post back home.

Innermost in Kobbefjorden there is a deep basin with 20–28 m depth, but vessels must pass a 4 m deep reef before entering. There is good holding ground inside the basin for vessels that can get in, while larger vessels anchor best between Postholmen and the northern shore in 7–10 m depth.

The 20 m contour lies close into **Ytterholmane**, west of Amsterdamøya, and vessels can keep close to the islets when passing on the west side. There is a least depth of 12 m in the middle of the channel between the islets and Amsterdamøya.

From the north point of Amsterdamøya, **Hakluytodden**, a moraine ridge runs in a large arc northwards and then southeastwards in towards Fuglesongen island. The depths vary, but are largely less than 30–40 m, and with the shallowest part of 12 m laying 278° – 3.5 nautical miles from the north point of Fuglesongen. There is a 7 m shoal about 8 cables northnorthwest of the north point of Fuglesangen.

The islet **Risen** (79°53.0'N 11°29.0'E) is about 1 nautical mile north of Klovningen, with **Kobbskjera** 2 nautical miles further northeast. Shoal ridges stretch in from both Risen and Kobbskjera towards Klovningen and Ytre Norskøya respectively.



Inner leads Magdalenefjorden–Nordgattet

(Chart no. 521)

Reuschhalvøya lies between Magdalenefjorden and Smeerenburgfjorden. Here the landscape is wild with sharp mountain ridges and peaks of up to 600–700 m, split by glacier-filled valleys. The mountains fall steeply down towards the sea, while the glacier arms along the coast end on the land or on drying areas.. Further east the great **Smeerenburgbreen** falls out into **Bjørnfjorden**, the inner arm of Smeerenburgfjorden.

Sørgattet (Chart no. 521)

Sørgattet (see harbour plan), forms the southern entrance to Smeerenburgfjorden, and runs between the mainland and Danskøya. Navigators should not reckon on depths greater than 10.5 m through the sound, even though with precise navigation deeper water may be found. In the western part of the sound there are pinnacles of 10.5–11 m and the eastern part must be manouvred between the 7.1 m and 9.6 m shoals.

MESTEINANE BEACON Photo: NHS

BJØRNHAMNA hunting cabin Photo: NHS

Larger vessels sailing in Sørgattet. When approaching from south it is appropriate to steer on Bikuben (Amsterdamøya) until as far as Mesteinane just clear of Moseøya's east side, and then pass Magdalenebåen on the inner side. The course is held until abeam of the first glacier north of Knattodden, then turned into mid-waters between Mesteinane and the mainland.

The same distance from the shore is held inwards when vessels are turned a little before the small islets near the southern shore. Vessels also go clear of the foul waters around Perskjeret, where the 10 m contour runs 3.5 cables out form Bluffodden. The course then turns eastwards on Gullmarbreen, with the sound north of Moseøya directly astern, where vessels are then in the deepest channel between the drying area from Danskeneset (lattice beacon) and the 7.1 m and 5.3 m shoals to starboard. Vessels go clear of the shoal area from Danskenset with *the cairn on Mesteinane in line with the cabin on Bjørnhamna*. This lead is the most natural to use on the way southwards.

The area that lies within the triangle between **Mesteinane**, Moseøya and Kapp Gurnerd is foul with many shoals. Those wishing to sail through this area should have accurate navigation. Smaller vessels will find safe passage along the northern shore, and further through the sound between Moseøya and Danskøya. When navigating this sound mariners must beware of the shoal area out westward from Moseøya. Mesteinane are a bird sanctuary, and legal access to the island and islets surrounding it is restricted by the protection regulations (Chapter 1).

The other shoal areas in Sørgattet are around Bluffodden, and a long shoal area projecting from Danskeneset (lattice beacon) with the 10 m contour about 5 cables south-eastwards from the ness. Beware of the 1.7 m shoal 5 cables south of the lattice beacon.

The best anchorages in Sørgattet are along the shore on the east side of **Danskøya**, 0.5–1.0 m, northeast of **Moseøya**, and in the bay due west of **Danskeneset**.

The way into **Bjørnhamna** is very foul, with the exception on the west side of the bay where there is a channel 1 cable wide with a depth of 5 m. There is an old hunting station here which was constructed by August Olafsson for the «Northern Exploration Company» in 1912/25. The cabin has been restored several times and is now used as a service cabin for the District Governor.

PERSKJERET BEACON Photo: NHS

DANSKENESET LATTICE BEACON Photo: NHS

Smeerenburgfjorden (Chart no. 521)

Smeerenburgfjorden cuts through the area from north towards south and southeast between the great Vasahalvøya on the east side and Reuschhalvøya, Danskøya and Amsterdamøya on the west side. North of Vasahalvøya are Nordvestøyane, which consist of 54 large islands and also several islets and rocks. All the islands are relatively high. Vasahalvøya is covered by continuous mountains with heights of up to 1000 m, and with glaciers that branch down to the fjord. The fjord is deep and clear, down to about 220 m on the inner side of Danskøya and Amsterdamøya. Along the whole of the east side of the fjord, where the steep mountain side and glaciers fall to the sea, it is relatively deep close to with the exception of the shallow bays where Frambreen and Kennedybreen run down to the sea.

In the south of the fjord vessels can anchor in a depth of 12 m, sand and mud bottom, in the mouth of **Scheibukta**, while further into the bay it is un-navigable due the large shoal areas. The bay is designated as a place of refuge against acute pollution (Chapter 1).

St. Laurentiusbukta, east of Scheibukta, is a rather shallow anchorage, but with an even seabed in to 6 m. A 4 m shoal lies between the two bays about 4 cables north of the point.

Marbukta, on the east side of the fjord, is a well sheltered harbour for smaller boats. They can anchor in 10-15 m innermost in the bay, clay bottom. Steep mountains with glaciers end on the land so vessels are not plagued with ice. Down winds occur in easterly wind directions.

Slaadbukta is an anchorage for larger boats of 25–30 m, but the bay is more open and exposed to strong easterly winds. It is also exposed to calving from the glacier.

Frambukta has not been surveyed. There is a shallow ridge across the whole of the opening. There is calf ice in the bay.

Vessels can anchor in **Kennedybukta** in depths of 40–50 m. The bay is open with much calf ice from the glacier.

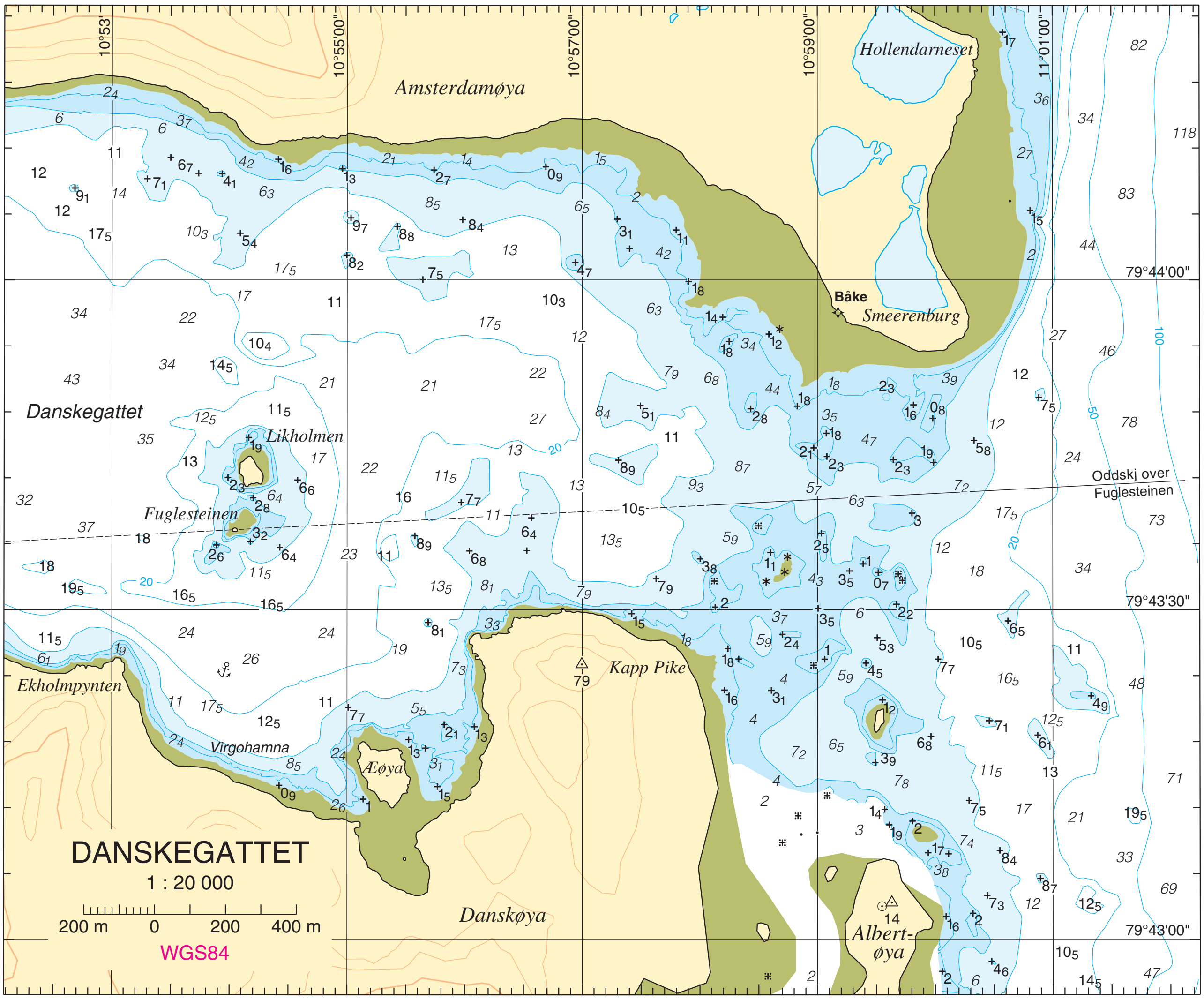
Northwards from Danskeneset the 20 m contour follows the fjords main direction and therefore it is relatively close to the shore at the beginning and off Smeerenburgodden, while to the north of and into the bays south of Albertøya it extends out into the fjord about 5 cables.

With care smaller vessels can find anchorage most northerly in the bay south of Albertøya, **Krunglebukta**, but further south the bay is un-navigable.

Smeerenbukta, on the north side of Smeerenburgodden, is otherwise the best anchorage along this stretch. Vessels can anchor in suitable depths, 5–10 m, but beware of the 6 m shoal that lies furthest outermost edge of the danger line, about 8 cables northeast of the wide point in the middle of the bay. South of the same point, towards the lagoon, it is shoal with several rocks awash. The same conditions also apply just on the north side of Smeerenburgodden.

Danskegattet (Chart no. 521)

Danskøya is situated north of Reuschhalvøya and is separated by this from Sørgattet. The island is barely 9 km long in a north-south direction and a good 6 km at its widest. A



SMEERENBURGODDEN LAT. BEACON Photo: NHS

fjord arm, Kobbefjorden, cuts in on the west side. The whole of Danskøya is covered by grayish peaks and stacks, with **Wellmankollen** (350) as the highest. There is a narrow coastal plain along the east coast of the island.

Danskegattet (see harbour plan) lies between Danskøya and Amsterdamøya, but at both ends of the sound is crossed at the entrances by shallow ridges. The eastern entrance can be passed in 6.3 m of water, with *Fuglesteinen in line with Oddholmen*. This lead also goes north of a rock awash that lies a little further west.

The western shallow ridge can be passed by keeping in the middle of the sound with *Fuglesteinen well clear of Kapp Pike*, depth 12 m. It shoals up nicely up towards the shore on the south side, but on the north side a reef projects just west of **Kapp Zachau**, and ends in a 1 m shoal 4 cables off shore.

The anchoring conditions on Danskegattet are good, sand and mud, but in the middle of the sound and westwards from Likholmen it is deep, down to 55 m north of Søre Midtodden.

The most usable anchorage is on the west side of Virgohamna and over towards **Likholmen**. Only small boats can go right inside the harbour, east and south of Æøya. On **Æøya** there is a cabin built by Alfred Johansen in 1925–30. Today the cabin is used as a service cabin for the District Governor. See list of cabins in Chapter 1.

In **Virgohamna** there are the remains of the polar explorers Andreé, Frænkel and Strindberg who began their balloon jorney from here in 1897, in an attempt to reach the North Pole by air balloon. The explorers ended up on the ice in the Arctic Ocean and crossed the ice to Kvitøya, where they perished. They were found in 1930. Virgohamna is an important cultural relic area and has entry restrictions. The District Governor can give permission to visit in special circumstances.

Amsterdamøya, which is separated from Danskøya by Danskegattet, which is about half the size of Danskøya. The highest peak (472) is situated in the middle of the island. From there the glacier arms stretch down towards the coast in the north and northeast, but without actually reaching the sea. The most easterly glacier, **Annabreen**, terminates at Gjøaneset. From Gjøaneset, Smeerenburgsletta extends to a width of about 600 m south-eastwards, and goes out over Hollanderneset with Smeerenburgodden the outermost. It is in this area where the Dutchman **Smeerenburg** («Spekkbyen») lies. The remains of the whale oil ovens can still be seen out on the point.

The name Smeerenburg means Blubber city. *The whaling station was the main base for the Dutch whalers in the first half of the sixteenth century. This was the period when the hunters still went along the coast and into the fjords on Svalbard. The most visible evidence of the old whaling station today is «spekkbetongen», one of the ovens where the whale flesh was boiled. The ruins of the old Smeerenburg are mainly hidden under the sand.*

In its heyday the whaling station consisted of around nineteen buildings. Most of the houses had floors and room s with fireplaces, so living conditions must have been relatively good. The areas between the houses were stone paved and drainage systems carried away rain and melt water. Out by the ovens the work place was covered against weather and wind, which provided reasonably comfortable working conditions.

(Source: Cruise handbook for Svalbard).

TORSBU, Æøya Photo: NHS

BIKUBEN, Amsterdamøya Photo: NHS

The hunting cabin on the north side of Fuglepynten Photo: NHS

On the south side of the island the steep cliffs fall down towards the sea and furthest west the island ends with the isolated and easily recognised peak, **Bikuben** (198).

Nordgattet–Norskøyane

(Chart no. 521)

Vasahalvøya, between Smeerenburgfjorden and Raudfjorden, is covered by pointed, rugged mountains between 600-1000m and with glacier filled valleys where the glaciers go right down to the sea. The glaciers have cut bays in the coastline, most of which are shallow and partially dry out.

On the north side of the peninsula, **Fuglefjorden** and **Holmiabukta** cut in respectively 3 and 1 nautical miles southwards.

Fugløya (380) lies outermost in the mouth of Fugløyfjorden where it divides into two arms.

The largest islands north of Vasahalvøya are as follows from west: **Fuglesongen** (387), **Klovningen** (292), **Ytre Norskøya** (152) and **Indre Norskøya** (257). Klovningen in particular is easy to identify with its sharp cleft on the north of the island which separates into two small peaks, and is easily seen from all directions except from northeast and southwest.

In addition to the larger islands there is also a number of islets and rocks in this area, the most northerly being Kobbskjera, about 3 nautical miles north of Ytre Norskøya.

Fuglefjorden is divided into two arms by Fugløya, where **Fuglegattet** is the best approach to the fjord. Here it is clear and deep with the exception of two shoals, 1 and 2 m, about 4 cables due west of the southwest point of Fugleøya, and a 7.6 m shoal in the middle of the fjord south of the same point. It is also shallow with rocks awash out from the west point of Fugløya.

In the eastern fjord arm the waters are foul with many islets, rocks and shoals. Navigation here demands extreme caution and the use of the largest scale chart available.

There are several channels to choose from if sailing further eastwards from Nordgattet. Larger vessels are safest by going west of the island **Fuglesongen**, but they can also sail up along the east side of the island. On the west side of the island there is an 8 m shoal about 7 cables out from the middle of the island, and at the same distance north-northwest of the north point there is a 7 m shoal. When these are rounded vessels can be steered eastwards, well clear of the north side of **Risen** and the rocks to its north, and then south of **Kobbskjera**.

FUGLEPYNTEN with FUGLESONGEN in the backgruound Photo: NHS

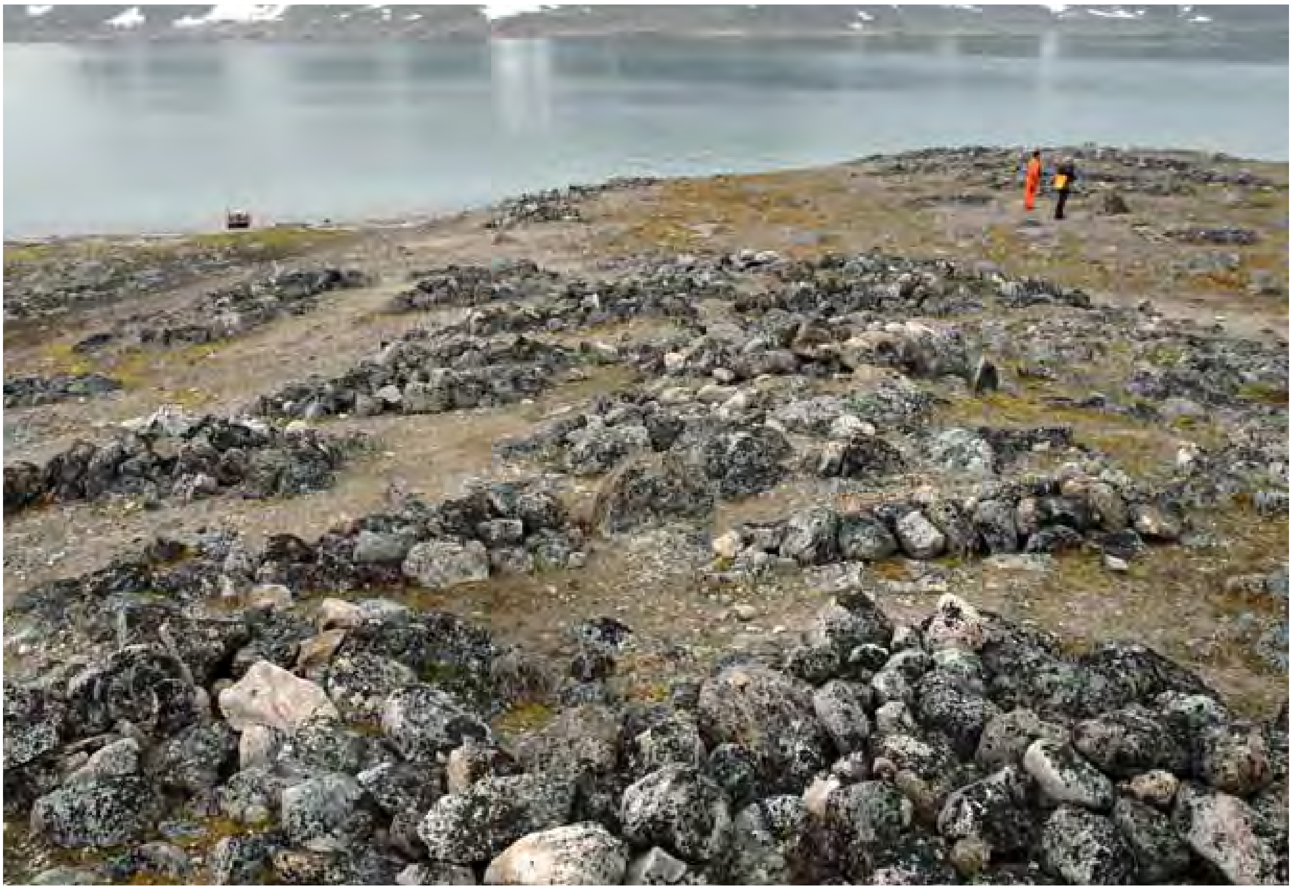
YTRE NORSKØYA, KLOVNINGEN and FUGLEHOLMGATTET, viewed from NE Photo: Eiliv Leren

If using **Barentsgattet**, between Fuglesongen and Klovningen, Fuglepynten and the west side of Fugløya must be rounded at a good distance, respectively 0.5 and 1.0 nautical miles off, to go clear of the shoals further round the southeast point of Fuglesongen, which is deep close to. The sound is clear with the exception of a 5 m shoal that lies on the east side of Fuglesongen, about 3 cables off shore a little north of the middle of the island. From there vessels are steered further eastwards between Klovningen and Risen, where there is about 17 m of water in mid channel. When sailing further eastwards mariners should note that there is 10 m shoal northeast of Ytre Norskøya, about midway between this and Kobbskjera.

Cooksundet, between Klovningen and Norskøyane is clear but there are 7–9 m shoals in the area south of Klovningen.

Smaller vessels usually go through **Norskøysundet** (see plan) between Ytre and Indre Norskøya, The sound can be passed in 8 m of water, and it is clear with the exception of a 1.7 m shoal that lies about 200 m out from the northern shore. The shoal usually does not cause difficulty due the stream eddies and brown colour of the sea. Otherwise the bed of the sound is sandy.

YTRE NORSKØYA with NORSKØYSUNDET Photo: Eiliv Leren



The graveyard on YTRE NORSKØYA Photo: NHS

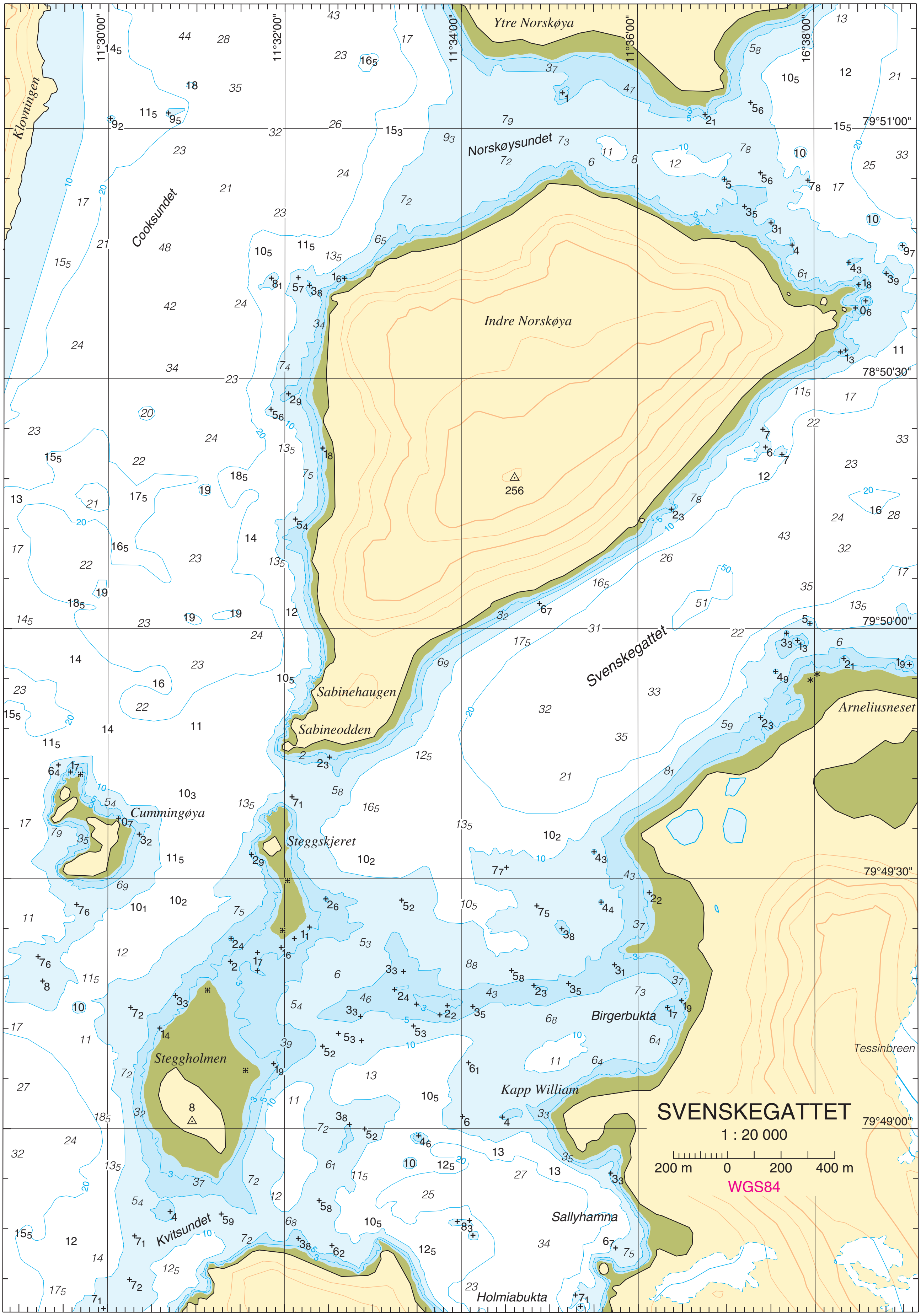
As early as the 16th C, several years before whaling stations were built, Ytre Norskøya had already been picked out as a good place to be. The island is one of Nordvestøyane, an area with its sound and islands that offer good sailing and anchoring conditions in addition to shelter from weather and wind. Just outside the great ocean rules! The area was christened Fair Haven.

Ytre Norskøya lies at the centre of the main area of the Dutch whale hunting in the 16th C, the time when whale hunting was based on land stations for boiling the whale flesh for the extraction of oil. The island was a place well suited for a whaling station, ideally placed in the neighbourhood of the hunting grounds. The station lies near Norskøysundet between Ytre and Indre Norskøya. A sheltered inlet protects from weather and wind, and a good and wide beach makes landing easy. Today the remains of nine flesh ovens can be seen, positioned in a row along the beach within the bay. The graveyard on the island, with its 165 graves is one of the largest on Svalbard (source: Cruise Handbook for Svalbard).

From **Fugleholmgattet** vessels can round Fugløya and be steered through Norskøysundet until past the 5.9 m shoal and then lay course south of Cummingøya. After rounding **Cummingøya**, course is laid in mid sound between Sabineodden and the drying area on the south side of the sound. By steering a little south of the 5.8 m depth in the plan there will be a depth of only about 8 m. This is the most sheltered sailing lead past the northwest point of Spitsbergen. Smaller boats can also sail south of Fugløya and through Kvitsundet and out into Svenskegattet but it then requires a man at the bow in certain areas and clear enough water.

Svenskegattet is clear, except for some rocks awash that lie out from Arneliusneset on the south side of the sound.

The waters are foul between Svenskegattet and **Holmiabukta**. By keeping on a line between Sabineodden and the western edge of Holmiabukta vessels will pass over the shoal fl t with a depth of only 4.5 m. Holmiabukta can also be entered from the west by going through **Kvitsundet**, between Steggholmen and the mainland, by keeping closer to the mainland than to the islet, depth 7 m. If this route is taken navigators must beware of the rock awash 3 cables northwest of Drotteneset. The basin in Holmiabukta provides good anchoring possibilities with depths up to 40 m. **Sallyhamna**, south of Kapp William, is a well sheltered harbour with steadily rising depths from 10 m to 4 m within the bay, mud and stone bottom. The cabin situated here was built by Waldemar Kræmer in 1937. It is now used as a service cabin for the District Governor. See list of cabins in Chapter 1.


SVENSKEGATTET
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200 m 0 200 400 m
WGS84
Ytre Norskøya
Norskøysundet
Indre Norskøya
Klovningen
Cooksundet
Sabinehaugen
Sabineodden
Svenskegattet
Arneliusneset
Cummingøya
Steggskjeret
Steggholmen
Kvitsundet
Birgerbukta
Kapp William
Tessinbreen
Sallyhamna
Holmiabukta
11°30'00"
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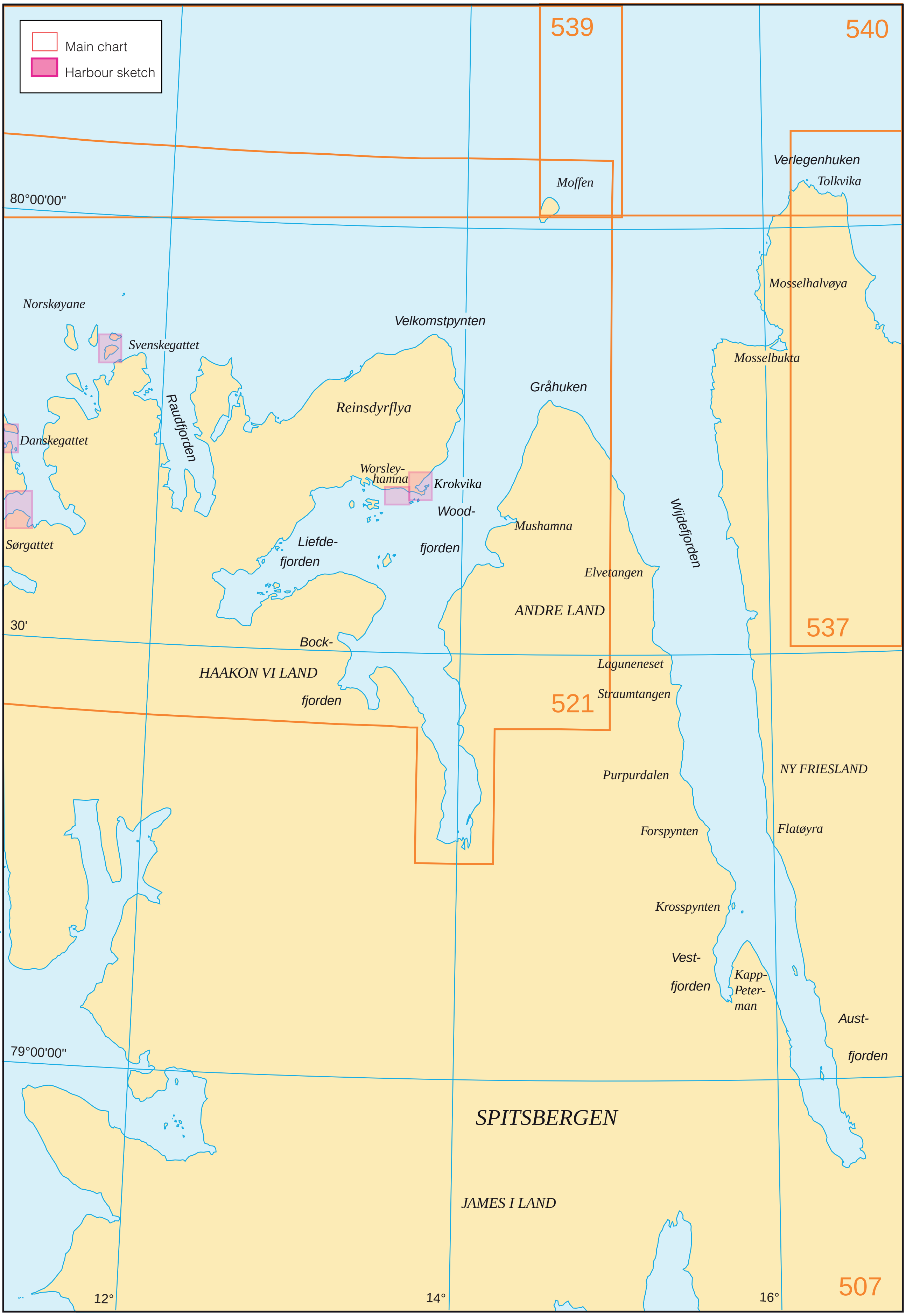

Main chart
Harbour sketch
539
540
537
521
507
80°00'00"
30'
79°00'00"
12°
14°
16°
Moffen
Verlegenhuken
Tolkvika
Mosselhalvøya
Mosselbukta
Norskøyane
Svenskegattet
Velkomstpynten
Gråhuken
Reinsdyrflya
Raudfjorden
Danskegattet
Worsley-
hamna
Krokvika
Wood-
fjorden
Mushamna
Sørgattet
Liefde-
fjorden
Wijdefjorden
Elvetangen
ANDRE LAND
Bock-
fjorden
HAAKON VI LAND
Laguneneset
Straumtangen
Purpurdalen
NY FRIESLAND
Forspynten
Flatøyra
Krosspynten
Vest-
fjorden
Kapp-
Peter-
man
Aust-
fjorden
SPITSBERGEN
JAMES I LAND

The north coast of Spitsbergen from Norskøyane to Verlegenhuken

(Chart nos. 507, 521, 539, 540)

(The information in this chapter is imperfect due to incomplete surveying)

The coastline between Norskøyane and Verlegenhuken is characterised by one small and two larger fjords, Raudfjorden, Woodfjorden with Liefdefjorden and Wijdefjorden.

Raudfjorden, on the east side of Vasahalvøya, stretches in southwards between Flathuken and Jermaktangen, and is about 12 nautical miles long and 4–2 nautical miles wide. Innermost in the fjord it is divided into two by **Buchananhalvøya**. This peninsula is highly visible from outside as it projects between two glaciers.

Vasahalvøya on the west side of the fjord has a wild mountain landscape with pointed summits of 600–1,000m which are separated by glaciers. The highest peak, **Stortinden** (1010), is on the W side of Narreneset on the north point of Buchananhalvøya.

Along the west side of the fjord, six glaciers with steep fronts run into the sea in shallow water. In the south, the two largest glaciers, **Chauveaubreen** and **Raudfjordbreen**, end respectively in **Ayerfjorden** and **Klinckowströmfjorden**, on each side of Buchananhalvøya.

The land on the east side of the fjord is also high, with summits of 600–800 m and with glaciers which on this side do not reach the sea. There are plains beneath the mountain slopes, several of which have lagoons.

In the north, the fl t **Ermaktangen** (79°50.3'N 12°12.2'E) and especially the most easterly **Biskayarhuken** stand out as good landmarks.

Raudfjorden

(Chart no. 521)

Raudfjorden has greatly varying depth, but a deep clear channel of over 100 m extends from Kobbskjera all the way into Buchananhavlvøya. About 2.5 nautical miles within the mouth there is one of the deepest parts of the fjord, 217 m, while close west of this the depth decreases to 20 m. Also in this fjord there is a shoal area approximately in mid-fjord. Also in the mouth there are shoals of 16–18 m, west of Bruceneset 14 m and not least the dangerous **Svalisbåen**, 1 m, which lies 7 cables southsouthwest of Bruceneset.

Along the west side of the fjord it is somewhat shoal in the outer part, and mariners should beware of the 1 m shoal which lies 4 cables from shore just before the first glacie .

In **Hamiltonbukta** there is a usable anchorage, well sheltered from the sea but down winds and calving ice from Hamiltonbreen can be troublesome. The area is attractive.

With the exception of Hamiltonbukta, all the glacier bays are unusable, while elsewhere the seabed falls steeply further inwards along the west side of the fjord.

HAMILTONBUKTA with HAMILTON GLACIER viewed from E Photo: Eiliv Leren

RAUDFJORDHYTTA Photo: NHS

Around **Ermaktangen**, on the east side of the entrance to the fjord, the 10 m contour crosses a large shoal fl t, and there are also depths of less than 10 m up to 2 nautical miles north and north-northwest of this spit. The shoal area is little used as there are several rocks awash and it is also very shallow in some places. The shoal area extends across to **Kapp Svensksund** where there is a rock awash and a 6 m shoal respectively 6 cables and 1 nautical mile north-northwest of the ness.

Further inwards along the east side of the fjord, there are no dangerous shoals before the dangerous Svalisbåen, south-southwest of **Bruceneset**.

Alicehamna, south of Bruceneset, is the best anchorage in the fjord but watch must be kept for Svalisbåen already mentioned. In southerly winds and with ice calved from Raudfjordbreen, vessels are safer on the north side of Bruceneset. The cabin on Alicehamna was built by Erik Mattilas in 1907–09. It was burnt down, probably by the Germans during the war, and rebuilt just afterwards. The cabin is in poor repair and functions as a refuge cabin. See list of cabins in Chapter 1. Alicehamna is designated a place of refuge against acute pollution. See Chapter 1 for further information.

Ayerfjorden and Klinckowstömfjorden (Chart no. 521)

The seabed falls steeply in both of the fjord arms, especially around Buchananhalvøya. In calm weather vessels can anchor in the inner part in 15–20 m, stone and mud bottom, but the harbour is poor due to down winds and calving from the glaciers.

Mariners should, however, beware of the rock awash that lay 4 cables from shore between Fuhrmeisterbreen and Portierbreen in Ayerfjorden.

Ermaktangen–Velkomstpynten (Chart no. 521)

The peninsula between Raudfjorden and **Breibogen** is parted almost in two by Richardvatnet, which runs across to **Morenelaguna** on the east side. This peninsula is a part of the large peninsula between Raudfjorden and Woodfjorden. The highest mountain, **Ben Nevis** (921), is situated in the south, while the height of the mountains and glacier landscape decreases north-eastwards to terminate with the conspicuous **Skjoldkollen** (479). From here the great **Reinsdyrflya** widens further eastwards to its highest point, Velkomstvarden (95), 2.5 nautical miles south of **Velkomstpynten** (79°52.6'N 13°46.0'E).

In **Lingbukta**, between Ermaktangen and Biskayarhuken, it shoals evenly. Vessels can anchor here in suitable depths but the bay should be entered just to its north to avoid the shoals off both points. There are two lagoons within the bay.

There are several lagoons within the beaches between Biskayarhuken and Velkomstpynten.

SOLANDERNESET and BRUCENESET with BUCHANANHALVØYA in the background, viewed from N Photo: Eiliv Leren

VELKOMSTPYNTEN viewed from NW Photo: Eiliv Leren

ERMAKTANGEN and LINGBUKTA viewed from W Photo: Eiliv Leren


The LATTICE BEACON on Moffen Photo: NHS

In Breibogen, the western part lies **Morenelaguna**, which is the largest of them. In a small boat and with care it is possible to cross through the lagoon to the river which forms a connecting channel with **Richardvatnet**. Richardvatnet reaches almost the whole way across to Raudfjorden.

In **Breibogen** it shoals evenly up from the 10 m contour but further out the depth is variable with shoal peaks of 8–10 m. Further westwards the conditions are mostly the same but the 10 m contour extends further out from the shore, eastwards towards Velkomstpynten, up to 1.5 nautical miles from shore in some places.

Norskøyane–Moffen
(Chart nos. 507, 521, 539)

The depths from north of Nordvestøyane and eastwards are extremely uneven, and when sailing along 79°57'N they fluctuate between 30 m and 200 m.

Larger vessels that sail outside all the islands will at a distance of 5 cables north of Kobbskjera should continue on a course due east (along 79° 55'N) and then go clear of the 20 m contour north of Velkomstpynten. Smaller vessels using Norskøysundet will, by keeping *Hakluytodden on Amsterdamøya in the centre of Norskøysundet* (066°–246°) go clear for the bank that ends in a 5 m shoal, 8 cables north of **Flathuken**, and also of the wide fl t shoal surrounding **Ermaktangen** with shoals of 6–8 m outermost.


MORENELAGUNA with BISCAYARHUKEN Photo: Eiliv Leren

Sven Poulsson

MOFFEN viewed from W Photo: Eiliv Leren

When sailing north of Moffen mariners should be aware of the 7.5 m and 9 m shoals, 15 and 10 nautical miles northwest and north of the island.

Moffen (80º01.5'N 14º30.0'E) is a remarkable island which lies about 13 nautical miles north of Gråhuken. The island is about 2 nautical miles long and 1.2 nautical miles wide most northerly. The whole of the pear-shaped circumference consists of a narrow sandy reef about 2 m high, which surrounds a shallow lagoon. A beacon is positioned on the south end of the island. According to a 16th C historical account, vessels could enter from the north and anchor in the lagoon. It is reasonable to assume that pack ice over the course of time has caused changes to the island. Today vessels can anchor on the sandy seabed anywhere around the whole island, formed by the top of a bank eight nautical miles long.

There are travel restrictions between 15th may and 15th September on Moffen, which is an important resting ground for walrus and bird nesting place. The restrictions also apply around the island for 300 metres out from the shore. (See also the travel restriction regulations in Chapter 1).

WALRUS on Moffen Photo: NHS

VELKOMSTPYNTEN to MULLERNESET, Woodfjorden Photo: Eiliv Leren

STASJONSØYANE with KROKVIKA in the background, viewed from SSW Photo: Eiliv Leren

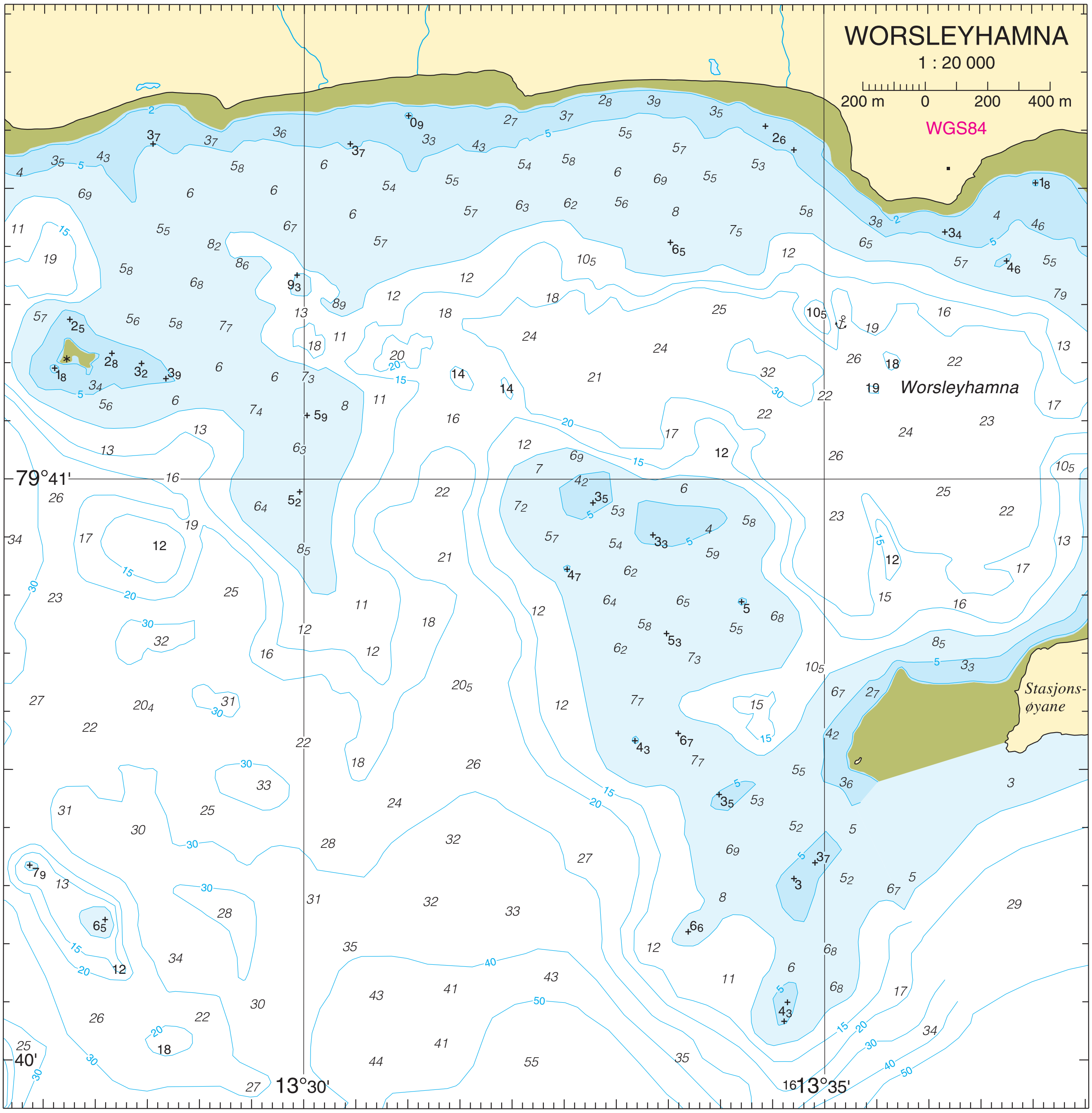
Woodfjorden

(Chart no. 521)

Woodfjorden cuts about 34 nautical miles southwards with a width of 5–2 nautical miles, between Velkomstpynter and Gråhuken. About halfway inwards, on the west side, the fjord has two arms, Liefdefjorden and the smaller Bockfjorden.

The entrance to the fjord is deep and clear but vessels are kept outside the 10 m contour that stretches 5–6 cables out from the shore on the inner side of Velkomstpynten, and about 8 cables off Gråhuken. Further inwards the fjord is also deep and clear, but with a pair of shoal points further in which should be avoided. There is also a 7 m shoal 2 nautical miles due north of Kapp Kjeldsen, and a 1 m shoal, **Midtbåen**, 2.1 nautical miles east-northeast of the same Kapp Kjeldsen.

Ice and fog in the inlet of Woodfjorden Photo: NHS

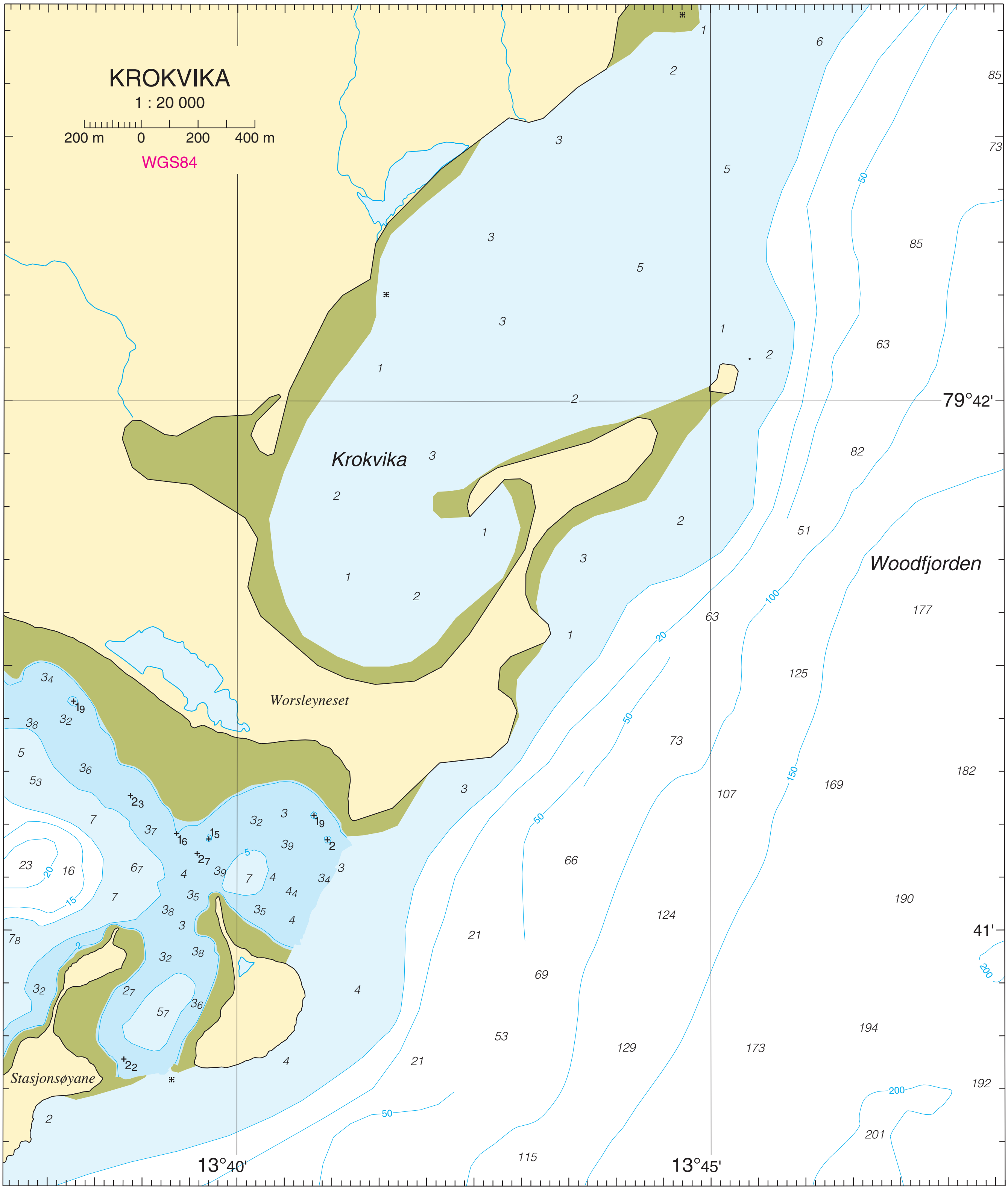


There is an excellent anchorage west-northwest of Stasjonsøyane, in **Worsleyhamna**, It is well shielded in most wind directions and with strong winds from W, you can search around Worsleyneset to Krokvika (see sketch).

Best entrance to the anchorage is from S and W, with depths of 14-16 m (see sketch Krokvika).

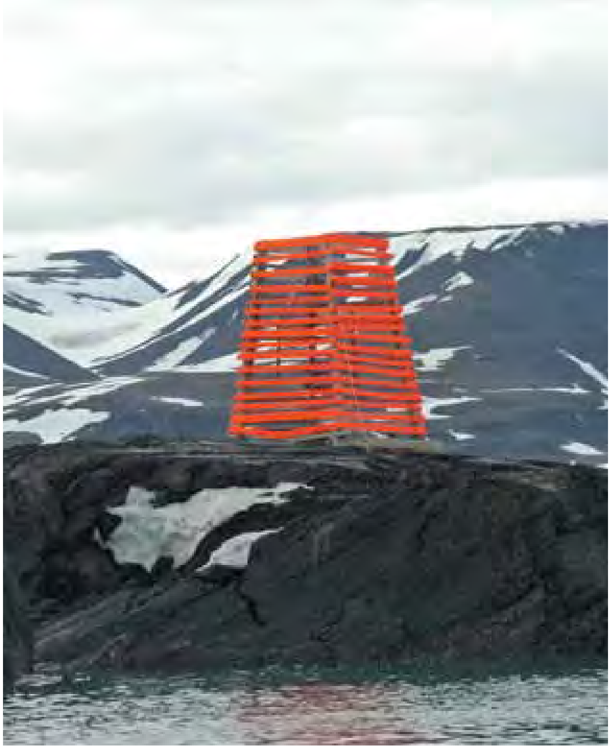
«Villa Oxford» lies in Worsleyhamna and there is a cabin that was erected in 1924 by Hilmar Nøis as a base camp. The material for the cabin was from a transport case for an aeroplane used for scientific service. The cabin has recently been restored and now functions as a refuge cabin. See list of cabins in Chapter 1).

VILLA OXFORD, Worsleyhamna (2009) Foto: Kartverket



Along **Reinstranda**, on the west side of Woodfjorden, it is open with steeply falling seabed and no harbour before reaching **Krokvika**, which is a well sheltered harbour for smaller vessels, depth 3-4 m. (see sketch).

Stasjonsøyane lay just south of **Worsleyneset**. The waters between the islands and Worsleyneset are foul but smaller boats pass with caution, depth about 4 m S of the 2.7 m shoal during the course. Should you enter between Stasjonsøyene, it should happen from N.



GRÅHUKEN LATTICE BEACON Photo: NHS

LIGHT and CABIN SW of Gråhukpynten Photo: NHS

GRÅHUKEN and GRÅHUKSLETTA viewed from NW Photo: Eiliv Leren

Between Mushamna and **Gråhuken** (beacon lattice, 79°48.3'N 14°31.6'E) the shelving bank is up to 5 cables wide with evenly rising bottom which provides excellent anchoring facilities. Gråhuken itself is best approached from the north because, as mentioned, there is shallow water westwards.

The beacon on Gråhuken is situated on one of two small islets, and the 20 m contour here is barely 3 cables wide just to the north. As systematic sounding has not been carried out within three metres, it is not known whether this is a single shoal or a larger area.

There is a light (Fl W) and cabin a little west from Gråhuken. The cabin, which was built by Hilmar Nøis in 1928, functions as a refuge cabin. See list of cabins in Chapter 1.

There is a cabin built by Hilmar Nøis in 1928, on the beach off **Vårfluesjøen**. It functions as a refuge cabin.

On **Mattilasodden**, off Mushamna, there is a timber cabin, built by Kjell Reidar Hovelsrud in 1987. The hunting station was taken over by the District Governor in 1997. The cabin is hired out for one year at a time with the possibility of extending the arrangement. It otherwise functions as a refuge or service cabin. See list of cabins in Chapter 1.

Mushamna has the area's best harbour conditions from all wind directions as vessels can enter the inner basin. The north side is followed where the shelving bank is narrow. The basin is bounded by a long, narrow and low point running in a south-easterly direction, which continues in a 1–2 cables long sand reef. Vessels then continue over towards the opposite point where it is deep close to, and then to a 1.5 cables wide channel with a depth of 10 m. Vessels can anchor inside the harbour in 15–20 m of water, mud and clay bottom.

VÅRFLUSJØEN CABIN Photo: NHS

THE HUNTING STATION on MATTILASODDEN, Mushamna Photo: Eiliv Leren

MUSHAMNA HUNTING STATION Photo: NHS

MUSHAMNA with DACHSTEIN (716) in the background Photo: Eiliv Leren

Jakobsenbukta is the most southerly and largest of the two bays and the 10 m contour here extends 2–4 cables from the shore on the south side, and slightly less on the north side. Innermost in the bay there is a 5 cables wide un-navigable area but vessels can anchor on the outer side of it in depths of 10–40 m. The bay is open to winds from the west and to swell from the north. Jakobsenbukta is designated a place of refuge against acute pollution. For further information see Chapter 1. Further in the fjord it is clear except for the two shoals in the entrance and should not cause problems.

The highest mountain in the area is **Scott Keltiefjellet** (1375) which lies innermost on the east side of Woodfjorden.

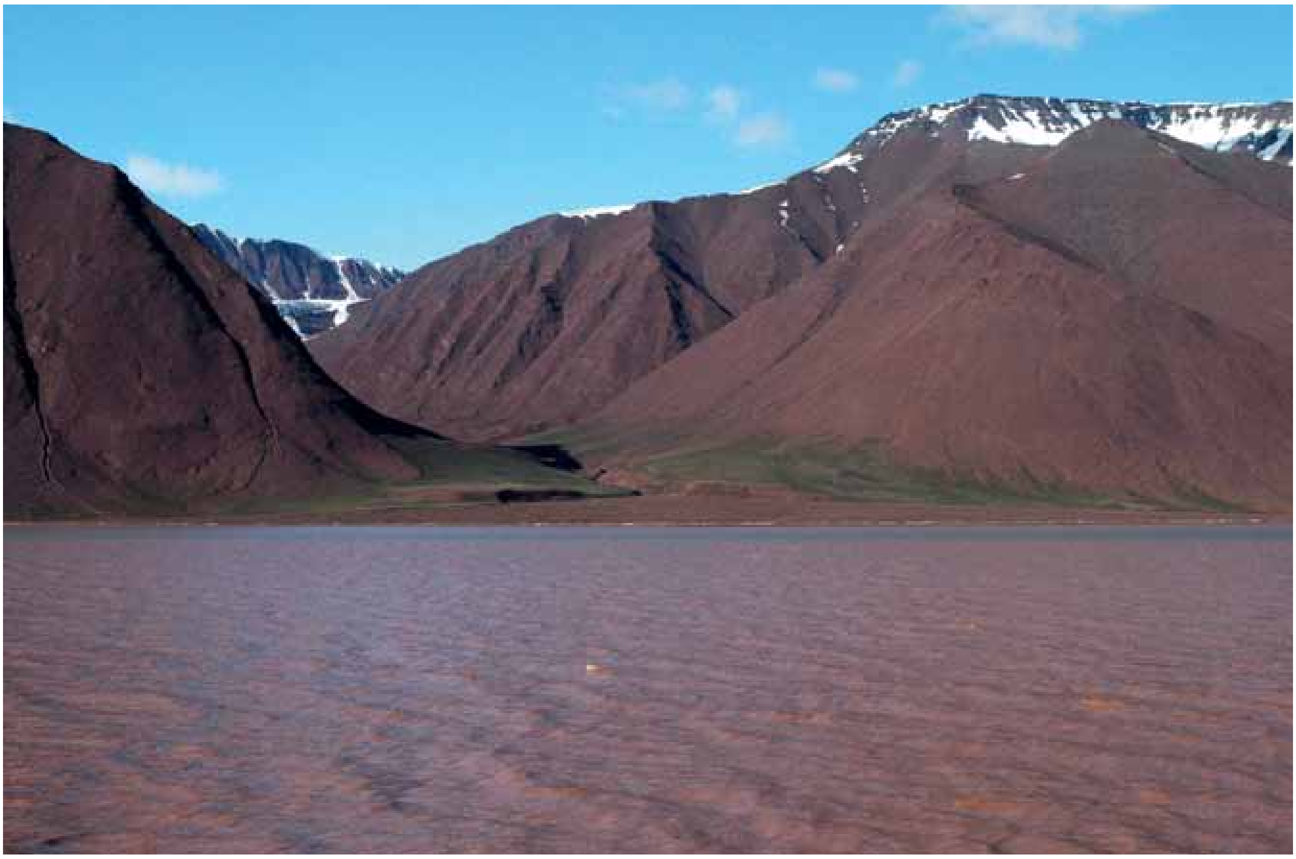
Right 1nnermost in Woodfjorden, on the inner side of Kapp Ringertz, a delta extends out from Woodfjorddalen and this makes **Breiddholmen** inaccessible for any other than small boats at high water.

Cabins and cabin remains on Kapp Auguste Viktoria Photo: NHS

KAPP AUGUSTE VIKTORIA Photo: Eiliv Leren

VERDALSPYNTEN with SØRLIFJELLET (1037) in the background Photo: Eiliv Leren

The ness off Stjørdalen Photo: NHS



The innermost part of WOODFJORDEN. Deposits from the red Devonian sandstone also colour the fjord water red-brown
Photo: NHS

BREIDDHOLMEN with Woodfjorddalen in the background
Photo: NHS

Liefdefjorden (Chart no. 521)
The very beautiful Liefdefjorden extends south-westwards between Worsleyneset and Roosneset and is about 12 nautical miles long. After that the fjord has been reasonably charted, it has been a suitable tourist destination, with its many islands, islets and beautiful nature.

Andøyane form a large archipelago west of Stasjonsøyane. Vessels should sail in on the north side of the islands and keep a good 7 cables to their east and then further westwards along the north side of Store Andøya.

There is an excellent anchorage for smaller boats in the inlet on the west side of **Store Andøya**, depth in the channel, 1.2 m and inside the inlet, 3.5 m.

To enter **Sørdalsbukta** vessels are kept further westwards between Store Andøya and Ringholmen. Vessels can also enter over the long shallow Sørdalsbukta by going south of Andøyane. Between the northern and southern Andøyane the depth conditions are very variable with several dangerous shoals and some in places it goes down to over 50 m. Vessels should be navigated with caution between the islands but the chart provides good details of the seabed conditions.

Måkeøyane lie on the south side of the entrance to Liefdefjorden. A channel over 200 m deep runs between them and the previously mentions Andøyane. Along the north side of Måkeøyane vessels should be kept about 1 nautical mile off, to avoid several shoals and rocks awash. Further into the fjord mariners should maintain a westerly course until past the large area with shoals and rocks that extends from 1.3 to 2.4 nautical miles west of the most westerly of Måkeøyane. The area surrounding Måkeøyane is also foul and must be navigated with caution.

Along the mainland south of Måkeøyane there is a clear deep channel with depths of 60–90 m, if vessels are kept 5 cables offshore.

There is no difficulty in finding an anchorage in Liefdefjorden, except that great care should be taken around the archipelago.

HESTESKOHOLMEN with ANDØYANE in the background, viewed from SW. Texas Bar is nearest in the bay

Photo: Eiliv Leren

HORNBÆKPOLLEN with RINGERTZFJELLET in the background

Photo: Eiliv Leren

TEXAS BAR Photo: NHS

Vessels can anchor in the bay north and south of **Hesteskoholmen**, depths 25–30 m. It is open to the east. The area is designated a place of refuge against acute pollution. See Chapter 1 for further information.

Hornbækpollen, a well sheltered harbour with depths of 9 m in the entrance and 15–20 m in the harbour, sand and mud bottom, is situated north of Lernerøyane.

Just north of Hornbækpollen stands the cabin **Texas Bar** which takes its name from the State of Texas in USA. The cabin functions as a refuge cabin, is in good condition and in constant use. See list of cabins in Chapter 1.

To get to the innermost basin of Leifdefjorden vessels are steered between the islets off Wulfberget and the most northerly of the small islets north of **Lernerøyane**. Course is then held in mid-waters between the mainland and Lernerøyane. As with the other archipelagos in the fjord the waters around the islands are difficult and in parts un-navigable. Innermost in the fjord towards the mighty **Monocobreen**, there is a 1 m shoals 6 cables east from the shore.

LERNERØYANE viewed from W Photo: Eiliv Leren

MONACOBREEN Photo: Eiliv Leren

BOCKFJORDEN viewed from N Photo: NHS

Bockfjorden (Chart no. 521)
The long, smaller **Bockfjorden** extends southwards between Roosneset and Kapp Kjeldsen. The fjord is surrounded by high mountains, except towards Roosfl a by the mouth. On the east side of the fjord arm **Kronprinshøgda** is easily recognised among the other peaks (835–1025).

In the area around the inner part of Bockfjorden, and the rest of the peninsula between Woodfjorden and Wijdefjorden, **Andrée Land**, the mountain landscape is continuous with peaks up to 1300 m and relatively small glaciers in the inner region.

The best anchorage in Bockfjorden is in **Vulkanhamna**, south of Næspynten, where vessels can anchor in a depth of 20 m. A drying bank extends innermost in Bockfjorden and is inaccessible to all but small boats at high water.

Bockfjorden is well known for its dormant volcano, **Sverrefjellet**, which lies on the west side of the fjord, and **Trollkjeldene** (hot springs). These are localised in and just south of Bockfjorden and is believed to be the most northerly land area with hot springs. The largest springs are known as Trollkjeldene. They are situated about fi e kilometres south of the head of the fjord. The water temperature is 20–30 ºC. Right down by the fjord are the small and less visible Jotunkjeldene.

Throughout the years the evaporation of the spring water and the limestone deposits have formed very remarkable terraces. The hot springs create large amounts of microscopic algæ and mosses which are exclusive to this area.

NEWTONTOPPEN (1713) Svalbards highest mountain Photo: Eiliv Leren

Wijdefjorden

(Chart no. 507)

Wijdefjorden is fully 59 nautical miles long. From the 13 nautical miles wide mouth between Gråhuken and Bangenhuk, it extends south-south-westwards and narrows evenly off towards the fjord head where **Mittag-Lefflerbreen** runs into the sea.

The only side arm to Wijdefjorden is in the inner part, Vestfjorden, about 10 nautical miles long.

To a large extent, the whole of the west coast of Wijdefjorden falls steeply to the sea, while the east coast is gentler.

Far into the fjord on its east side, however, are the highest mountains with **Perriertoppen** (1712) and **Newtontoppen** (1713) as Svalbard's highest mountain.

On **Ny Friesland**, the peninsula between Wijdefjorden and Hinlopenstretet, the mountains on the northerly part are somewhat lower than on Andree land. **Asgårdfonna** is also situated here and is the second largest continuous glacier on Spitsbergen. Three small glacier arms run down from it towards the coast.

A coastal plain extends out towards Verlengenhuken around **Bangenhuk** (79°52.4'N 15°42.5'E) and further around **Mosselhalvøya** a coastal plain spreads out towards Verlegenhuken. Here **Polhemhøgdene** rise up to 361 m, in an area which otherwise is covered by a level glacier ridge.

Wijdefjorden is only partly charted by systematic echo-sounding, namely the inner part, Austfjorden. The fjord further out appears clear except from a shoal fl t with a 3 m shoal about 3 nautical miles within **Elvetangen**. The shoal lies about 2 nautical miles from the western shore. The east side is relatively clear; at a distance of 1.5–2.0 nautical miles from the shore the depths are passable. The west side appears to be a little shallower and generally requires greater distance. With a little care there should be no problems in nearing the shore on either side of the fjord if vessels keep away from the areas around the river mouths.

Anchorages in Wijdefjorden will, in general, be in the largest lagoons on the west side of the fjord, and correspondingly on the east side near **Dirksodden**. Care should be exercised in the bays as the seabed rises sharply to the shallow areas along the shore. In Austfjorden the best anchoring conditions are on the east side of the fjord.

The cabins in Vassfarbukta (Laksevågen) Photo: NHS

Cabin ruins on Svartdalsneset Photo: NHS

There are many cabins situated along the fjord. All the cabins are habitable, except «Gletcerhytta» which lacks a fi eplace.

In **Vassfarbukta** (Laksevågen), right out from Femmilsjøen, about 5 nautical miles south of Bangehuk, stands a cabin built by Arthur Oxaas in 1921. The cabin functions as a refuge cabin. See list of cabins in Chapter 1.

On the west side of the fjord, near the mouth of the river from **Vogtvatnet**, stands the cabin «Lille Krypin» (79°43.11'N 14°56.34'E). The cabin was built in 1988 by Kjell Reidar Hovelsrud, and functions as a refuge cabin. See list of cabins in Chapter 1.

RUSSEHYTTA north of Elvetangen Photo: NHS

ELVETANGEN with Andredalen, viewed from E (deposits from the red Devonian sand stone) Photo: Eiliv Leren

ELVETANGEN cabin Photo: NHS

VILLA MØEN Photo: NHS

The cabin on **Elvetangen** was built in 1918–19 by AS Svalbard Kulgruber and functions as a refuge cabin. See list of cabins in Chapter 1.

Gletcherhytta stands on the ness out from **Midtbreen**, south-east of Elvetangen. The cabin was built in 1933 by Georg Bjørnes and functions as a refuge cabin. See list of cabins in Chapter 1.

A little south from **Sørbreen** there is Villa Møen, which was built by Georg Bjørnes in 1927, and functions as a refuge cabin. See list of cabins in Chapter 1.

Cabin ruins on the mountain Natthøgda Photo: NHS

FLATØYRHYTTA Photo: NHS

The ruins of a cabin stand a little further in under the mountain **Natthøgda**.

Flatøyrhytte, on the north side of Wijdefjorden, is about 5 nautical miles northeast of Ræstadholmen on **Flatøyra**. The cabin was built by Hagerup-Jensen expedition in 1921 and later extended by Bjørnnes. Is little used because it is small and there are better cabins in the neighbourhood. It functions as a refuge cabin. See list of cabins in Chapter 1.

Villa Purpur stands on the west side of Wijdefjorden, about 10 nautical miles north of Vestfjorden. The cabin stands on the bank at the mouth of **Purpurelva**, was built by Claus Andersen in 1912 and now functions as a refuge cabin. See list of cabins in Chapter 1.

Cabin on the ness north of Flatøyra Photo: NHS

VILLA PURPUR Photo: NHS

Cabin in Vestfjorden Photo: NHS

Vestfjorden and Austfjorden (Chart no. 507)

Off **Krosspynten** in the north mouth of Vestfjorden is **Ræstadholmen** where it is rather foul. The same applies south of the island where there is 7 cables long shoal area surrounding some rock awash.

On Krosspynten stands Krosspyntenhytta which was erected by Hilmar Nøis and August Stenersen in 1922. The cabin functions as a refuge cabin. See list of cabins in Chapter 1.

Off Landingsdalen, on the west side of Vestfjorden, it is rather foul but otherwise the fjord is clear with the exception of the drying area innermost at the head of the fjord.

Austfjorden is the innermost part of Wijdefjorden on the inner side of **Kapp Petermann** (79º09.8'N 15º49.0'E). **Bjørnnesholmen** is situated about 2.5 nautical miles off the eastern shore. It is foul around the island but the sound on the east side of the islet is navigable. Vessels can anchor off Austfjordneshytta whaling station on the mainland. The cabin was originally built by Hagerup in 1921 and moved and extended by Georg Bjørnnes in 1928. The station is hired out to hunters and otherwise functions as a service cabin. See list of cabins in Chapter 1.

There is a 1 m shoal 1 nautical mile from the western shore, about 3 nautical miles further southwards. The two largest of **Gyllenskjöldholmane** further in can be passed on either side while it is un-navigable between the islets. In the sound on the east side of the little islet by the shore it is 17 m deep. Navigators must look out here for a 1 m shoal about 5 cables north-northeast of the islet.

RÆSTADHOLMEN and KROSSPYNTEN viewed from E Photo: Eiliv Leren

AUSTFJORDNESHYTTA Photo: Eiliv Leren and NHS

KAPP PETERMANN viewed from NNW Photo: NHS

The east side of AUSTFJORDEN from BJØRNNESHOLMEN and southwards Photo: Eiliv Leren

Austbottenhytta stands on **Granatodden**, southeast of Gyllenskjöldholmane. It was erected by Georg Bjørnnes in 1927 and functions as a refuge cabin. See list of cabins in Chapter 1.

Overgangshytta is on the west side of the ness at the head of the fjord and was built by Georg Bjørnnes in 1933. The cabin is used by To- takter'n as a hire cabin. See list of cabins in Chapter 1.

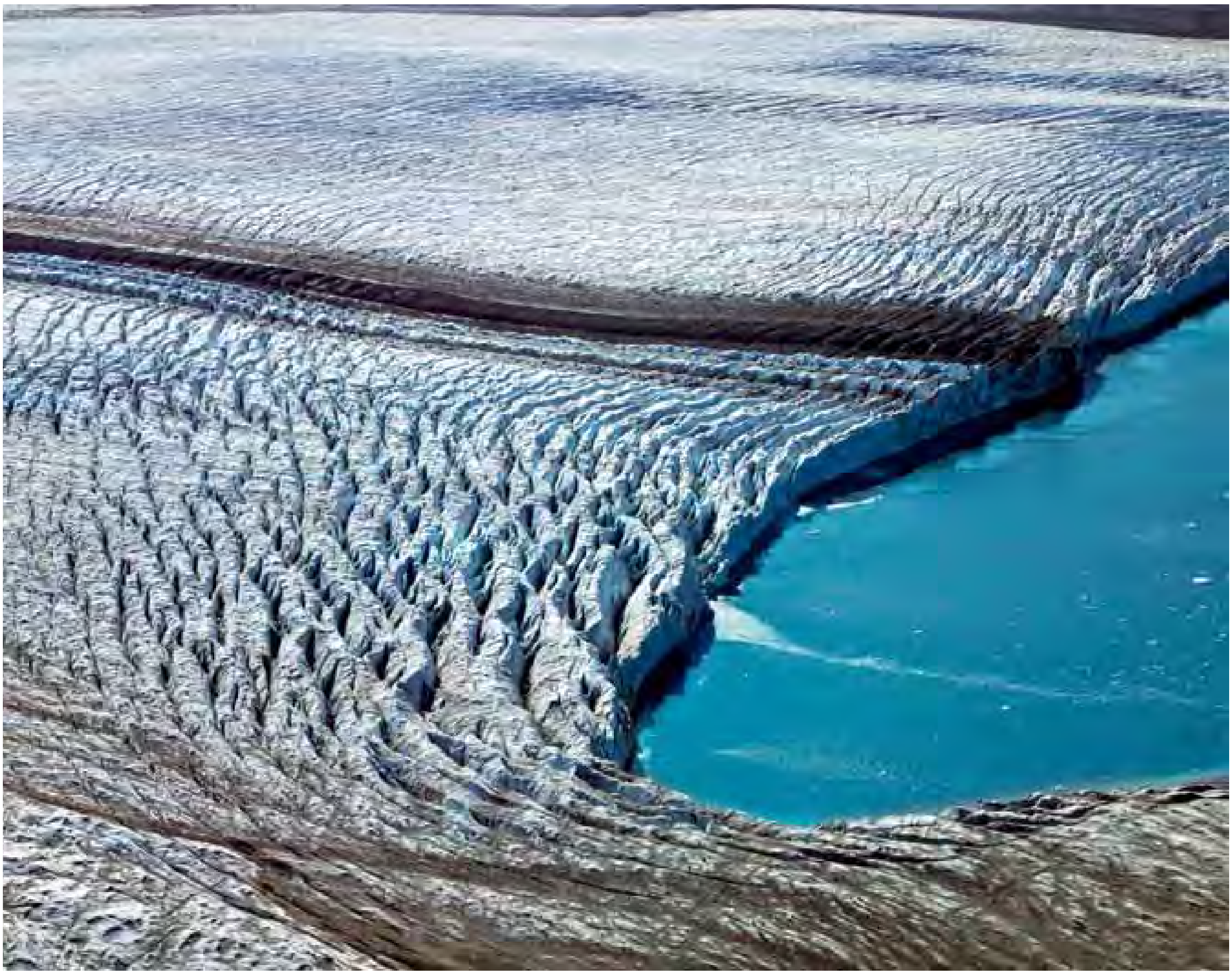
Innermost in the fjord there is a 5 m shoal about 5 cables off the glacier front of **Mittag-Lefflerbreen**.

From the bottom of Wijdefjorden (Austfjorden) there is only 20 km in direct line over to Petuniabukta in Billefjorden, while the route via Nathorstdalen to Dicksonfjorden is somewhat longer but easier.

AUSTBOTNHYTTA Photo: NHS

OVERGANGSHYTTA Photo: NHS

MITTAG-LEFFLEBREEN Photo: Eiliv Leren



MITTAG-LEFFLEBREEN Photo: Eiliv Leren

EINSTEINFJELLET Photo: NHS

Mosselbukta has over the years been much used as a harbour despite the fact that it is exposed to westerly weather, and also to pack ice during the period September–July. The bay is not adequately surveyed but appears to have a bar of 12–16 m across the outer part, with comparatively deeper water within. When calling here vessels should go in on a suitable distance from the northern shore. Navigators will then see an islet, **Polhemøya**, which is now connected to the shore about 0.5 cables from the head of the bay. At the top are the ruins of Nordenskiölds over-wintering house, «Polhem», from 1872–73, named after his own ship.

A little north of Polhemøya there is the cabin Polheim which was built in 1972 and functions as a refuge cabin. See list of cabins in Chapter 1.

Vessels lay well sheltered in a good and popular harbour after entering **Polhemhamna**, on the inner side of Polhemøya. Smaller vessels can go south of the two islets, which are actually two almost continuous skerries, and anchor between them and the steep Polhemøya in 4–6 m of water. Vessels have also anchored in 13 m, 5 cables off.

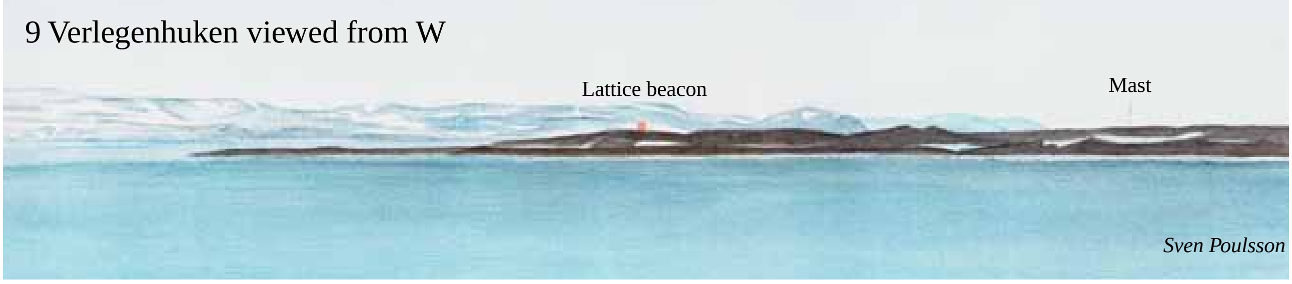
The area within the reef, **Mossellaguna**, is un-navigable for any other than light boats.

There is a cabin on **Bangenhuk** that was erected by Hagerup/Jensen Expedition in 1921 and functions as a refuge cabin. See list of cabins in Chapter 1.

The cabin in **Rekvika**, between Mosselbukta and Verlegenhuken, was erected by Hagerup/Jensen in 1921. The cabin was restored in 1993 and functions as a refuge cabin. See list of cabins in Chapter 1.

Anchoring in POLHEMHAMNA Photo: NHS

BANGENHUKHYTTA Photo: NHS



POLHEIMHYTTA Photo: NHS

Verlegenhuken (Lattice beacon 80º03.6'N 16º14.8'E) was previously considered as a critical point because pack ice could be forced easily towards the shore, which could make it difficult for sailing craft to progress further eastwards. It is stony and foul around the point but it has been used as an anchorage in 7 m, 5 cables southwest from the lattice beacon, and 12–15 m deep.

The anchoring ground in **Tolkvika**, east of the lattice beacon, is better. There is a sounded depth of 5 m, 070º, 3 nautical miles from the lattice beacon.

An automatic meteorological mast has been erected on the inner side of the beacon on Verlegenhuken.

VERLEGENHUKEN LATTICE BEACON Photo: NHS

WEATHER MAST on Verlegenhuken Photo: NHS


Main chart
Harbour sketch
507
535
536
537
540
541
Karl XII
øya
Foynøya
Storøya
Kapp Laura
Italiaodden
Isøyane
Bjørnvika
Kapp Bruun
ORVIN LAND
Repøyane
Austfonna
Kapp Mohn
Bråsvellbreen
Botten-
vika
Duve-
fjorden
NORDAUSTLANDET
PRINS
OSCARS
LAND
Rijp-
fjorden
Kræmerbukta
Vibebukta
Kapp Platen
Nordenskiöldbukta
Phippsøya
Parryøya
Sabine-
bukta
Wahlenbergfjorden
Ekstrem-
fjorden
Brennevins-
fjorden
Sjuøyane
Nordkapp
Lady-
Franklinfjorden
Storstein-
halvøya
Lågøya
Hinlopenstretet
Nordporten
Langgrunn-
odden
80°00'00"
SPITSBERGEN
30'
18°
20°
22°
24°
26°
28°

North and east coasts of Nordaustlandet

(Chart nos. 507, 535, 540, 541, NPI's S250)
(The information in this chapter is imperfect due to incomplete surveying)

GENERAL DESCRIPTION
The north coast of Nordaustlandet is one of the most northerly open stretches of coast in the world. Nevertheless, the area is surprisingly free from snow in summer, including inside the many fjord areas. This is in contrast to the large glacier areas in the interior and along the south and southeast coasts. This is caused by little precipitation falling in the northern areas, as this usually comes with south and southeasterly wind directions. It then falls over the higher areas of the island.

Except for a small area north of Hinlopenstretet, also called Hinlopen, no systematic charting has been undertaken in the coastal waters of these northern areas. Mariners must therefore take great care when navigating in this region.

STREAM AND ICE CONDITIONS
The Vest–Spitsbergen Current swings round the northwest corner of Spitsbergen but it has little influence east of Hinlopenstretet, as it is normally forced down by the colder, fresher and much lighter west fl wing current in the area between Moffen and Sjuøyane. The pack ice which comes down from the Polar Sea can close the coast to eastwards even in summer, but conditions are not such that an ice strengthened vessel cannot usually force its way forward. It can be advantageous to go further from the coast, where the ice will be more open. Weaker vessels can also proceed in some summers but mariners must always be on watch so as not to be taken unawares by sudden changes in the direction and strength of the wind. Generally there will always be, including in the summer, pack ice from the area Sjuøyane–Nordlapp (Chermsideøya) and eastwards but there may be ice-free areas right up to 60 nautical miles north of Kvitøya.

Hinlopenstretet to Sjuøyane

(Chart nos. 507, 540, 541, NPI's S250)

The coastal landscape is generally more barren than on Spitsbergen as these regions are poorer in fauna and flo a.

Storsteinhalvøya lies between Murcisonfjorden and Lady Franklinfjorden, and from a height of between 130–230 m at Murchisonfjorden, the landscape rises up to the gently undulating Wargentinfjellet with heights of 200–300 m. The landscape then changes to the low Wargentinfl a with its many lagoons and lakes.

Lågøya lies on the north side of Franklinsundet and forms a continuation of Wargentinfl a on the south side of the sound but it is still much lower and fl tter.

A deep channel, Hinlopenrenna, extends northwards, north of Hinlopenstretet, and appears to continue northwards to the sea as Questrenna. East of Questrenna, on the north side of Nordaustlandet, a large bank extends out to the edge at about latitude 18°20'N. Even the coastal waters on the north side of Nordaustlandet are particularly shallow and foul.

LÅGØYA viewed from E Photo: NHS

LAGGRUNNODDEN with Lågøya in the background, viewed from SW Photo: Eiliv Leren

From **Langgrunnodden** (80°07.8'N 17°45.2'E) on the northwest side of Storsteinhalvøya, where vessels have anchored in

8 m water about 0.5 nautical miles from land, the 20 m bank widens out northwards, so that northwest of Lågøya it extends to more than 10 nautical miles off the island. Here, a 10 m danger line and foul water out to 3 nautical miles off shore along the west and north sides of the island can be expected. As mentioned, Wargentinfl a and Lågøya have the same fl t topography, and it is therefore not surprising that it can be a nerve-racking experience to go through the 5–2.5 nautical miles wide and shallow **Franklinsundet**.

There are depths of more than 50 m a good 1 nautical mile off the southeast side of Lågøya. The depth conditions off the northeast coast of the island are uncertain but whaling vessels have anchored in 10–13 m depth a couple of cables off, between **Purchasneset** (80°21.9'N 18°17.3'E) and the most easterly point.

Lady Franklinfjorden (Chart nos. 507, NPI's S250)

Lady Franklinfjorden is about 17 nautical miles long, and the safest entrance to the fjord is between Kapp Hansteen and **Draugskoltane** which lie 1–2 nautical miles northwest of Kapp Hansteen. Great care should be exercised when going in between Draugskoltane and Lågøya.

LÅGØYA viewed fom NE Photo: Eiliv Leren

Cabin in Mollbukta, Lågøya Photo: NHS

THE CAIRN on Lågøya Photo: NHS

There is considerable shoaling along the east side of Lady Franklinfjorden, but when the outer, foul areas are passed, it is clear when vessels keep in mid-fjord and the depths increase gradually from about 60 m to 180m.

Lågøya, as its name suggests, is very low and fl t. The highest point is right in the south at 38 m. The island is filled with a multitude of lagoons and pools.

The two bays on the east side of Lågøya, **Mollbukta**, (the most northerly) and **Meyerbukta**, are excellent anchorages for smaller vessels, with even depths of 2–4 m, stone and sand bottom. There is an especially fine bay off the cabin. The entrance channel between Lambrechtsodden and Nordlysøy-ane appears clear, 30–50 m. In earlier days a hunting station was situated in Meryerbukta.

Vessels can anchor in **Anitavika** on the south side of Lågøya, in 15–20 m, sand and stone bottom.

Tomboloøya, east of Franklinsundet, can be passed on all sides.

5 nautical miles from the head of the fjord, **Jäderinfjorden**, about 3 nautical miles long, extends south-eastwards. The depth in the fjord is about 70 m but in the inner part the depths rise up to suitable anchoring depths of 10–25 m.

In the innermost part of Lady Franklinfjorden the two Franklin glaciers reach the sea from the inland ice. The glaciers often calve and the grounded icebergs in the fjord suggest that there must be a number of shoals there.

TOMBOLOØYA viewed from NNW Photo: Eiliv Leren

OXFORDHUSET, Depotodden Photo: NHS

KAPP RUBIN Photo: NHS

Botniahalvøya sticks out like a sore thumb north-north-westwards between Lady Franklinfjorden and Brennevinsfjorden, The peninsula is about 12 nautical miles long and 4 nautical miles wide, and the landscape here is completely different to anywhere in the western areas. From its root and outwards the peninsula consists of a ridge that has its highest point, **Franklinfjellet** (408), a good halfway out on the western side. A broad valley divides the peninsula in a north-westerly direction and runs into Hansteenfjellet, filling the most northerly area with its highest peak (355) on the eastern side. The 270 m high **Kapp Hansteen**, with its precipitous mountain sides, stands on the most northerly part of the peninsula.

Brennevinsfjorden (Chart no. 507, 541, NPI's S250)
Brennevinsfjorden runs in between Kapp Hansteen and Depotodden on Laponiahalvøya, and stretches about 11 nautical miles south-south-eastwards. In the eastern half of the 4 nautical miles wide entrance there is a shoal fl t about 1.5 nautical miles off Depotodden. The shoal bank peaks as a rock awash and a 6 m shoal respectively 1.5 and 1 nautical miles southeast of the point. There are depths of more than 200 m close southwest of the bank, but it must be considered that the shoal fl t may connect to another shoal fl t which at firs extends southwards past a small skerry in approximately the middle of the fjord, before turning westwards in a wide band across towards Botniahalvøya. There are also some other isolated, smallish skerries extending from this barrier. The western part of this shallow belt has been crossed with a least depth of 4 m at its shallowest.

The safest entrance to Brennevinsfjorden is therefore in along the rather shelving **Depotodden**. A little inside the point, there is «Oxfordhuset» a cabin that was erected by Oxford University in 1935, and functions as a refuge cabin. See list of cabins in Chapter 1. There is good anchorage here in 20 m water about 200 m from the shore.

DEPOTODDEN Photo: NHS

BIRDVÅGEN with SVARTNESET viewed from NW Photo: Eiliv Leren

Further due S-wards in the fjord there are depths of more than 100 m. There is an excellent harbour with a cabin in the innermost bay on the east side of the fjord. There is also a cabin in the bay out on the east side.

The ice conditions in the fjord can be very variable, but particularly in calm weather the pack ice is seen to follow the eastern shore as the current turns away from the shoal fl t.

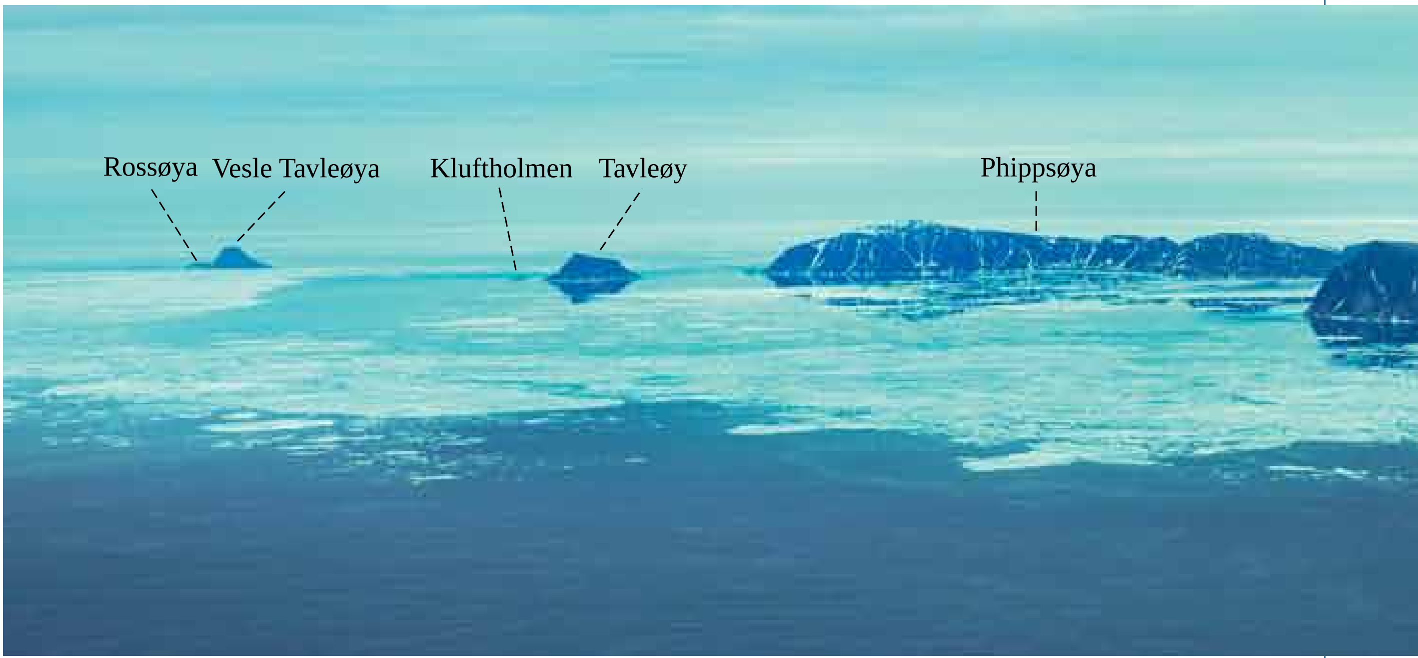
NORDKAPP viewed from W Photo: NHS

Brennevinsfjorden–Nordkapp (Chart no. 507, 541, NPI's S250)

Laponiahalvøya, 18 nautical miles long and 8 nautical miles wide, is the next large peninsula and separates Brennvinsfjorden from **Nordenskiöldbukta**. The peninsula is covered by mountains and fjord arms and is deeply cut by bays and fjord arms which continue on land in wide valleys. The bays and fjord arms are separated by steep mountain headlands. About midway along the peninsula there is a narrow low isthmus about 2.5 km wide. The landscape elsewhere consists of mountain regions of 300–600 m in height, dissected by deep valleys and clefts. The highest mountain is **Snøtoppen** (610) which lies in the northwest. It is also the most easily recognised as it is the only one that is glacier covered. The outermost headlands in this area should be easy to pick out, such as the dark Svartneset, Kapp Rubin and **Nordkapp** on Chermsideøya.

From Depotodden it is 5 nautical miles northwards to **Svartneset**, and then a further 3 nautical miles north-eastwards to **Kapp Rubin**. Both headlands are a good 300 m high with steep mountain sides and with low beaches on the northeast sides. They are easily identified, particularly Svartneset with its descriptive name.

Birdvågen cuts in between Svartneset and Kapp Rubin, between steep mount sides. Birdvågen is 2.5 nautical miles long and 1 nautical mile wide at its entrance valley extends in a southerly direction from the head of the bay to Zeipelbukta.



SJUØYANE viewed from N

Chermsideøya, northeast of Laponiahalvøya, is separated from this by the angular Beverlysundet. The island is divided almost in two by the wide valley in a northwesterly direction, but otherwise the landscape is very similar to that of Laponiahalvøya. The mountains to the west and east, Knoll and Tott, (305) dive steeply to the sea.

Beverlysundet, which separates Chermsideøya from the mainland, extends 3 nautical miles south-eastwards at a width of about 1 nautical mile, and then swings north-eastwards for about 1 nautical mile. The north-easterly part of the sound narrows to a width of barely 4 cables, and on the south side of the sound there is a 2 m shoal 1 cable off the shore and about 2.5 cables from the easterly headland. There are good depths on both sides of the shoal, but it is most usual to pass on the north side with about 15 m of water. The wider, southeast going part of the sound has been passed in 30–40 m of water along the mainland side. West of the south point of Chermsideøya there is a good anchorage.

BEVERLYSUNDET viewed from NE Photo: Eiliv Leren

Photo: Eiliv Leren

The sound between Chermsideøya and **Castrénøyane** is a good 1 nautical mile wide and has depths of up to 150 m. On the west side of the sound, off the valley mouth, there is an anchorage 9 m deep, about 5 cables from shore.

The islands north of Nordkapp (Chart no. 507, 541, NPI's S250)
Waldenøya (80°37.3'N 19°46.3'E) lies about 5 nautical miles north-northwest of Nordkapp. The narrow, 1.2 nautical miles long island rises to a height of 175 m. The depths around Waldenøya appear to be considerable. 1.5 nautical miles south of the island there is, however, a very dangerous rock awash, **Heclaskjeret**, where the sea breaks, but is otherwise deep around the rock.

Sjuøyane are the most northerly land areas of Svalbard and include Nelsonøya, Parryøya, Martensøya, Tavleøya, Vesle Tavleøya and Rossøya. Each of the three largest islands (2–4 above), which together cover an area of about 65 km^2, have several undulating or fl t summits with steep mountain sides. There are low isthmuses or plains covered by loose material between the summits. The other islands are small and form isolated peaks.

WALDENØYA viewed from SW, with Sjuøyane in the background Photo: Eiliv Leren

SJUØYANE viewed from N Photo: Eiliv Leren

The waters around Sjuøyane have been visited fairly often but little of the area has been described. It is not difficult to fin anchorages here.

Nelsonøya lies nearest Nordkapp and is quite small, about 140 m high, and has the shape of a top hat. (The island is named after Horatio Nelson who was almost taken by a polar bear in 1773 when he was a midshipman on the Phipps expedition).

Parryøya consists of three mountain areas separated by a wide, low valley in a north-south direction which ends in an isthmus that crosses to the most southerly summit. **Øykollen** (370) in the west is the highest peak. In some places there are narrow beaches beneath the steep mountain sides.

Martensøya is the most easterly of Sjuøyane. There are four mountain areas on the island, separated by plains. The highest summit, **Sølvberget** (405), is in the southwest of the island.

Phippsøya is central in the island group, and is also the largest. The island is cut into by wide bays towards the low plains between the mountain areas. A low and narrow plain covered by old beach ridges divides the island in two parts. The southern part, Høgberget (405) in the northeast, is the highest of fi e peaks. In the west there are three hills of a good 200 m in line in a north-south direction. The northerly part of the island is 3,5 nautical miles long. In the southwest there is a hill (a good 200 m) while the plain within this narrows northwards as a coastal plain. The rest of the area is covered over its entire length by a massive mountain chain which in the north is topped by **Tryggve Granfjellet** (465).

There is no difficulty in finding anchorages, for example, in **Isflakbukta**, on the southeast side of Phippsøya. Vessels have anchored in a depth of 9 m at a distance of 3 cables from the shore, off from a cabin. The cabin was erected by the State in 1936, and now functions as a refuge cabin. See list of cabins in Chapter 1. There is also an automatic MET station here.

Tavleøya, about 5 cables west of the northwest point of Phippsøya, projects from the sea as an isolated rocky ridge (about 230) with a small islet off the northwest point.

Vesle Tavleøya (80º49.2'N 20º24.0'E) lies 4 nautical miles north-northwest from Phippsøya, and consists of a rocky ridge (about 275) with steep sides. A good 1 nautical mile south-southeast from Vesle Tavleøya there is a 3.5 m shoal, but otherwise no foul water has been discovered along the west side of the islands. The sounds between Sjuøyane have also been passed without reports of particular shoals. There are, however, shallow depths and navigation must be carried out carefully.

Rossøya is situated just north of Vesle Tavleøya and is only a rocky knoll. Rossøya lies at 80º49.6'N and is thereby Svalbards most northerly point.

Sjuøyane to Kapp Laura
(Chart no. 507, 541, NPI's S250)

The countryside between the glaciers **Austfonna** and **Vestfonna** and the sea is barren with little vegetation but rich in colour and beautiful in several places. There are many lakes and rivers in the low land eastwards from Sabinebukta.

Nordenskiöldbukta (Chart no. 507, 541, NPI's S250)

The coast eastwards from Nordkapp has many fjords which are divided by large and smaller peninsulas and these in turn are strongly cut into by fjord arms. The largest peninsula extends 30 nautical miles due north between Rijpfjorden and Duvefjorden/Forherbyfjorden, and end at **Kapp Platen** (80º30.3'N 22º46.8'E) which falls steeply to the sea from a height of a good 300 m. Kapp Platen lies approximately on the same latitude as Kapp Rubin.

ROSSØYA and VESLE TAVLEØYA viewed from NW Photo: Eiliv Leren

The outer waters eastwards from Nordkapp/Sjuøyane have been relatively frequently traffic ed without there being reports of dangerous shoals, but depths in these waters vary greatly. There is a rock awash about 16 nautical miles north of Kapp Platen and about the same distance east-northeast of Martensøya and although charted, its position is doubtful.

In the basin east of Nordkapp/Sjuøyane the mouth of Nordenskiöldbukta extends 25 nautical miles eastwards to Kapp Platen and from there a number of fjords and bays cut into the coastal area.

Vessels can anchor along the west side of the fjord in **Ekstremfjorden**, on the east side of Laponiahalvøya.

North-eastwards from **Ekstrembuken** the depths are found to vary between 1–20 m about 4 nautical miles out to a number of shoals between Castrénøyane and **Scoresbyøya**. These shoals are charted with legend PD (Position doubtful), which indicates that the positions are not to be relied upon.

Further southwards along the west side of Nordenskiöldbukta, the 9 nautical miles long coastal stretch to the head of **Linghagenbukta** have an undulating character. From the north there is a narrow coastal plain that terminates by **Schröder-Stranzfjellet** (ca 380 m) where it ends as a steep cliff in the sea.

Southwards from there the coastal plain widens inwards in Lindhagenbukta and continues eastwards with Kolkfl a to **Sabinebukta**. The peninsula between Lindhagenbukta and Sabinebukta is tongue-shaped and only 15–20 m high but terminates in a promontory, Kapp Lindhagen, with heights of 209 and 223 m.

From Kapp Lindhagen it is 6.5 nautical miles to the head of Sabinebukta. The seabed conditions in these bays are unknown except that they are acknowledged to be foul. This is also suggested by the surrounding landscape. Navigation is difficult, particularly in the inner areas, but otherwise there are several inlets where it is possible for smaller vessels to find usable anchorages.

Reinhalvøya, which is mostly quite low, forms the east end of Sabinebukta. Reinbukta divides the peninsula almost in two, and continues as a depression across to the east side. The highest point of the peninsula is on the southern part and is 137 m high.

Carolusbukta, is on the east side of Reinhalvøya, is 3 nautical miles long and 1 nautical mile wide. The depth in the bay is unknown but a couple of rivers that fl w from the glacier may cause shoaling.

Irmingerneset forms the north point of the broad «Tongue» between Carolusbukta and **Planciusbukta**. The ness is relatively high with a peak of over 300 m, which outermost plummets steeply to the sea from 109 m. Further in, around the bays, the land is wide and low. On the east side of Planciusbukta and its continuation **Planciusdalen** out towards Rijpfjorden, **Båtkvelvet** (343) extends northwards to **Kapp Lovén** and dives steeply down to the sea.

Sabineøyane lie off the opening of Sabinebukta, approximately midway between Kapp Lindhagen and Irmingerneset. The largest and most northerly of them is about 1.5 nautical miles long and has a pyramid shaped mountain on the north side.

Scoresbyøya, which is situated about 2 nautical miles north-northeast of Sabineøyane, is a good 4 km long and 1 km wide. There is a narrow hill crest along the whole of the east side of the island, which ends steeply in the sea on the northeast side. The island's highest point (47) lies by the northeast point, while the north point ends in a fl t sandy spit with a small rock off. The central area of the island consists of a large plain with two big lakes. The south end of the island is formed by a large branching lagoon which is bounded towards the sea by low, narrow sand ridges that extend south-westwards from the southern point. Two similar sand ridges are visible above the surface at a distance of 0.4 and 1 nautical mile south of the island. The waters around Scoresbyøya therefore appear to be foul.

Rijpfjorden extends 18 nautical miles southwards from the entrance between Kapp Loven and Prins Oscars Land. The fjord forms the continuation of a deep channel which comes in from the north on the west side of Kapp Platen and **Kapp Wrede**, and where there are depths of between 150–250 m at 2–3 nautical miles from land. The depths are largely 100–200 m in mid waters inside Rijpfjorden and its side arm, **Bengtssenbukta**, on the west side.

The coastal stretch from Kapp Lovén to Planciusdalen consists almost solely of steep hill sides. There is low hilly terrain on both sides of the 3–4 nautical miles long Bengtssenbukta, and at the head of the fjord arm, Rijpbreen reaches down to the sea with a front divided in two by a small hill region. Rijpbreen is the only glacier which reaches the sea in Rijpfjorden. A prominent nunatak (an exposed mountain peak completely surrounded by glacial ice) **Ismåsetoppen** (458) rises above the glacier about 8 km west of Bengtssenbukta.

Eastwards from Bengtssenbukta, the coast continues as a gently curving bay to Bergesenneset. The coast here is low and several rivers fl w out from the lakes between the ranges of hills in the south. Bergesenneset itself is a fl t point which ends in a long, narrow sand bank stretching almost across to the 2.5 km long, low island **Galten**.

The inner part of Rijpfjorden has a comparatively straight coastline along the west side with heights up to over 200 m, the highest summit being **Hamneberget** (205) about 2.5 nautical miles from the head of the fjord. A 26 km long valley, Rijpdalen, leads from the head of Rijpfjorden across to Bodleybukta in Wahlenbergfjorden, and forms the division between the two large glaciers on Nordaustlandet, Austfonna and Vestfonna.

There is good holding ground at the head of Rijpfjorden with 10–12 m depth about 1.5 cables from the shore, where there is usually a quantity of driftwood.

The coast is more indented on the east side of the fjord, and here there are also some smallish islands and islets, and two large bays. **Kræmerbukta** is the most southerly and stretches in 3.5 nautical miles from the 1 nautical mile wide mouth between Kræmerodden (122) and Wordieodden (119). The other large bay runs in on the north side of Wordieodden for a length of 2 nautical miles, and with a 6 cables wide opening. There is a small islet in the middle of the entrance in both bays, but vessels have entered each place and anchored in 10–12 m with good holding ground. There are river estuaries in both bays, and in the next bay to the north.

Northwards from Wordiebukta, the landscape is fl t and marshy with three projecting fl t points. The bays between these points are little suited as anchorages. An islet stands out off the central point like an isolated rock knoll.

Prins Oscars Land, which stretches northwards between Rijpfjorden and Duvefjorden, is filled with many mountain areas with wide valleys between them in parts. The most southerly area of Prins Oscars Land is mainly covered by **Ahlmannfonna** which reaches up to a good 520 m in height. The central part of the peninsula is comparatively low whereas on **Platenhalvøya** furthest north, there are two of the highest peaks on Nordaustlamd, **Binneyfjellet** (600) and **Goodenoughfjellet** (525). The latter lies furthest to the north and falls steeply to the sea between two small glacier arms.

The west side of the peninsula consists of a mountainous landscape which is broken by two broad valleys across to Duvefjorden. There are no sheltered bays or other places suitable for anchoring along this stretch.

In the bay 3.5 nautical miles northeast of the island Erkna, by **Bluffvarden**, is Bluffvarden cabin which also functions as a refuge cabin. See list of cabins in Chapter 1.

There is a broad, fl t sandy beach with two river estuaries in **Vindbukta**. The terrain from Vindbukta across to Zorgdragerfjorden is low.

Kapp Wrede is the north point of the peninsula that extends from the low crossing between Vindbukta and Zorgdragerfjorden. The peninsula is covered by a mountainous massif. The highest peak, **Nordenskiöldvarden**, (461) lies in the northwest and falls steeply to the sea.

Zorgdragerfjorden is 3 nautical miles wide at its mouth between Kapp Wrede and Platenhalvøya, and cuts 7 nautical miles southwards into Prins Oscars Land. The fjord is reported to be clear, and in the inner part there is a well sheltered harbour with suitable depths for anchoring. Along the east side of the fjord there is a narrow lowland belt where the massive rises up to the named highest summits on Nordaustlandet.

Kapp Platen is the most northerly point on Prins Oscars Land. Out over the ness is **Havsula** (440) which continues northwards in a ridge and ends in its own cape or promontory, with a new peak (310). The mountain sides fall steeply to the sea.

Duvefjorden (Chart no. 507, NPI's S250)

Duvefjorden cuts in about 23 nautical miles on the east side of Prins Oscars land, and in the outer areas the fjord is about 8 nautical miles wide. Little is known of the depth conditions but by looking at the surrounding landscape around the fjord, all experience suggests that great care should be taken. The land is deeply divided by large and smaller peninsulas that rise up to 300–500 m peaks.

Minebukta is the outermost bay on the west side of the fjord but it is completely open to easterly winds.

Reliktbukta lies further inwards on the west side, due east of Binneyfjellet (600) and is a somewhat better harbour, that is for smaller vessels, as they have the possibility of going into the inner, south-going basin through a narrow but relatively deep channel. Vessels will be well sheltered here from all wind directions.

A little further south is **Doroteabukta** has a similar basin but it is no longer navigable. Duvefjorden is divided into three south-going fjord arms in the inner part. The most westerly, **Innvika**, is 1 nautical mile wide and 3 nautical miles long and ends at the inner part in a small bay on the east side of the fjord head. There is a passage into a sheltered harbour, **Depotlaguna**, between two low points at the western head of the fjord. Vessels enter on the north side of an extensive skerry before swinging in. These directions are based on air photography but there is no information regarding actual depth conditions, other than that the waters are shallow. It also appears to be shallow in some places between the points along the west side of Innvika.

The peninsula on the east side of Innvika rises up to heights of about 300 m. The north end of the relatively wide peninsula is cut into the north end by a wide, funnel-shaped bay. A rock, **Stompen**, is situated a little off the west point.

Djupkilen is the middle fjord arm and is about 4 nautical miles long and 1 nautical mile wide. The name does not refer to the depth conditions in the fjord, as little is known of them or elsewhere in the area. A group of islets and skerries, about 2 nautical miles long, and with foul waters, stretches northwestwards from the peninsula on the east side of Djupkilen. The peninsula ends in Louise Richardfjellet (436) with Kapp Leijonhufvud, which plunges vertically to the sea.

Botnvika, the most easterly of the three fjord arms, is 5 nautical miles long and 2 nautical miles wide at its mouth. It narrows further in to a width of 1 nautical mile. Outermost in mid-fjord,

The inner part of INNVIKA with DEPOTLAGUNA and RINGGÅSVATNET in the background, viewed from NE
Photo: Eiliv Leren

there is a row consisting of a rock, two islets and another rock, orientated northeast/southwest.

Innermost in the fjord arm, a branch of Austfonna reaches right down with its front in the sea. The same applies to another glacier arm, Duvebreen, in a smaller bay on the east side of Vågekallen.

The easily recognised nunatak, **Tvillingstakken** (381) stands out on the edge of Austfonna, about 10 km south of Vågekallen, approximately 8 nautical miles north-northeast of Vågekallen.

Close to the opposite shore there is a rock awash at the entrance to the bay in towards the front of Duvebreen.

Continuing about 3 nautical miles northwards, a bay, **Dokka**, cuts in 1.3 nautical miles eastwards. From this bay vessels can cross the 20 km to **Albertinibukta** and to the fjords on the north side, avoiding the height of 100 m. Several peninsulas project northwards like fingers f om this, Damfl a.

Sætherbukta cuts in 3.5 nautical miles towards the southeast and separates into two arms about hallway in. The fjord arms are about 2 nautical miles wide outermost between Hukkollen (378) and Polarklubben (413). Somewhat closer to the easterly Polarklubben are the low and fl t islands of **Konsuløyane**.

Adlersparrefjorden is the outermost and at the same time the largest of the fjord arms on the east side of Duvefjorden. The fjord is about 4 nautical miles long and 2.5–3 nautical miles wide in the outer part. About halfway into the fjord it divides into three arms. A 2.5 km wide peninsula with Conwayfjellet (326) separates the two most westerly arms, **Godfreybukta** and **Pollen**. A smaller peninsula lies between Pollen and the most easterly inlet, **Mosskilen**. There are only two minor islands in the fjord area, respectively north and east of Conwayfjellet.

From the head of Pollen there is a fl t and low isthmus of only 0.5 km across to Finn Malmgrenfjorden on the east side of Glenhalvøya. By the coast in this area there are 3–4 heights over 100 m but otherwise the landscape is low, especially in the north

Repøyane–Kapp Laura (Chart no. 507, NPI's S250)

Karl XII Island (80°39.3'N 25°00.7'E), is 12 nautical miles out at sea, northeast of Nordre Repøya. It is a wild and rugged island with a dome shaped summit (103). The south side of the mountain is terraced and changes to a low coastal plain. The southerly part of the island, **Drabanten**, is low and has earlier been reported as a separate island, but it is now connected to the main part by a narrow strip of land.

Near Karl XII Island the waters are foul a couple of nautical miles southwards from Drabanten, and further southwards, **Karl XII Flak**, requires careful navigation. A safe distance from the island seems to be about 3 nautical miles, but otherwise there should be no difficulty in pproaching the shore.

Repøyane form, in a manner, a continuation of Glenhalvøya. The islands rise up as two isolated low mountain plateau with steep sides, especially towards the north and east. Nordre Repøya rises to 230 m while Søre reaches 240 m and is the largest with an undulating plateau.

Gilessundet, between the Søre Repøya and the mainland, is at least 1 nautical mile wide and has an islet in the middle of the eastern entrance. An amount of grounded pack ice has been observed in this sound, and it is reasonable to assume the entrance is not navigable.

The sound between Repøyane and **Poortsundet** is 1.4 nautical miles wide and has been used by hunting vessels. «Glennhytta» stands northeast on **Glenhalvøya**. It functions as a refuge cabin. See list of cabins in Chapter 1.

The west side of FINN MALMGRENFJORDEN with SCHRÖDER-STRANZEIDET and POLLEN, viewed from NE
Photo: Eiliv Leren

Finn Malmgrenfjorden cuts in between Glenhavøya and Bergströmsodden. **Alpiniøya** lies at the entrance to the fjord, northwest of Bergstrømodden. From there and inwards the fjord is about 6.5 nautical miles long.

Nordenfalkbukta is halfway in on the east side of the fjord. There is an islet named Lundborgneset about 1 nautical mile north of the ness on the east side of the bay.

Across the bay from Nordenfalkbukta, near the isthmus across Glenhalvøya, **Schröder-Stranzeidet**, there is a bay which is the best sheltered in the whole fjord. Off the bay there is an islet on the north side and a rock to the south.

The inner part of Finn Malmgrenfjorden is surrounded by a relatively low terrain. As is most usual here the land consists of granite and gneiss and is without any other sign of vegetation, other than patches of moss on the stony ground. There is little bird life in these areas.

The peninsula out to Bergströmodden is the most easterly «Finger» from Damfl a. **Kamfjellet** (281) takes up most of the inner part and **Boydfjellet** (232) covers the outermost part. A valley separates the two mountains.

South eastwards from Bergströmodden is the **Kapp Bruun** peninsula, and in the bay between these peninsulas is the 3 nautical miles long glacier front of **Schweigaarbreen**. In the bay on the east side of Kapp Bruun, Nilsenbreen reaches the sea with some narrower fronts.

KAPP BRUUN with the island DYNA behind, viewed from NW Photo: Eiliv Leren

Further south-eastwards there is a stretch of about 6 nautical miles of smaller peninsulas and groups of islets and islands off shore.

The north coast of Nordaustlandet terminates in an 11 nautical miles long edge of **Leighbreen** up to **Kapp Laura**.

There is a group of four islands 9–13 nautical miles north-northeast of Kapp Bruun. Of these islands, **Foynøya** (80º27.0'N 26º09.2'E) is the largest.

Both Foynøya and **Brochøya** appear as curved shields with pointed low headlands towards the south. They both also have narrow beaches.

Draugen and **Schüberlerøya** are situated 3 and 4 nautical miles southwest of Foynøya; the first is a rock and the second is an islet.

The waters around the archipelago appear to be mostly clear.

On the stretch about 14 nautical miles eastwards to **Raschøya**, inland ice reaches the coast in two places, namely on both sides of the peninsula which is about 7 km long, out to **Kapp Bruun**. At the head of **Albertinibukta**, between Bergstrømodden and Kapp Brunn, **Schweigaardbreen** reaches forward to the sea with a front about 5 km wide. **Nilsenbreen** forms a slightly narrower front in the bay between Kapp Bruun and Běhouneckodden. The little island **Dyna**, with a small rock on the north side, lies in the bay out from the glacier. The small islet **Sarsholmen** is 1.2 nautical miles east-south-east from Kapp Bruun.

1 nautical mile southeast of Běhouneckodden, **Viglieriberget** (213) stands out with its mountain sides falling steeply to the sea. **Normanbukta** cuts a good 2 nautical miles southwards between it and Soraberget (210). The peninsula between Normanbukta and Bjørnvika further east runs out on to the fl t Čuchnovskijodden north of Soraberget.

In the waters just off Čuchnovskijodden there is a multitude of low, fl t islands and islets that are surrounded by rocks and shoals on all sides. The two largest are **Kjerulføya** outermost, and Boeckøya. The former is almost cut through by a bay from northwest.

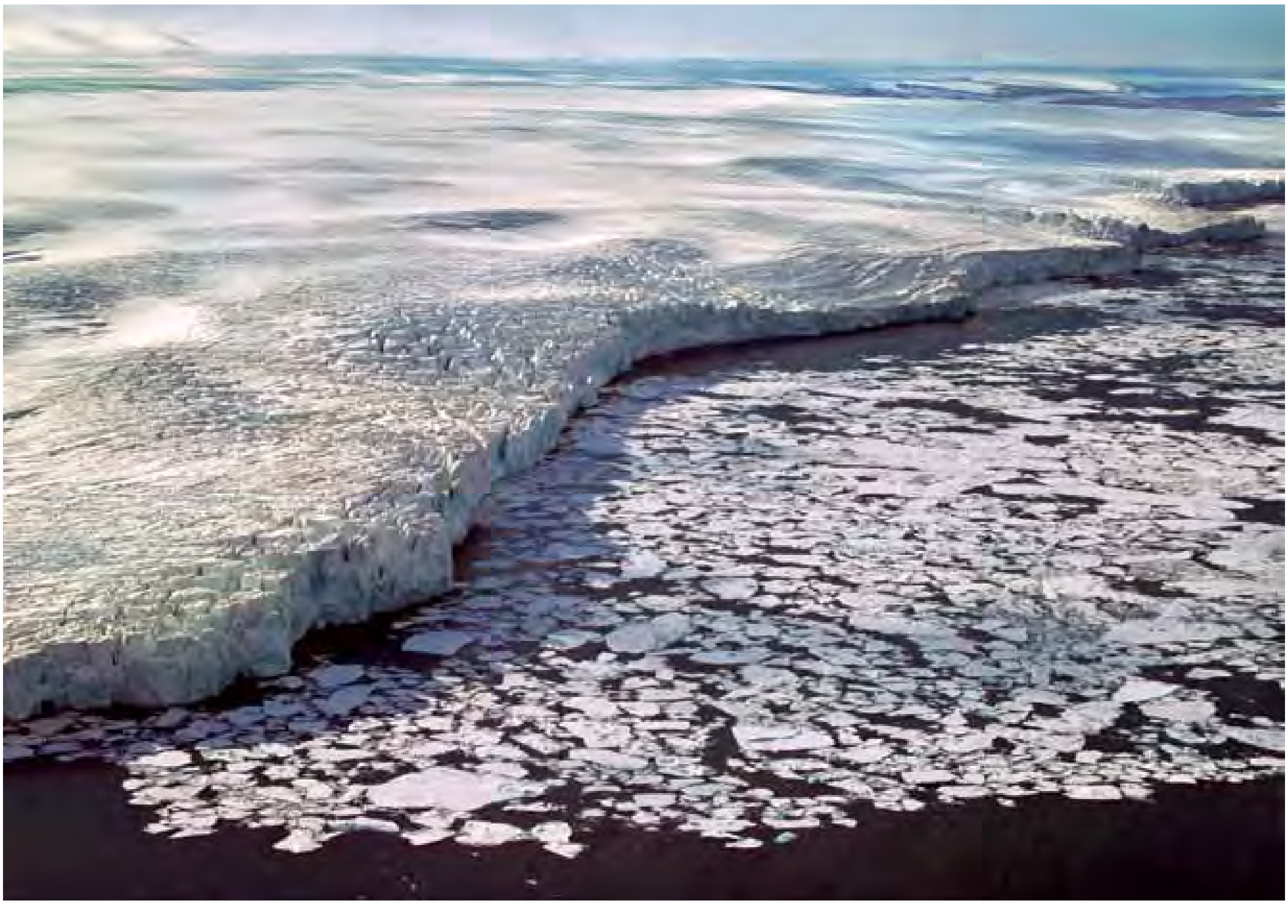
Bjørnvika, with the narrow **Fjellstrandvika** is the most easterly bay on the north side of Nordaustlandet, and cuts in 3 nautical miles and a good 2 nautical miles in width. **Tandbergøya** is situated in the centre of the entrance and has a number of small rocks on the east side. There is also a couple of islets and rocks further into the bay.

Raschøya is just off the western edge of **Leighbreen** and is the largest island along this stretch of the coast after Repøyane. Raschøya rises up to a good 100 m in height towards the north end where the coast is steep.

Esmarkøya is only a couple of cables east from Raschøya and is surrounded by several small skerries.

From Roschøya the front of Leighbreen runs 9 nautical miles eastwards to **Kapp Leigh-Smith** and continues 4 nautical miles southwards to Van Dongenbukta, on the inner side of Kapp Laura, with Sucaiøya nearby. Vessels must keep a good distance off the glacier front as rocks stick up in several places, especially on the north side, which suggests that the waters are foul.

Further south-eastwards towards Storøya the depths are greatly variable and it can be stated that 16 nautical miles east-southeast of Foynøya depth sounded 30 m, and 9 nautical miles northeast of the east point of Storøya depth sounded 18 m.



LEIGHBREEN with KAPP LEIGH SMITH viewed from SE Photo: Eiliv Leren

FROSTØYANE viewed from E Photo: Eiliv Leren

Kapp Laura–Bråsvellbreen

(Charts 507, 535 NPI's S250)

Nordmarka is the most northerly ice-free area on the east coast of Nordaustlandet, with **Kapp Laura** (80º04.0'N 27º12.0'E) on the most easterly corner. This ice-free area extends 4 km eastwards along **Van Dongenbukta** out to Kapp Laura, and then 7 km southwards towards Worsleybreen. This glacier a tongue, with a 5 km front, shoots out southwards where it ends up in a smaller ice-free area, **Sørmarka**. This ice-free area extends barely 3 km southwards. In both the mentioned ice-free areas the rock consists of granite, but there are also beach-like moraine edges up to a height of about 70 m.

Frostøyane are two groups with smaller islands and islets that lay respectively 2 and 1.5 nautical miles east and southeast of Sørmarka. **Snøholmen** is the largest and the most northerly of the islands.

At a distance of about 6.5 nautical miles east from the north edge of Sørmaka It has been sounded to 4 m, and this should indicate that care is to be taken when sailing in the area of Frostøyane.

Kaldøyane is a group with islands and islets 2–3 nautical miles east and southeast of Frostøyane which extend about 5 nautical miles in a north-south direction.

Further southwards along the coast from Sørmarka, the front of Austfonna has a number of marked bends. From **Italiaodden**, 4 nautical miles south of Sørmarka, the glacier front continues 11 nautical miles south-westwards to the low, ice free **Isisøyane**. Between Italiaodden and Isispynten, about 1.2 nautical miles off the glacier edge, is **Einstøingen**, which is a solitary little islet surrounded by a number of rocks and shoals. To its southwest there is a bare area consisting of several islets and rocks just off the glacier edge.

EINSTØINGEN viewed from E Photo: Eiliv Leren

ISISØYANE viewed from S Photo: Eiliv Leren

The glacier edge off ISDOMEN, HARTOGBUKTA in the background, viewed from SW Photo: Eiliv Leren

The whole stretch south of Sørmarka otherwise has small patches of bare land on the upper edges of the glacier front. This should be an indication that the land below the ice now reaches almost completely to the front and therefore a good distance from the coast should be maintained when navigating southwards from Kapp Laura.

Near **Hartogbukta**, about 14 nautical miles southwest from Isispynten, the glacier front swings in an south-south-easterly arc, and then south-westwards towards **Kapp Mohn**, a stretch of about 15 nautical miles, to cross to a new bay, **Klerckbukta**, Vessels can anchor in Klerckbukta on good holding ground but mariners must take note of calving from the glacier front. It is a useful refuge harbour in northerly winds. **Isdomen** (the ice dome) within this coastal stretch suggests that the conditions off the glacier front are largely the same as the stretch further north.

KLERCKBUKTA with ISDOMEN, viewed from S Photo: Eiliv Leren

VIBEBUKTA with BRÅSVELLBREEN in the background, viewed from W Photo: Eiliv Leren

The glacier front then continues about 8 nautical miles southwestwards to **Kervelbukta**. Between this and **Vibebukta** further west, **Bråsvellbreen**, with its 20 nautical miles wide front advanced rapidly, probably about 3 nautical miles outwards, in 1938. The front is now in retreat. It is relatively deep along the glacier front and the whole area appears to be clear. It can be considered that in total the front of Austfonna from Sørmarka to Vibebukta covers a stretch of about 100 nautical miles. The height of the front varies greatly between 10 and 35 metres.

Hovedkart
Havneskisse
Langgrunn-
odden
Nordporten
Kinnvika
540
541
GUSTAV V LAND
80°00'00"
Murchisonfjorden
NORDAUSTLANDET
Mossel-
halvøya
Fosterneset
Russøyane
Sorg-
fjorden
Sparreneset
VESTFONNA
Hinlopenstretet
Wahlenbergfjorden
Gyldénøyane
Kapp Fanshawe
Palander-
bukta
536
Scaniahalvøya
Lomfjord-
halvøya
Faksevågen
537
30'
Lom-
fjorden
Nyströmøya
535
Wahlbergøya
Torellneset
22°
Franzøya
SPITTSBERGEN
Von Otterøya
Vaigatt-
bogen
Wilhelmøya
Bastianøyane
79°00'00"
523
OLAV V LAND
Kapp Payer
533
18°
20°

Hinlopenstretet

(Chart nos. 507, 533, 535, 536, 537)

GENERAL INFORMATION

Hinlopenstretet is the sound between Spitsbergen and Nordaustlandet. The sound has been used over the years by both whaling and exploration vessels. It has now been systematically surveyed so safe through passage can be undertaken. Some areas around the islands and along the shore have not been surveyed (index on chart) and therefore the greatest possible care must be taken when navigating in these waters.

Hinlopenstretet in about 90 nautical miles long and stretches from the entrance between Verlegenhuken and Langgrunnoddens (80º07.8'N 17º45.2'E, Nordaustlandet's most westerly point), in the north to Sørporten between Bastianøyane and Bråsvellbreen in the south.

The most northerly part of Hinlopenstretet, the mouth between Mosselhalvøya and Storsteinhalvøya, is known as Nordporten and is about 15 nautical miles wide and narrows to 5 nautical miles near Sparreneset.

Hinlopenstretet ends in the south in Sørporten, which in the west is bounded by the islands over towards Kapp Freeden. Wilhelmøya, the largest island in Hinlopenstretet is also here. The islands highest point (568) stands just in on the most easterly headland, Tumnlinodden. The central area (over 200 m in height) of the island is otherwise covered by glacier.

WEATHER, CURRENT AND ICE CONDITIONS

The tidal stream in Hinpolenstretet is strong and it follows the direction of the sound, northwards on the flood tide and southwards on the ebb.

Pack ice can be troublesome, especially along the east side of the sound. According to whalers and other explorers, the waters are most frequently open along the west side, even if elsewhere the ice is close. With a lot of ice in Sørporten, however, mariners must also assume that the western channel will close with the north-fl wing stream and with persistent southerly or south-easterly winds. When navigating with pack ice in the waters mariners must beware the pack ice fl w can change to the opposite direction.

The cabin on Lagunepynten Photo: NHS

Nordporten

(Chart no. 537)

The west side of Nordporten extends along Mosselhalvøya from **Lagunepynten** to Fostrneset. On the north side of Mosselhalvøya the coast is a low sand-ridge with several sandy bays along the 4 nautical mile long stretch east-south-eastwards from Verlegenhuken to Lagunepynten.

Further on from here the landscape is low with sandy beaches southwards to Eolusneset on the west side of the mouth of Sorgfjorden. The area has not been surveyed so navigators must stay well outside the 20m contour. The area is open and without usable anchorages.

An eider colony on Lagunepynten Photo: NHS

The cabin north of Eolusneset Photo: NHS

Sorgfjorden (Chart no. 537)
Sorgfjorden cuts in between the broad coastal plain in front of the snow clad Polheimhøgdene (354) on one side and Fosterneset on the other, where a wide, stony coastal plain crosses over towards **Heclahuken** (486) on the other side. Heclahuken falls steeply down towards Sorgfjporden.

Eolusneset is about 30 m high and at a distance can appear to be an islet. A cross, which according to the inscription was raised in 1855 by Skipper C Holmgren of the schooner «Eolus» of Bergen, stands on the top of the ness, **Krosshaugen**. The inscription also states the cross was raised in memory of the hunting folk lost during a known shipwreck here in 1693. Thirty graves are also witness to the tragedy.

FLAGSTONGHAUGEN on Crozierpynten Photo: NHS

From Eolusneset, Sorgfjorden extends 5 nautical miles inwards to a large river mouth at the head of the fjord. The outer part of the fjord is about 2 nautical miles wide but narrows a little in the inner part. A good halfway in on the west side of the fjord stands a comparatively high headland with a cairn and also a lattice beacon. **Crozierpynten**, with 30 m as its greatest height, projects about 3 cables from the beginning of the coastal plain.

Sorgfjorden has been very much used as a base for hunting vessels and scientific expeditions. The depths in the fjord vary between 50 and 120 m, and vessels enter the fjord a little closer to Eolusneset than to Sorgfjordneset on the opposite side. The fjord appears clear apart from a shoal bank 5 cables north of Crozierpynten and just along from the eastern shore. There are shoals of 3.6 and 6.9 m on the east end of the bank. Vessels are clear west of the bank with *Lagunepynten and Eolusneset in line*. It is also possible to sail on the inner side of the bank.

EOLUSSLETTA viewed from S Photo: NHS

KROSSHUAGEN CROSS and CAIRN, Eolusneset Photo: NHS

Helclahamna, on the south side of Crozierpynten, is the most natural anchorage in the area between Verlegenhuken and Lomfjorden, where there is good holding ground in depths of 10–14 m. Sorgfjorden is designated a place of refuge against acute pollution. See Chapter 1 for further information.

The bay is named after the British naval ship «Hecla» which was used by Captain W E Perry when in 1827 attempted to reach the North Pole from here. The Swedish Degree measuring Expedition over-wintered here in 1899–1900, when an excellent land station was built. The remains of the buildings cannot be seen until within Crozierpynten.

Fresh water can be taken on from a stream about 1200 m south of Heclahamna.

Cabin remains in HECLAMANA Photo: NHS

Vessels can also anchor in 12–14 m on the north side of Crozierpynten northeast of the steep headland. The northerly winds can be troublesome but on the other hand there is a better view of any pack ice that may form there. Even if southerly gales affect Hinlopenstretet and/or Wijdefjorden, experience shows that it can be calm in Sorgfjorden.

Sorgfjorden in the 1600s. In 1689 a war broke out among the seafaring nations, with England and Holland on one side and France on the other. There were no rules, and even the whalers in Svalbard did not avoid it. In 1693, the French captain Varenne was given the task of sailing northwards to Svalbard to burn and sink all ships that sailed under the flags of the enemy – England, Holland and Hamburg. The catch was to be seized as a prize of war. Four French frigates departed for the archipelago and began raiding all «enemy» whalers in the surrounding waters. Finally 40 Dutch ships gathered to attack two of the French frigates in Sorgfjorden.The battle in Sorgfjorden lasted for hours and there was much bombardment from both sides. The Dutch ships then began to escape from the fjord by towing their ships with their rowing boats, although the manoeuvre was difficult. They made it past the Frenchmen who could not stop them as their own rowing boats had been destroyed in the heat of battle. Despite this, the French managed to capture 13 of the Dutch ships. The French frigates left Sorgfjorden with 11 of the Dutch whalers, after having burnt two of the ships. (Source: Cruise Handbook for Svalbard).

On the east side of **Nordporten**, Wargentinfl a, about 10 km long and of similar width, rises up towards Wargentinfjellet with its height in excess of 368 m.

The waters between Langgrunnen and Marchisonfjorden have not been surveyed. From the steep wall in Nordporten the distance from depths of about 400 m decreasing to 10–20 m is short.

Further in towards the shore it is flat with shallow and varying depths. From experience the seabed in some places rises almost vertically, and even when there are depths of 50–100 m, they can change instantly to shallow depths, requiring great caution. The unfamiliar should avoid this area as the water visibility is often poor.

A channel used when approaching from northwest is to keep in deep water until **Claravågsundet** bears due east, and then steering to it. The entrance to Claravågen is easily recognised by a stack-like summit on each side (see photo). These are the first seen and easily recognised if approaching from the west in clear weather. At Claravågsundet course is steered southwards east of **Ringertzøya**. However, it is barely 2–3 m deep in some places on the east side of Ringertzøya, and a good 1 nautical mile northwards from the north end of the island. When underway, navigators should therefore keep closest to the eastern shore, where they will pass an 8–9 m deep ridge.

Entrance to CLARAVÅGEN Photo: Hydrograf

CLARAVÅGEN sett fra W Foto: Eiliv Leren

KROSSØYA and NORDRE RUSSØYSUNDET viewed from W Photo: Eiliv Leren

The inlet to Clara harbor is narrow, about 30 meters wide with a depth of 5 meters. Inside the bay there is good depth throughout the area. Just to the west of the outlet is a bank with minimum depth of 1.8 meters, distance to shore approx. 150 meters. At the approach to the bay followed the shoreline from S up to the inlet at a distance of about 75 meters.

Murchisonfjorden (Chart no. 537)
South of Wargentinfjellet, Murchisonfjorden cuts in at a length of 10 nautical miles and a width of 5 nautical miles. The fjord forms an archipelago, with its many islands, large and small, islets and rocks. The inner part is marked by **Celsiusberget** (350) an on the north side by Kinnberget (130).

The fjord roughly assumes a rectangular shape and the sounds between the islands and islets are mostly clear and deep in contrast with the outer waters. The coast around the fjord is relatively steep and the same applies to most of the islands.

The shallow waters towards Hinlopenstretet and of the many islands and islets, allow the inner part of Murchisonfjorden to be locked by pack ice from outside. By taking note of the land formations around the inner area of the fjord there wil l be no problems in finding anchorages that are sheltered from the wind. There are several entrances to the fjord but the safest and most used is between Søre Russøya and **Krossøya**. On the top of Krossøya there is an old Russian cross, erected to keep evil spirits away. When the cross is abeam course is then ste-ered 037º. On nearing the northeast point of Russøya a rock is passed a good 3 cables on the starboard side and approximately the same distance from a 2.6 m shoal a little further in.

When sailing to **Kinnvika** the same course is held until midway out in the waters towards Indre Russøya when tur-ning right in towards the inlet on a course of 349º. To enter the inner part of the fjord course is held in mid-waters through the sound north of Indre Russøya. Kinnvika is a good harbour with depths innermost of 15–20 m, mud and clay bottom. It is open to westerly winds but otherwise well sheltered from swell and ice. The harbour is designated a place of refuge against acute pollution. For further information see Chapter 1. There are several houses around Kinnvika dating from the Swedish-Finnish- Swiss expedition of 1957–58, and they have been used subsequently for research purposes. The houses also function as refuge cabins. See list of cabins in Chapter 1.

KINNVIKA RESEARCH STATION Photo: Eiliv Leren

The channel between **Søre Russøya** and the mainland is also navigable. There is a dangerous 2 m shoal 7 cables north of Sparreneset and otherwise course should be kept well off when rounding the southeast point of the island. Under difficult ice conditions it has been necessary to go directly from Hinlopenstretet and in between Depotøya-Nordre Russøya and Ringertzøya. It has been surveyed here so if the 5 m shoal south of Ringertzøya and the 1 m shoal north of Kvaløya are avoided, it is clear into the fjord. Inside Murchisonfjorden there are good anchorages on both the north and south sides of the low sand ridges that connect Sørpynten with the rest of the Y-shaped **Kvalrosshalvøya**.

Best holding ground is probably in Catalina bay where it can be anchored at about 20 meters depth. It is relatively large tourist traffic in this area.

The bays on the east side of the club-shaped **Floraodden** and on the north side of **Celsiusberget** have both been used as anchorages.

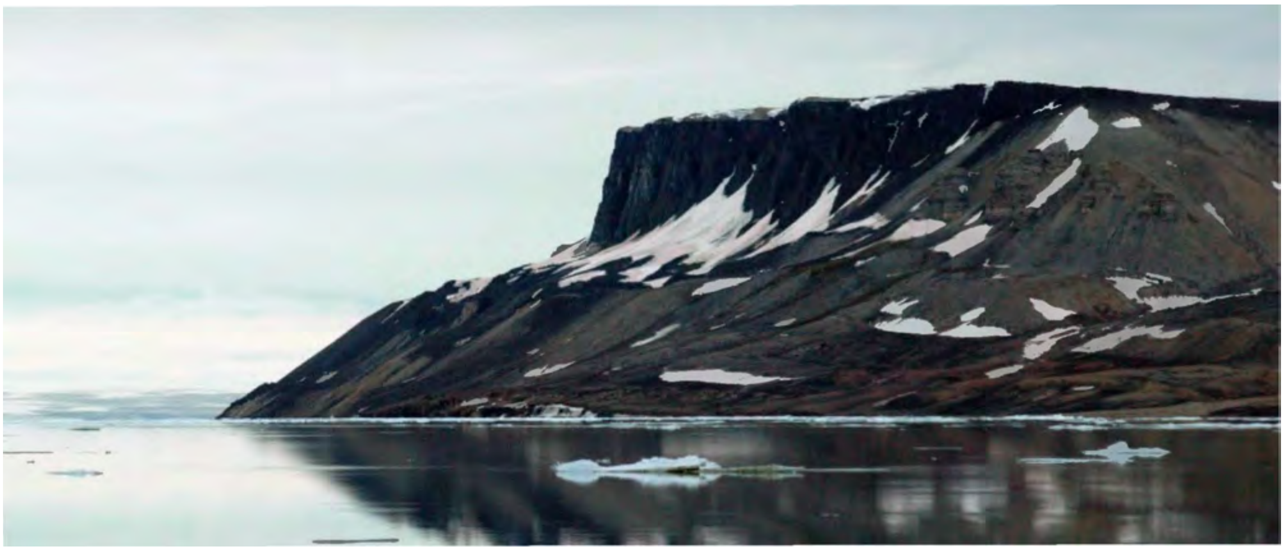
There are also good anchorages to be found in other places but mariners should be prepared for steeply sloping seabed, especially in towards the shores.

In the narrowest part of **Hinlopenstretet** there is a 40 nautical mile long submarine valley with depths 400–500 m, with sheer «walls» rising almost to the surface on both sides.

South of Murchisonfjorden the landscape is lower with a clear coastal plain southwards from Sparreneset.

FOSTERNESET LATTICE BEACON Photo: NHS

BULDREVÅGEN viewed from N Photo: Eiliv Leren



KAPP FANSHAWE Photo: NHS

Sparreneset projects a good nautical mile into Hinlopenstretet. When rounding the ness vessels must be kept off the 2 m shoal, 7 cables north of the ness. On the south side of the ness there is a broad sandy bay where vessels can anchor in 10–15 m with even, gently sloping bottom up towards the beach. It is easy for pack ice from Hinpolenstretet to collect in the bays on both sides of Sparreneset. The most exposed side will depend on wind and current directions.

Anchorage south of Sparreneset gives protectionagainst northern winds, (unknown holding bottom). Ice drift in Hinlopen will periodically be problematic in the anchor area.

Dolomittøyane are situated about 5 nautical miles south of Sparreneset, in an arc about 3 nautical miles long formed by a chain of islets and minor islands towards Gimleodden. Within the islands there is a wide bay that has been used by whaling vessels but the holding ground quality is not known. The north end of this area is marked by Forsiustoppen (236).

The wide bay further towards **Brageneset** (79°43.4'N 18°48.0'E) is greatly incised in the northern part and there are many island, islets and rocks outside. The nature of the waters suggests that the utmost caution must be exercised when navigating here.

A good nautical mile south-southwest from **Gimleholmane** is a small isolated rock almost on the edge towards the deep water in Hinlopenstretet. The rock can be dangerous to shipping under certain conditions with pack ice in the waters when it may be mistaken for «black ice» i.e. ice covered by gravel.

In the southern part of the bay towards Bragneset, **Gimlebreen** reaches the sea near Bragneset. On the opposite side of the ness **Bragebreen** continues towards Idunneset.

With care there are anchorages to be found in both **Brageneset** and **Idunneset**.

On the west side of Hinlopenstretet southwards from **Fosterneset** to Kapp Fanshawe, there are no harbour possibilities before reaching Lomfjorden. Here the plain merges with the mighty 12 nautical miles long front of **Valhallfonna**.

Lomfjorden (Chart nos. 536, 537)
On the west side of Hinlopenstretet, between Valhallfonna and Kapp Fanshawe, Lomfjorden extends south-south-westwards 18 nautical miles. The fjord is surrounded by mountains 200–800 m, high, apart from innermost on the east side of the fjord. The 380 m high **Kapp Fanshawe** (79°37.3'N 18°15.3'E) forms the northern end of Lomfjordhalvøya.

Cabin ruins near the glacier Frøya, on the east side of Lomfjorden Photo: NHS

MYTEBERGET Photo: NHS

Faksevågen lies scarcely halfway in on the west side of the fjord. The inlet appears clear, but drifting ice from Hinlopen tends to accumulate in the fjord and along the western shore with wind from north. However, it shoals to some extent out from the mouth and a depth of 3 m has been found at a distance of 500 m from the shore, and about 150 m off the rock awash. Faksevågen is a good anchor harbour with depths of 40–50 m, with mud and clay bottom, open to the east. The harbour is designated a place of refuge against acute pollution. See Chapter 1 for further information. There is a cabin on the north side of Faskevågen's entrance channel.

To the east of Faskevågen, closer to the eastern shore, there is **Footøya** with an islet, Jakta, and three small rocks on the south-east side. They can be passed between these and the eastern shore in a depth of 25 m, while on the western side the depth is 90 m. Possible to anchor on the south side of Footøya for smaller vessels. Going up from the west and keep the middle of the strait between Footøya and Jakta until depths of 12 m of water without going through the strait. There is a shoal on the eastern side. There is good holding ground.

Northwest of Kapp Fanshawe there is a depth of 7 m at a distance of 1 nautical mile from the shore. In the same direction about 2 nautical miles off, depths of 7 m and 9 m have been reported.

Lomfjorden is otherwise clear with 180 m at the mouth and 70 m at the head. There is an anchorage with a depth of 13 m a little south of Valhallfonna or another in Faskevågen which are sheltered from pack ice.

Wahlenbergfjorden (Chart no. 537)

On the east side of Hinlopenstretet, Wahlenbergfjorden cuts about 25 nautical miles eastwards into in Nordaustlandet from Brageneset, while Palanderbukta, an arm of this fjord, cuts 12 nautical miles south-eastwards. Both of the fjords are mainly surrounded by high glacial areas. In the mouth between Iduneset and Selanderneset there is Gyldenøyane, the largest of them which has a height of 40 m.

Vestfonna, which also shoots two glacier arms, **Gimlebreen** and **Bragebreen**, down towards Hinlopenstretet on each side of Brageneset, dominates the north side of the fjord.

From the head of Wahlenbergfjorden the fjords on the north side of Nordaustlandet can be reached through Helvetesfl a and Rijpdalen, which separate Vestfonna and Austfonna.

The fjord is apparently clear and the south side of the fjord has been surveyed in as far as Kobbungen, showing that this side has good depths. One can find the appropriate depths for anchoring along the northern countries of the fjord, but the ice from calving glaciers can be troublesome. Looks like the

TANNA, innermost in Wahlenbergfjorden, towards Bodleybukta Photo: Eiliv Leren

OXFORDHALVØYA with KLØVERBLADBUKTA and BODLEYBUKTA Photo: Eiliv Leren

main feature of the ice along the northern country beyond. Is also a primary plateau some distance east of **Gyldénøy-ane**. By Gyldénøya it is also possible to find anchorage for smaller vessels. Be avare of the shallow area at the island's northwest corner. Gyldénøya can be passed on both sides. On the south side of the fjord can be anchored by **Ismåkefjellet**. There is good holding ground, but with southerly winds, strong Katabatic wind tends to arise.

At the head of **Bodleybukta** it is a good anchorage with medium good holding bottom. By searching against the south-east part of the bay into 20 meters of water will prevent the outfl w of ice to be troublesome.

It narrows to the innermost part of the bay and it is barely 3 m deep through the entrance channel.

Between Bodleybukta and the massive **Etonbreen** lies **Oxford-halvøya**. This peninsula is cut off by **Kløverbladbukta** with the entrance partly closed by projection ridges. The highest point of the peninsula is Carfaxhaugen (106) to the southeast and the glacier (now) lies right up to the most westerly part of the peninsula.

Vessels can anchor on the outside of the Kløver-bladbukta, but drifting ice can make problems. West-northwest of Kløverbladbukta is a shallow area with shallowest depth about 1.5 meters, due to several peaks. This can be passed on both sides. It has been reported that there is a 2 m shoal further out, off the westerly part of **Aldousbreen** and about 1000 m from the shore.

On the south side of Walhenbergfjorden, about 7 nautical miles inside Selanderneset, **Palanderbukta** sits in between Sca-niahalvøya and **Zeipelodden** (70°40.0'N 20°29.0'E) as a fjord arm about 12 nautical miles long and 3–4 nautical miles wide.

PALANDERBUKTA viewed from W Photo: Eiliv Leren

LOSEN viewed from N Photo: Eiliv Leren

KRYLEN, SVÆRINGEN and PILTEN, FOSTERØYANE viewed from SE Photo: Eiliv Leren

PERTHESØYA viewed from S Photo: Eiliv Leren

The depths are even at 50–70 m into the fjord. Some calving from the glacier and strong down winds occur. The fjord is designated a place of refuge against acute pollution. For further information see Chapter 1.

The southern part of Hinlopenstretet (Chart nos. 536, 537)
Hinlopenstretet shoals sharply southwards, especially midway towards Fosterøyane.

Southwards from Bragerneset and Kapp Fanshawe, Hinlopenstretet widens and merges with the broad **Sørporten**.

There are several large and small islands in this area. The most northerly archipelago is Fosterøyane which lies approximately in the middle of Hinlopenstretet. To the west of Fosterøyane, Tommeløyane lie in towards Lomfjordhalvøya. Between Scaniahalvøya and Vaigattbogen are Vaigattøyane with a length of about 15 nautical miles and up to 12 nautical miles in width. Wahlbergøya is the largest of the islands and is about 7 nautical miles long and 194 m at its highest.

On the east side of Hinlopenstretet across from Lomfjordhalvøya, **Scaniahalvøya** stretches southwards from **Selanderneset** (79°36.4'N 19°41.0'E) to **Torellneset** (79°21.8'N 20°44.4'E). The peninsula is dominated by **Glitnefonna** which is separated from **Vegafonna** by the broad Palanderdalen. Both snow field rise up to over 400 m in height. Vegafonna also has an outlet to the sea just north of Torellneset, Mariebreen, and an outlet that goes down to the bay east of Torellneset, Rosenthalbreen.

From Torellneset the coast curves eastwards with a narrow coastal plain inside, broken by Rosenthalbreen. **Svartknausflya** then goes up towards **Svartknausane** (275) and Vibehøgdene. From there the mighty Austfonna reaches the sea along the whole of the east side of Nordaustlandet.

The main channel through the southern part of Hinlopenstretet goes along the eastern side of the sound nearer Nordaustlandet where the channel is deepest and easiest. After passing between Fosterøyane and Selanderneset on the way southwards, course can be steered mid-waters between the easily recognised Svartberget on Scaniahalvøya and Wahlenbergøya, continued southwards between Wahlenbergæya and Perthesøya, and then 2–3 nautical miles southwest of **Franzøya** out into Sørporten.

FRANZØYA and KARL ALEXANDERØYA with Ulvebukta in the background Photo: Eiliv Leren

The channel between **Perthesøya** and the low Torellneset has also been used, even though there are some shoals. When it used it is natural to go on the north side of **Karl Alexanderøya** and to then steer out of Sørporten. Navigators should expect shoals in some places along the shore from Selanderneset to the head of Vibebukta.

It is relatively clear around the islands in the sound between the islands of Franzøya and Karl Alexanderøya. There are comparatively strong currents in the sound between the islands and it is exposed to the weather. The survey ship MS «Hydrograf» anchored in **Pücklerhamna**, on the west side of Franzøya. To the west of the islands is **Lomfjordhalvøya**, which is mostly covered by glacier over 600 m in height. The glacier fronts mainly reach the sea but are broken by the steep nesting cliffs. The best known of these is the beautiful **Lovénberget** (534), which some consider to be the best nesting site in Svalbard.

North of Wahlbergøya is **Nyströmøya**, while to the south is Von Otterøya. These are the largest, although to the west there are many lesser islands with **Berggrenøya** as the most westerly. There are many possible anchorages with good holding ground on all sides of the islands in all wind directions.

On the southwest side of **Wahlbergøya** there is good anchorage east of **Ardneset** depths about 15 m. It has good holding ground but there are strong currents in the sound between **Von Otterøya** and Wahlbergøya.

It is deep close to on all sides of **Nordenskiöldøya**, apart from on the north side. Here a number of shoals extend out from the shore. Along the west side of Hinlopenstretet there is also a channel that is clear of the islands and islets, and where there has been an amount of traffic. The channel runs between Vaigattøyane and the western shore and vessels leave best north of Wilhelmøya.

ALKEFJELLET, cramped for space Photo: NHS

LOVÉNBERGET Photo: NHS

MS «HYDROGRAF» at anchor near ARDNESET on WAHLBERGØYA viewed from S Photo: Eiliv Leren

The largest island near Sørporten is the high **Wilhelmøya** (568) with its glacier clad peak. **Bjørnsundet** lies between Wilhelmøya and the mainland and is relatively narrow. Vessels can pass through Bjørnsudet on the south side of Wilhelmøya. The depths in this sound are 20–30 m and the current can reach a rate of 2–3 knots. In **Binnebukta**, on the west side of Wilhelmøya, it is shallow but relatively clear, mud and clay bottom. The area is designated a place of refuge against acute pollution. See Chapter 1 for further information.

There is a long row of lesser islands, **Bastianøyane** and **Rønnbeckøyane**, further south-eastwards from Wilhelmøya, and on the south side of these a large basin has formed which reaches almost down towards **Kapp Payer** (78°49.9'N 21°29.0'E).

BJØRNSUNDET viewed from SE Photo: Eiliv Leren

TORKILDSENØYA and MACKØYA viewed from NNW Photo: Eiliv Leren

New surveys show that vessels can sail safely north or west of **Bastianøyane** and on both sides of **Torkildsenøya**. There is good anchorage with good holding ground in the bay on the south side of **Pescheløya**, the most westerly of Bastianøyane.


Main chart
Harbour sketch
SPITSBERGEN
Heleysundet
60
10
Ginevrabotnen
Ormholet
Main lead
505
30'
Mistakodden
Barentsøya
SABINE
LAND
Secondary lead
Zeiløyane
Kapp Hauglin
534
Barkhamnodden
11
Domen
Freemansundet
Blåbukta
11
Kapp Lee
533
507
Agardhbukta
523
78°00'00"
Ryke Yseøyane
Kapp Dufferin
Diskobukta
513
HEER
LAND
STORFJORDEN
EDGEØYA
Russebukta
30'
Boltodden
Tjuvfjorden
Kvalvågen
Kvalpynten
525
Halvmåneøya
Kong Ludvigøyane
Negerpynten
TORELL
LAND
Tusenøyane
Tiholmane
Brotneset
77°00'00"
526
Isbukta
SØRKAPP
LAND
30'
Sørkapp
527
16°
18°
20°
22°

Storfjorden–Barentsøya and Edgeøya

(Chart nos. 505, 507, 533, 534)

(The information in this chapter is imperfect due to incomplete surveying)

GENERAL INFORMATION

Except for the inshore waters with depths under about 50 m, most of Storfjorden has been surveyed in recent years. Freemansundet was partly surveyed during 1987. On the east and west sides of Barentsøya there are areas along the shore and large areas around Edgeøya, however, that have still to be systematically sounded, and mariners must take special care in these areas.

See Chapter 1 for an index of surveyed areas.

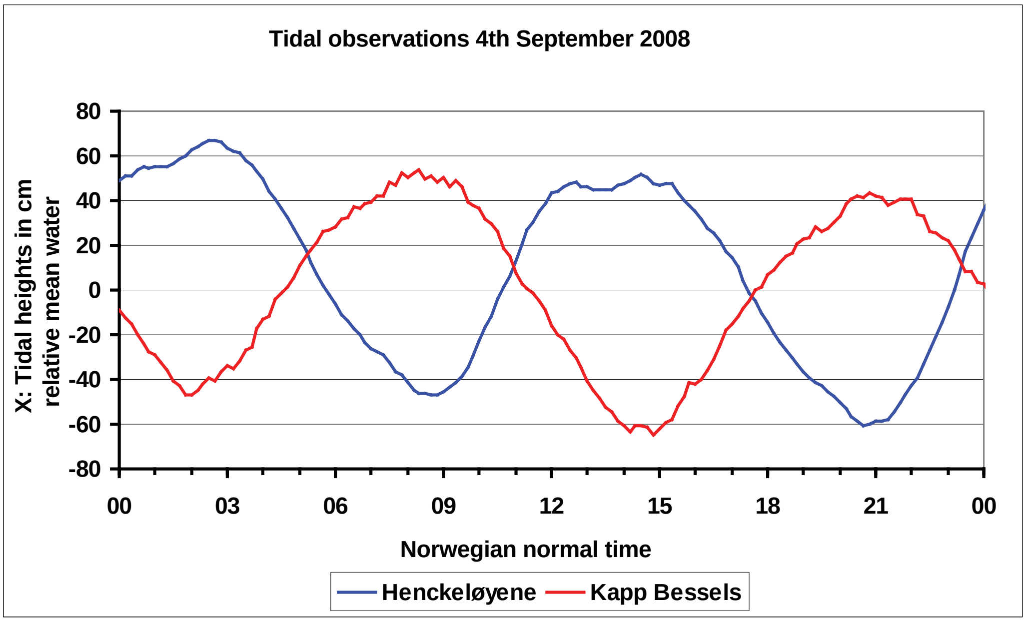
TIDES, CURRENTS AND ICE CONDITIONS

There are strong tidal streams in these waters, especially round Tusenøyane south of Edgeøya, and not least in the sounds around Edgeøya and Barentsøya. Mariners are particularly warned against the sounds between Spitsbergen and the north side of Barentsøya, where very strong tidal streams (possibly 8–9 knots) combined with pack ice can be a great hazard to the safety of a vessel.

The tides in these waters are «steered» by the tidal wave that rotates around the amphidromic point east of Bjørnøya (see section on tides, page 78).

In the shallow areas the propagation speed is slight and this leads to large tidal differences between the east and west sides of Barentsøya and Edgeøya. At the same time tidal recordings on the east and west sides of Heleysundet show that when there is high water on one side there is low water on the other, and vice versa. This is illustrated in Figure 1 which shows a part of the record.

The difference in levels between the east and west sides can be more than a metre and this leads to strong tidal streams in Heleysundet and Freemansundet. Without other influences the tide will turn when the tidal height is the same on both sides, that is to say, midway between high and low water and it will be at its strongest at high-low water when the tidal differences are greatest. Observations suggest that there is a certain delay (about 30 minutes) related to «the theory». On average, high water occurs in the north of Storfjorden about 1 hour 30 minutes earlier than in Longyearbyen. There the stream is strongest eastwards about 1.5–2 hours before high water in Longyearbyen, then turns about 1.5–2 hours after high water in Longyearbyen. It will be at its strongest westwards about 1.5–2 hours before low water in Longyearbyen and turns about 1.5–2 hours after high water in Longyearbyen. The tidal differences between high and low water in the area, and high and low water in Longyearbyen vary somewhat, and therefore the times of when the stream turns are for guidance only.



Tidal observations from the west side of Heleysundet (Henckeløyane) and the east side of Heleysundet (Kapp Bessels).

ZINGERFJELLA viewed from S

Storfjorden

(Chart nos. 505, 527, 533)

From Sørkapp the mighty Storfjorden stretches 140 nautical miles northwards along the southeast coast of Spitsbergen until it ends in Ginevrabotnen. The fjord is bounded to the east by Tusenøyane, Edgeøya and Barentsøya.

Following the sounding of most of Storfjorden in recent years it has become apparent the seabed topography is far more varied than was previously considered. As mentioned earlier, the areas close to the shore were not included in the most recent surveys but there seems to be an even bottom with about 20 m depth along the west side of the fjord where vessels are kept 2–3 nautical miles off the coast.

The west side of Storfjorden (Chat nos. 505, 527)
The east coast of Spitsbergen mostly falls steeply to the sea, from mountains 500–700 m high. The mountains are separated by glaciers or glacier tongues and many of these reach the sea. **Haitanna** (932) and **Hornsundtind** (1429) on Sørkapplandet are also the most outstanding on this side. **Kvalhovden** (345) which is situated off Zingerfjella (636) and **Agardhfjellet** (587) stand out well, as in both cases the coast turns sharply eastwards where it ends in these peaks. The same applies also to **Teistberget** (425) further north.

KVALHOVDEN viewed from S Photo: NHS

Service cabin on BOLTODDEN Photo: NHS

Photo: Eiliv Leren

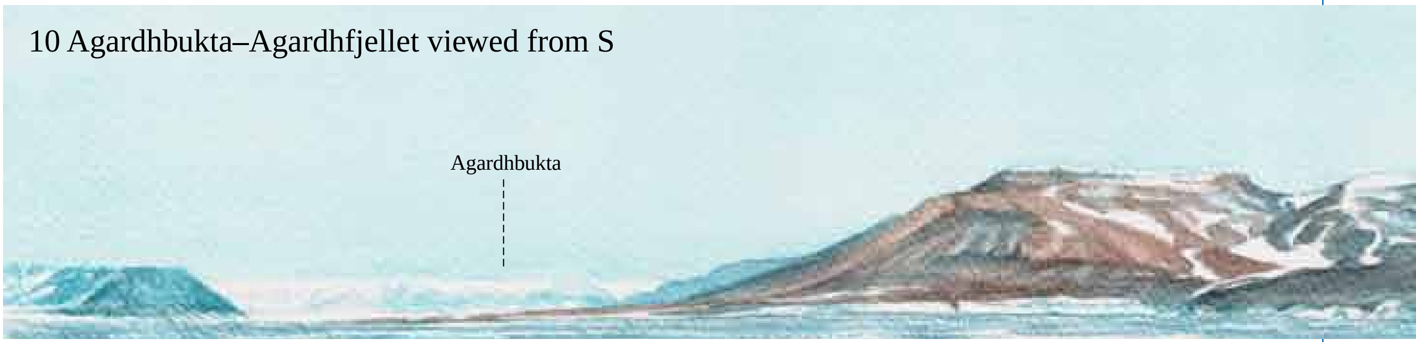
There are no good anchorages from Sørkapp and northwards to Kvalvågen. The mountains dive steeply to the sea between glaciers, and shallow waters make it difficult to access sheltered areas. Mariners can reckon on shallower water off the glaciers, especially in **Kalvågen**. Vessels anchor south of **Boltodden**, out from the two cabins, where the depths are 12–15 m, sand and clay bottom. The usable anchorages are sheltered from pack ice. Kvalvågen is designated a place of refuge against acute pollution. See Chapter 1 for further information.

Inwards of the western half of Storfjorden, it can be said generally that the depths decrease from about 200 m outermost to about 100 m when approximately almost level with **Teiknarneset** and 70–120 m further up towards Negribreen.

Nature's sculptures on Boltodden Photo: NHS

The cabin near BOLTODDEN Photo: NHS

BOLTODDEN viewed from SW Photo: NHS




AGARDHBUKTA, LJFF, hire cabin, light mounted on the cabin roof Photo: NHS


AGARDHFJELLET, refuge cabin Photo: NHS


MYKLAGARDHYTTA in Agardhbukta, service cabin Photo: NHS


DUNÉRHYTTA Photo: NHS

Agardhbukta is also shallow, from 8–10 m outermost to 4–6 m, sand bottom. Both of these bays are usable anchorages, where vessels are also protected from pack ice. Agardhbukta is designated a place of refuge against acute pollution. See Chapter 1 for further information.

Two cabins stand on the northeast side of Agardhbukta. The nearest is a service cabin and the higher one, on which is a light, Fl W, is mounted. The cabins are for hire by Longyearbyen JFF. See list of cabins in Chapter 1.


Cabin in the south of Mohnbukta Photo: NHS

A refuge cabin stands on the beach at the foot of **Agardhfjellet**. See list of cabins in Chapter 1.

South of «**Dunérbukta**» is Dunérhytta which was built by Georg Bjørnes in 1928. The cabin was restored in 2008 and is used by To-takter'n as a hire cabin. See list of cabins in Chapter 1.

The cabin south of **Mohnbukta** was erected in 1928 as a secondary base to Georg Bjørnes' Dunérhytta. Longyearbyen JFF use it as a hire cabin. See list of cabins in Chapter 1.

For vessels sailing from the south, making for Ginevrabotnen and Heleysundet, the waters in this part of Storfjorden there are the safest. Usable sailing depths are to be found 100–150 m from the shore.

In 1936 the mighty **Negribreen** advanced halfway across towards **Mistakodden** (78º28.8'N 20º09.7'E) on Barentsøya and at that time covered Kvalrossøya. With the glacier's retreat in 1950–1960, the island is now clear of ice again.

WICHEBUKTA viewed from E Photo: Eiliv Leren

EDLUNDFJELLET and KAPP BROWN with Ginevrabotnen in the background Photo: Eiliv Leren

GLACIER FRONT Photo: NHS

KAPP BROWN, DIABASTANGEN and EDLUNDHAMNA viewed from S Photo: Eiliv Leren

Ginevrabotnen with Heleysundet and Ormsundet

(Chart no. 533)

Ginevrabotnen is the innermost part of Storfjorden and this bay swings eastwards between the north side of Barentsøya and Olav V Land on Spitsbergen. The two mountains **Hellwaldfjellet** (662) and **Kvitberget** (646) are particularly discernable in the northeast. Further to the east Ginevrabotnen ends towards **Kükenthalvøya** with Heleysundet on the north side and Ormholet on the south side of the island. Both sounds are known to have violent tidal streams.

By the entrance to Ginevrabotnen vessels should also be kept closer to **Kvalrossøya** than to Mistakodden on Barentsøya. About 2 nautical miles from Mistakodden in the direction of Kvalrossøya, there is a 1 m shoal. From there and further inwards it has not been sounded but experience suggests that it is clear in mid-waters into Helesundet, while great care must be exercised around Mistakodden Henckeløyane, Engeløya and also along the coast.

There is usable anchorage on the west side of **Henckeløyane**, where vessels are sheltered from ice that drifts about.

There is also a good anchorage southwest and north of **Lamontøya**.

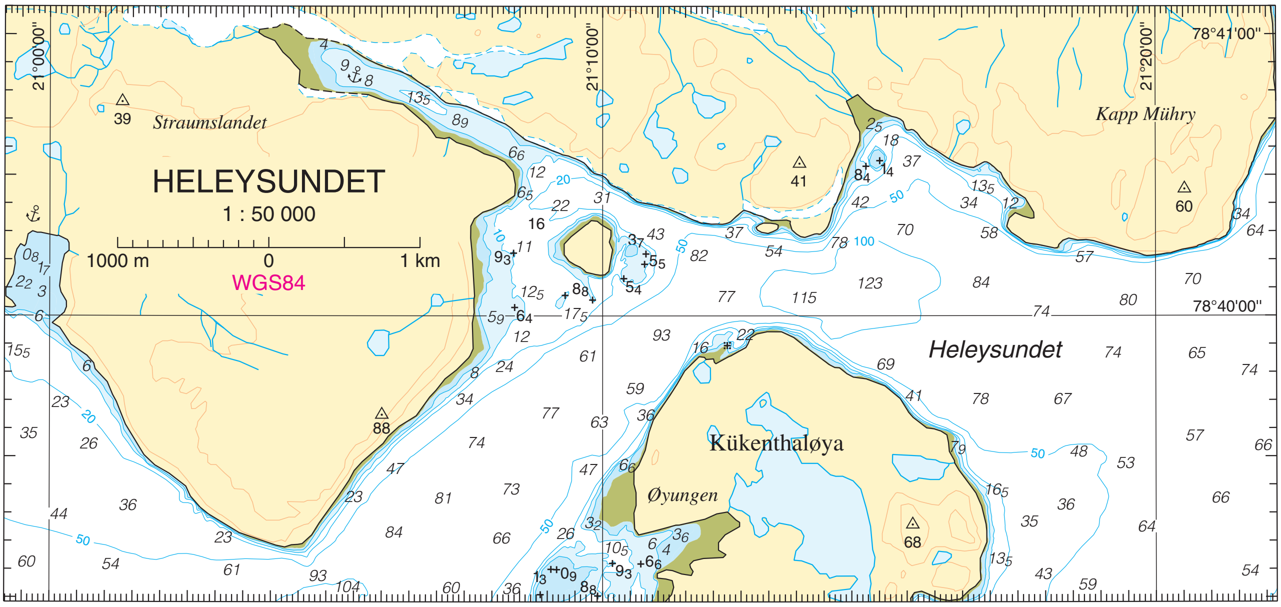
The north side is fairly exposed to ice from the glacier but the anchorage southwest of the island is exposed to westerly winds. The stream direction by Lamontøya is typically southerly and rates of 4 knots and some pack ice from Sonklarbreen have been observed.

There is a well sheltered, fine little boat harbour, depth 3 m, sand bottom, southwest of **Straumslandet**. Vessels can also anchor in the inlet northeast of Straumslandet in depths of 7–13 m, mud bottom. It is well sheltered (see harbour plan of Heleysundet). Barentsøya was originally thought to be a peninsula until the Norwegian hunting fraternity discovered that there was a sound on the north side of the island. It was later revealed that there were two, Heleysundet in the north and a rather smaller Ormholet on the south side of the relatively low and cliff-edged Kükenthalvøya.

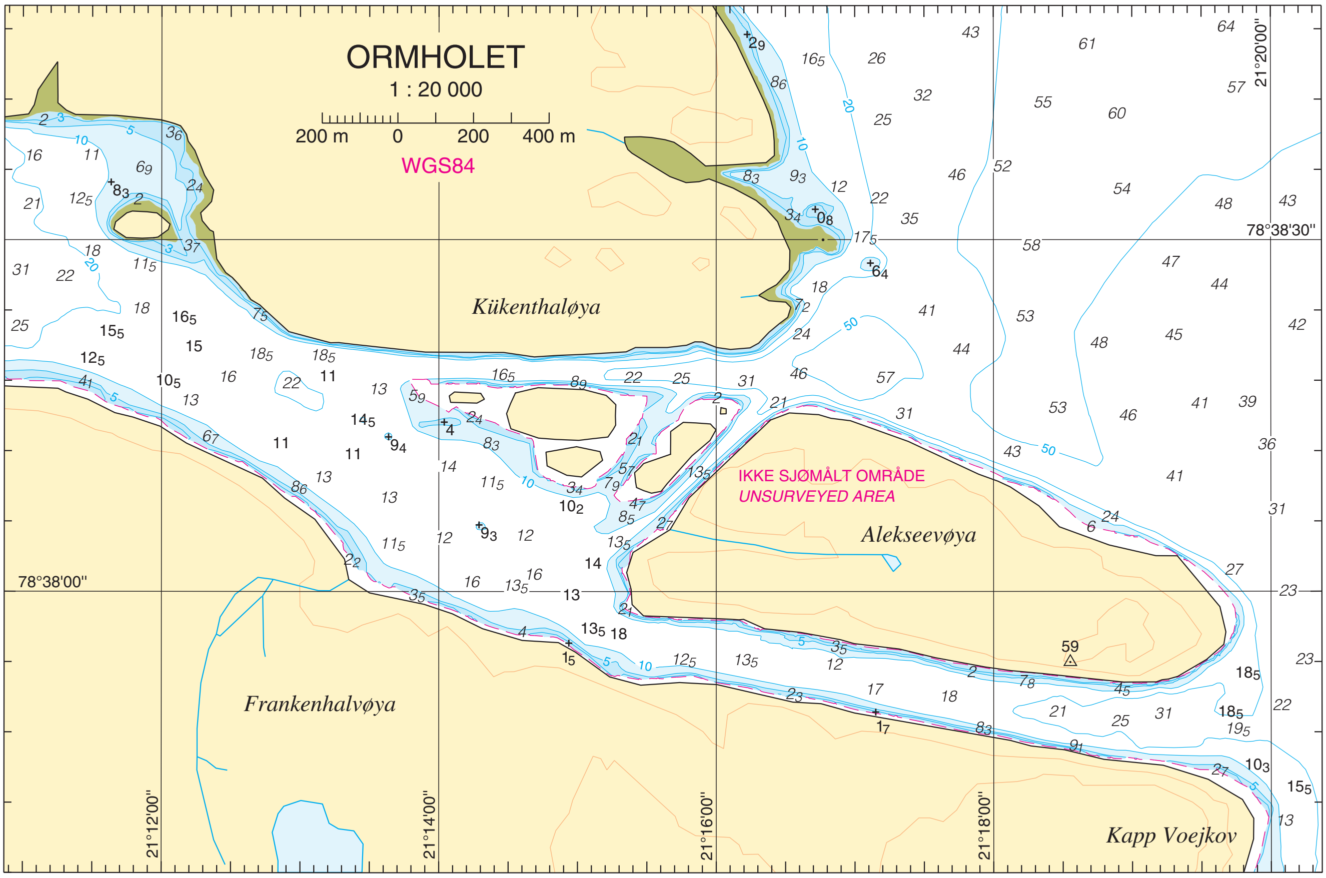
HELEYSUNDET viewed from SE Photo: Eiliv Leren

The coast along the north side of Heleysundet is mostly relatively steep and high. The sound swings in an arc north-eastwards and eastwards, and is about 2 nautical miles long and 600 m wide at it narrowest. Ormholet is fairly straight and orientates in an east-southeast direction. The sound is about 1 nautical mile long and about 150 m wide in the eastern part. There are some larger and smaller islets along the northern side.

The depths in **Heleysundet** (see harbour plan) vary between 60–70 m, while the southern part of **Ormholet** (see harbour plan) has 10–12 m. Several vessels have recorded a tidal stream rate of 8–9 knots in the narrowest part. When there is much pack ice the sounds must not be used, especially not with the current. Even with high engine power vessels are at risk of becoming icebound as it presses together in the sounds' funnel-shaped entrance areas. Occasionally hunting vessels have been crushed because they have not been able to get away in time. The tidal streams in the sounds change quickly in the sounds as there are no slack periods worth mentioning.



ORMHOLET viewed from E Photo: Eiliv Leren



The refuge cabin on Heimland Photo: NHS

Vessels can anchor in the north of the bay on the west side of **Frankenhalvøya**, near **Heimland**, in depths of 12–15 m, fin sand bottom. There is a cabin that was built in 1936. Recently restored, it now functions as a refuge cabin. See list of cabins in Chapter 1.

The east side of Storfjorden

In contrast with Spitsbergen, Edgeøya and Barentsøya are covered by mountains with rounded summits 400–500 m high.

The much larger Edgeøya has similar glacier coverage as Barentsøya and then predominantly in the southeast where **Edgeøyjøkulen** reaches the sea with Stonebreen's front which is about 35 nautical miles long. South of Stonebreen, and almost continuous with it, Kong Johan's glacier emerges with its front which is about 5 nautical miles long. There are also some larger and smaller glaciers northwest and west of the glacier arm and between these and the mountain regions there are also wide valleys that end in coastal plains.

The highest point on Edgeøya with it's the peak of **Digerfonna** (585) while **Müllerberget** (533), about 5km further west, is the highest bare summit.

Storfjorden is generally shoaler from mid-fjord and eastwards than on the west side, and the uneven seabed therefore makes big demands on navigation. There are several dangerous shoals in this area and some lay well out in the fjord.

A good 12 nautical miles west of Martinodden, on the west side of Edgeøya, is **Storfloskjeret** (77°35.8'N 19°56.4'E), the only rock awash out in the fjord. About 4.5 nautical miles northwest of the same point is **Sylen**, a 3 m shoal. Other dangerous shoals are the 6.5 m **Mefjordbåen**, about 10.5 nautical miles north of Storfloskje et, and the 3.5 m **Folafoten**, which lies 6.5 nautical miles east-northeast of Mefjordbåen. With *Kreftberget* (392) *in line with Dolerittneset* (the south side of the entrance to Freemansudet) vessels go clear west of Sylen and east of Folafoten.

Kalvpynten, (77°26.6'N 20°52.8'E) a conspicuous headland, projects from the southwest end of Edgeøya. Northwest of Kalvpynten is **Kariskjeret**, with a shoal to westwards. It is clear and deep on the inner side of the rock.

KVALPYNTEN viewed from SE Photo: NHS

The cabin on Svarttangen Photo: NHS

Svarttangen light, white, stands on **Svarttangen**. By the side of the light there is a poor, dilapidated cabin that was one of the secondary bases of the hunting ground's main station further north in Diskobukta.

In the area around **Hassensteinbukta** and about 3 nautical miles further out in the direction of the 3 m shoal, Sylen, the waters are foul but with care there is shelter to be found in the bay.

Russebukta is a good anchorage, depth 20 m, clay bottom. Smaller vessels can draw further in on 10–15 m, stones and clay bottom. The best approach is from North. The bay is designated a place of refuge. See list of cabins in Chapter 1.

Diskobukta has also been used as an anchorage. «Disco Villa», which was built in 1929 by Georg Bjørnnes and the brothers Einar and Eldor Svendsen, stands in the north of Diskobukta. The cabin was the main station for the hunting ground, with secondary bases further south in Diskobukta and on Edgeæøya's north-eastern side near Kapp Heuglin. Just by the cabin is a newer cabin built by Norwegian Polar Institute.

The light on Svarttangen Photo: NHS

Cabin interior Photo: NHS

The cabins in Diskobukta Photo: NHS

Bird cliff near Diskobukta Photo: NHS

The cabin functions as a refuge cabin. See list of cabins in Chapter 1. Behind the cabins there is a gorge with a great bird nesting cliff.

A shoal extends off **Blankodden** about 4 nautical miles out from the shore, with 8–10 m depths outermost. The shoal area also runs about 2 nautical miles off shore along the whole of the west side of Edgeøya, but there are also shoals between 10 and 20 m off the shoal area.

About 9.5 nautical miles southwest of Dolerittneset there are two shoals, **Tvillingane**, 8.3 m (these can be mistaken for **Sletvoldgrunnen**, 5 m, which was discovered in 1923).

There is good anchorage in northerly winds off **Rosenbergdalen**, depths 5–7 m.

On both sides of **Dolerittneset** there is a good, very frequently used harbour with sand bottom, sheltered from all wind directions. Vessels are sheltered from southerly winds on the north side but a couple of rocks extend outwards from the ness. There is a 105 year's old hunting cabin on the ness, built by the crew of the yacht «Elina Kristine» of Tranøy, in 1904. The cabin was restored in 1929 by Georg Bjørnnes. It has recently been restored and it now functions a refuge cabin. See list of cabins in Chapter 1. There are also two newer cabins here.

The highest peak, **Schweinfurthberget** (548), stands on **Barentsøya** on the east side of the island. Barentsøya is otherwise half covered by Barentsjøkulen with its four branches that all reach the sea. Besselsbreen lies in the northeast and is the largest of these branches, while the little Willybreen extends eastwards. Between these two glacier arms there is a coastal plain in front of the glacier. Freemanbreen extends into Freemansundet while the latter arm, Duckwitzbreen, ends on the west side of the island.

Off **Barkhamodden**, the most south-westerly point on Barentsøya, lie **Ureinskagen** and **Jakimovičøyane** which consist of two large, narrow and crooked islands and a number of smaller islets and rocks. The waters around these islands, and further southwards in the western entrance of Freemansundet are foul and vessels should be kept well clear of this area. In westerly weather the anchorage on the southeast side of Jakimovičøyane is usable, depths 10–15 m, sand bottom.

THE KAPP LEE CABINS on Dolerittneset. The old cabin is on the left Photo: NHS

JAKIMOVIČØYANE with UREINSKAGEN and Freemansundet in the background Photo: Eiliv Leren

Larsholmen lies about 4 nautical miles from the coast off Anderssonbukta and navigators should be aware that it shoals some way westwards out from the islet.

There is an anchoring harbour, well sheltered from northerly winds in **Anderssonbukta**, south of the glacier. Larger vessels can anchor south of Anderssonbukta in depths of 8–10 m, clay and sand bottom. Smaller boats can anchor inside Anderssonbukta, 2–4 m, fine sand bottom. There are water filling possibilities but the streams often dry out in the summer. Anderssonbukta is designated a place of refuge against acute pollution. See Chapter 1 for further information.

Spjutneshamna is well sheltered from pack ice because of Spjutnesryggen, the reef that runs eastwards and northwards. The depths are 10–5 m, sand bottom.

Further up towards Mistakodden, there are 9.5 and 9 m shoals about 8–9 nautical miles southwest of **Vossebukta**. The otherwise partly visible Øylandskjera lies in the middle of this bay, about 3 nautical miles from shore. Mariners should otherwise reckon with a 10 m danger line that extends up to about 5 nautical miles from the coast, but which narrows considerably southwards towards Duckwitzbreen.

ANDERSSONSØYANE with ANDERSSONBUKTA viewed from NW Photo: Eiliv Leren

FREEMANSUNDET viewed from SSE Photo: Eiliv Leren

Freemansundet with the east side of Barentsøya

(Chat nos. 533, 534)

Freemansundet, between Barentsøya and Edgeøya is about 20 nautical miles long and about 3 nautical miles wide. The sound is named after Alderman Ralph Freeman who was a leader for the Muscovy Company of London and who visited Svalbard as early as 1619. The sound is encircled by mountains and hills of up to 450 m, with a low foreground that presents a poor radar echo.

Freemansundet has become regarded as a difficult sound for navigation. A lack of charted information, strong and unpredictable sets of currents and ice that accumulates at both ends of the sound are the most important reasons.

Later sounding of Freemansundet, in 1987 and 2000, shows that vessels can sail safely in depths of 15–40 m by keeping more than 0.5 nautical miles from the shore. The exception to this is in front of Freemanbreen where it shoals between 11 and 15 m at a distance of 1.1 nautical miles from the glacier front. Also, in the westerly part of the sound, there are recorded shoals of 11–17 m at a distance of 0.9 to 1.3 nautical miles off the west-north-west off Kapp Lee.

WÜRZBURGERHYTTA Photo: NHS

The stream through Freemansundet is dominated by the tidal stream, see page 321. The highest recorded value is 3–4 knots and here are large differences in stream strength at springs and neaps. Further east in the sound (off Meodden) the stream is rather stronger and slack water occurs about thirty minutes earlier. The current generally follows the main direction of the sound but near Kapp Waldberg it appears to set more in towards the shore (a westerly direction). This must be noted by navigators when rounding Kapp Waldberg. The stream is stronger here and it is thought to fl w at a rate of 4–5 knots along the shore.

The best entrance to Freemansundet from south is by passing **Kapp Lee** about 0.6 nautical miles and then into the sound. From the north it is best to sail north of Jakimovičøyane, then between these and Ureinskagen and then through this and **Brimulen**.

Vessels can anchor in the east of **Sundbukta**, east of Sundneset, depth 20 m, mud bottom, and further into the bay in 8–10 m, clay bottom. The bay lies in a backwater and is sheltered from the current but pack ice has a tendency to collect here. The bay is designated a place of refuge against acute pollution. See Chapter 1 for further information.

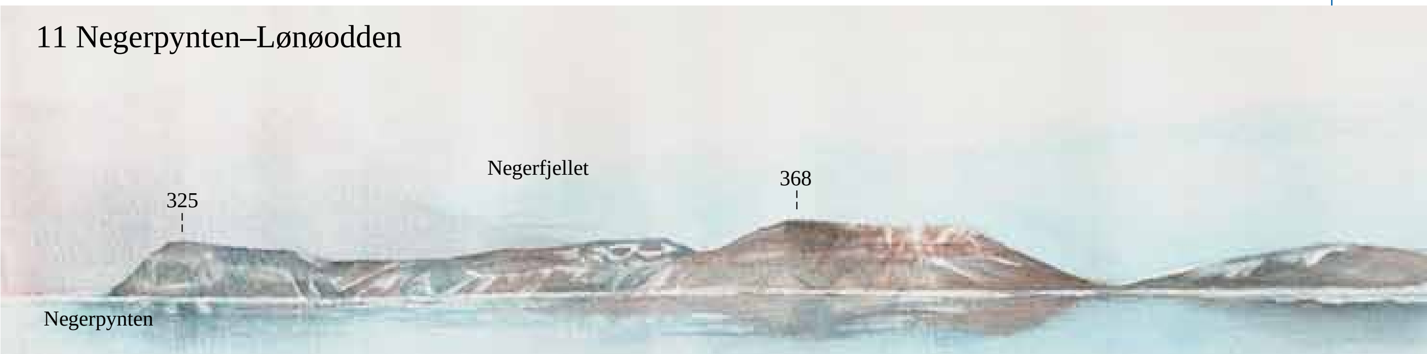
Würzburgerhytta, which is used as a service cabin, stands on the east side of **Sundneset**. See list of cabins in Chapter 1.

In calm weather vessels can anchor everywhere in Freemansundet, where the clay holding ground is good. On the east side of Freemansundet, **Walter Thymensbukta**, southwest of Zeiløyane, has been considered a relatively good anchorage with even bottom, 13–15 m, clay and stone bottom. Vessels can anchor north of **Kapp Waldburg** in depths of 5–10 m.

The waters between **Zeiløyane** and **Kapp Heuglin** on Edgeøya are foul with shoals and stones.

Along the east side of Barentsøya the areas are still unsurveyed and course should therefore be held at least 1.5 nautical miles off shore and great care exercised when navigating in these waters.

ÅNESET with ZEILØYANE viewed from S Photo: Eiliv Leren



South and east side of Edgeøya (Chart no. 505)

Tjuvfjorden lies most southerly and cuts in between two high peninsulas that end in conspicuous headlands, **Kvalpynten** (77º26.6'N 20º52.8'E) in the west and **Negerpynten** (77º14.7'N 22º39.5'E) in the east. From the head of the fjord the island's largest valley, Dyrdalen, lies in between the glacier arm and the two glaciers, Digerfonna and Storskavlen. The valley runs northwards through mostly low terrain which forms large coastal plains in the east towards Blåbukta and in the north towards **Kapp Heuglin** (78º15.3'N 22º49.0'E).

Tjuvfjorden cuts almost like an equilateral triangle in about 23 nautical miles inland on the south side of Edgeøya. The depths in the fjords are shallow and the danger line crosses the mouth of the fjord and also includes the areas around **Kong Ludvigøyane** in the southwest. There is a couple of smaller areas in the fjord where the depths reach down towards 30 m.

Vessels can anchor in 15 m, 5 cables off shore in **Keilhaubukta**. The depths slope evenly inwards, 10–12 m, 4 cables out, sand and stone bottom.

Off Andréetangen on the east side of the fjord there are the two islands, **Zieglerøya** and **Delitschøya**. On the west side of Zieglerøya there is good anchorage with a depth of 30 m at a distance of about 2 nautical miles from the island.

In the bay on the north side of the named islands the even seabed is of sand and gravel. Vessels here are well sheltered in all weathers in an excellent anchorage with depths of 7–10 m.

The sound is un-navigable between these islands and similarly between Delitschøya and the high islet on its eastern side. Between **Andréetangen** and the high islet, however, the depth is 13 m.

On Andréetangen stands a cabin that was erected by Henry Rudi in 1946, which functions as a refuge cabin. See list of cabins in Chapter 1.

Bjørnbukta, on the south side of Andréetangen, is quite shallow and the rocks awash, **Indre** and **Ytre Hesteskogrunn** respectively 2 nautical miles south-southwest and 3.5 nautical miles west-southwest of Zeiglerøya, warn of a need to exercise care as the areas have not been surveyed. The same applies to other waters further over towards Kong Ludvigøyane.

Vessels can also anchor throughout the west and northerly part of Tjuvfjorden in 10–15 m where it shoals gently towards the shore.

Tusenøyane are spread over a large area from the mouth of Tjuvfjorden and about 30 nautical miles southwards. A preliminary survey has been carried out, and this reveals many shoals and rocks awash between the island groups from **Tiholmane** in the south to **Menkeøyane** in the northeast

Håøya is the most southerly of Tusenøyane, and the 10 m danger line extends about 2 nautical miles out from the island. There are two rocks awash about 9 nautical miles west of Håøya, **Brotskjer** and **Rumpetrollet**. These rocks are about 4 nautical miles apart in a north/south direction and are easily visible in the set of the stream, and that they break even in calm weather and sea conditions.

ANDRÉETANGENHYTTA with WALRUS COLONY Photo: NHS

Vessels can pass north of Tusenøyane by keeping about 2 nautical miles south Kong Ludvigøyane, north of Bölscheøya further south of Negerpynten and north of Menkeøyane, where there is not less than 20 m water.

The stream in the waters around Tusenøyane can reach up to a rate of 5 knots, and mariners must therefore navigate with great caution. Should it appear that a large piece of ice is bearing down on the vessel, it must steer away as it is possible that the ice is aground on a shoal, and the vessel is being carried, perhaps sideways, towards it. On **Lurøya**, the largest of Tusenøyane, there is a cabin that was built by Norwegian Polar Institute, which functions as a refuge cabin. See list of cabins in Chapter 1.

Halvmåneøya is situated in **Sørkappstraumen** on the southeast side of Edgeøya and therefore has more pack ice than other places in the area. This is one of the reasons that there is one of the biggest concentrations of polar bears on Svalbard. Due to this fact the hunting stations on the island have perhaps been the best known for hunting on land on Svalbard.

In common with most of Tusenøyane, Halvmåneøya, with the surrounding islets are very barren, with rocks and boulders but there are also some marshes and lakes. Halvmåneøya is about 7 nautical miles long and 2 nautical miles at its widest. The greatest height, 23 m, is on the west of the island.

The waters around Halvmåneøya allow anchoring in several places but mariners must be aware that it shoals for about 1.5 nautical miles from the south side of the island, and that there is a rock awash just outside the danger line.

Halvmånesundet is 1.8 nautical miles wide at its narrowest and the sound is considered clear providing vessels stay in mid-channel. Vessels can anchor in the bay off the hunting station, about 50 m from the beach in 7 m of water, and in **Dianahamna**, northeast of the station.

There is a 4 m shoal just 2 nautical miles north of Halvmåneøya, and by the entrance and exit of the sound vessels are held between this and about 1 nautical mile off the north point of the island. On the inner side of **Halvmåneøya** there is an earlier hunting station, Bjørneborg, which is now a service cabin. See list of cabins in Chapter 1.

Further northwards along the east side of Edgeøya it is rela-

HALMÅNEØYA and HALVMÅNESUNDET viewed from S, Edgeøya in the bacground Photo: Eiliv Leren

DIANAHAMNA, Halvmåneøya Photo: NHS

tively shallow but comparatively clear. It can be assumed that the waters are fairly shallow, especially along the front of **Stonebreen**, where there are isolated ice pillars that remain from the glacier's retreat. The waters between Edgeøya and Ryke Yseøyane appear to be clear.

BJØRNEBORG, Halvmåneøya Photo: NHS

RYKE YSEØYANE viewed form S Photo: Eiliv Leren

The west side of **Ryke Yseøyane** (77°48.0'N 25°05.6'E) appears to be passably clear. Between the two most westerly islands the depths are 60–70 m. South and east of the islands there is a number of shoals and rocks awash. A cabin built by the State in 1967, functions as a refuge cabin and stands on the most southerly island. See list of cabins in Chapter 1.

It is shallow of the northeast coast of Edgeøya, especially in **Blåbukta** where it is difficult to approach the shore closer than 3–4 nautical miles. The waters north of Kapp Heuglin are, as mentioned previously, very foul, and if entering Freemansundet from the east, vessels must sail between Zeiløyane and the southeast point of Barentsøya.

The cabin on the most southerly island of Ryke Yseøyane Photo: NHS


541
507
536
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533
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NORDAUSTLANDET
Kvitøya
Kræmerpynten
Hornodden
Andréeneset
Storøya
Sørodden
ERIK ERIKSENSTRETET
KONG KARLS LAND
Kongsøya
Abeløya
Nordneset
Sørporten
Kapp Altmann
Helgolandøya
Svenskøya
Kapp Hammerfest
SPITSBERGEN
Heleysundet
Ormhodet
BARENTSØYA
OLGASTRETET
EDGEØYA
Tusenøyane
Beisaren
Hopen
Hopen Radio
Kapp Thor
Hovedkart
Havneskisse
80°00'00"
79°00'00"
78°00'00"
77°00'00"
30'
20°
22°
24°
26°
28°
30°
32°
34°

Storøya–Kvitøya–Kong Karls land–Hopen

(Chart nos. 505, 507, 534)
(The information in this chapter is imperfect due to incomplete surveying)

Storøya
(Chart no 507)

Storøya lies about 5 nautical miles east-north-east of Kapp Laura, and is separated from Nordaustlandet by **Storøysundet**. The island, with an area of about 33 km^2, is covered by an icecap, Storøyjøkulen, on the southern part. It has the shape of a shield which arches above the mountain areas of the island and slopes down to the sea. **Storøyjøkulen** is about 245 m high, and a little area of bare land projects at **Sørodden** (80°02.9'N 28°02.9'E). The northern and eastern parts of Storøya consist of ice-free fl t land with gravel and pebbles. There are also many small lakes in this area, and the land usually slopes evenly down to the sea.

On the ness on the west side of Storøya there is a cabin that was built by «The Ymer Expedition» Norwegian Polar Institute in 1980. The cabin functions as a refuge cabin. See list of cabins in Chapter 1.

Along the NW coast, it is reported to be deep to 50 m from land, but shallow and stony in towards the shore. Otherwise there are relatively shallow areas around the island, and vessels should keep 4–5 nautical miles from the coast to be relatively safe.

Kvitøya
(Chart no. 507)

Kvitøya, which was discovered in 1707 and called Giles Land, is Svalbard's most easterly outpost. It lies about 32 nautical miles east of Storøya. The polar explorers Andrée, Frænkel and Strindberg crossed the pack ice to Kvitøya in 1897 after their balloon journey, which started in Virgohamna, had been wrecked on the ice in the Polar Sea. They died on the island, and were found in 1930 by an expedition from the Norwegian Svalbard and Arctic Ocean Exploration. The Swedish State has erected a memorial in the place where the Andrée's expedition was found.

POLARSTARODDEN and NORVARGODDEN, Storøya N, viewed from N Photo: Eiliv Leren

ANDRÉENESET, Kvitøya

Kvitøya has previously been charted as a long island, about 24 km long and 6–8 km wide. More recently, however, interpretation from satellite photographs has shown the island to be considerably larger, so that in the eastern part the breadth has increased to fully 22 km. The area is also estimated to be about 700 km^2. The island is completely covered by glacier except for a small area at the east and west points. The highest point of Kvitøya is approximately in the middle of the island and reaches up to 410 m.

Andréeneset (80°05.0'N 31°26.2'E) is the most westerly point of the island, with an ice-free area which extends about 2 km into the glacier over a length of 4–5 km. There is gravel and sand, as well as a small lake, between the low hill areas. A reddish brown moss provides a thin cover but otherwise the vege-

HORNODDEN, Kvitøya Photo: Eiliv Leren

Photo: Eiliv Leren

tation is unusually poor. There is an automatic MET station at the north end of Andréeneset.

Barely 2 nautical miles southwest of Andreeneset, there is a dangerous rock awash which mariners must be aware of if approaching the shore. There is also a group of small islets and rocks, **Lundquistskjera**, off the southwest point of the island, and these extend about 1.5 nautical miles southwards from the coast.

At **Hornodden** the southeast point of Kvitøya, there is also an ice free area but its size is completely insignifican

New land at KVITØYA, south of Kræmerpynten Photo: Eiliv Leren

KRÆMERPYNTEN, Kvitøya Photo: Eiliv Leren

Kræmepynten, on the E side of the island, lies in 80°13.4'N 33°30.4'E, and is the most easterly point of Svalbard. Near Kræmerpynten, the ice-free area is rather smaller than at Andréeneset, but otherwise the description given for Andréeneset is the same.

Kong Karls Land

(Chart nos. 507, 534)

Kong Karls Land consists of the large islands Svenskøya, Kongsøya and Abeløya, and a number of smaller islands and islets, particularly south of Kongsøya. The group of islands is separated from Nordaustlandet by **Erik Eriksenstretet**, and lies at about 30–55 nautical miles from Nordaustlandet. Svenskøya is the most westerly of the group, and is separated from Barentsøya in the west by the 47 nautical miles wide **Olgastretet**.

It is accepted that the British whaler Thomas Edge was the first to observe the islands in 1617, and he named them Wiches Land. This was forgotten, however, until the Norwegian whaling skippers Erik Eriksen and Elling Carlsen rediscovered the islands within a few days in 1859. The island group has been named after King Carl XV of Norway and Sweden, or Charles I, King of Wurtemberg.

It can also be said that the first over-wintering by Norwegian hunters took place in 1908/09 when 100 polar bears were killed. Today, the area is regarded as being the most important stronghold for polar bears in Svalbard but they are no longer hunted since the total protection for the polar bear was introduced in 1971.

Elevated beach ridges with round basaltic blocks occur in many places on the islands, on the most southerly point of Svenskøya, Kapp Hammerfest, and almost throughout the lower parts of Kongsøya. These terraces are the old shorelines which reach up to a height of about 120 m above present sea level. It may also be mentioned that drift wood and whale bones have been found at up to 100 m height, the oldest dated about 9850 years old.

Svenskøya (Chart nos. 507, 534)

Svenskøya is about 21 km long and about 7.5 km wide. A mountain plateau runs along the centre of the island for the whole of its length. The most southerly part of the plateau is made up of Kükenthalfjellet (190). The mountain plateau tapers off to a narrow ridge, Kjølen, in the middle of the island, before widening evenly again northwards to the highest area, **Dunérfjellet** (251). A small «saddle» leads from this across to **Mohnhøgda** (288) with its fl t top. Both in the south and north there are steep cliffs facing the lowland and the sea.

Kapp Hammerfest is the most southerly point of Svenskøya. The ness stretches southwards as a peninsula about 1 km wide and 3 km long, and the land is relatively low. A good way in

SVENSKØYA viewed from S Photo: Eiliv Leren

on the east side of the ness there is a cabin which was built by Tor Larsen, Norsk Polarinstitutt, and now functions as a refuge cabin. See list of cabins in Chapter 1.

On the inner side of Kapp Hammerfest, there is a formation on the hillside that has been named Kyrkja.

West of Kyrkja is the inlet **Kyrkjevika** which is partly sheltered by a group of islets with Antarcticøya in the centre being the largest.

Barely 2 nautical miles southeast of **Arnesenodden** (78°51.6'N 26°32.0'E) is the most northerly point of Svenskøya, **Kapp Pettersen**, with a cabin erected by the State in 1936. The cabin functions as a refuge cabin. See list of cabins in Chapter 1.

ARNESENODDEN and MOHNHØGDA, Svenskøya, viewed from SW Photo: Eiliv Leren

KAPP WEISSENFELS, Svenskøya, viewed from E Photo: Eiliv Leren

Kapp Weissenfels is the most south-easterly point of the island. It is about 25 m high and consists of a basalt pillar which provides a breeding place for kittiwakes, ivory gulls and guillemot. In the vicinity of the point there are undulating sand dunes and a yellow sandy beach which merges with steep, fl t-topped mountains south-westwards to Kapp Hammerfest. Vessels can anchor at a suitable distance from the shore around the whole of Svenskøya providing ice and weather conditions permit, but there are no well sheltered anchorages for larger vessels.

Smaller vessels can find some shelter in 8–10 m water, sand bottom, in the bay inside **Antarcticøya**, but the anchorage is not recommended in southwesterly winds.

Kongsøya (Chart no. 507)

Kongsøya lies east-north-east of Svenskøya, and is separated from it by the 14 nautical miles wide **Rivalensundet**. Kongsøya is the largest island in Kong Karls Land, and extends about 40 km in an east-west direction. The island can be divided naturally into three parts; a plateau or highland in the western part, a low area in the centre, and high land in the east. When seen at long distance, Kongsøya can therefore appear as several islands. The island with **Retziusfjellet** (320) on the western side as the highest, and **Johnsenberget** (230) dominates the eastern part. All the mountains are of the same formation and have basalt tops over fossil bearing Jurassic rocks. The flo a is very

NORDAUSTPYNTEN, Kongsøya E, viewed from SE Photo: Eiliv Leren

TIRPITZØYA and HELGOLANDØYA with a bit of ANKARTROLLET, viewed from SE Photo: Eiliv Leren

sparse, but the barrenness is broken in some places by plants other than moss. The island is the most important stronghold of polar bears in Svalbard.

There are several broad bays around the coast of Kongsøya, but none provides sheltered anchorage.

However, vessels have anchored on both sides of **Kapp Altmann** on the southwest side of the island, but the holding ground is not particularly good, especially not on the east side of the ness where it is stony.

Vessels wishing to go into these anchorages must keep well clear of the rock awash lying 1.5 nautical miles south of Kapp Altmann. When it is ice-free here there can be heavy breakers in the swell. A shoal about 3 m has also been seen 5 nautical miles southeast of Kapp Altmann.

Breibukta lies between Kapp Altmann and Tømmerneset on the south side of the island. There are several groups of islets and skerries in this bay, and in the area south of the bay. Furthest south, off Breibukta itself, there are **Helgolandøya** (20) and the narrow **Tirpitzøya** (15). Just 2 nautical miles south of Tirpitzøya there are the two **Nubbane**, rocks that are easily visible and usually break although they are easily confused with pack ice.

As in the rest of the eastern waters of Svalbard, information is sparse on the depths around Kongsøya, but the waters give the general impression of being rather foul, especially in the area on the south side of the island. An automatic MET station on has been established on **Tømmerneset**.

TØMMERNESET, Kongsøya, viewed from S Photo: Eiliv Leren

NORDNESET and TEISTPYNTEN, Kongsøya N, viewed from NW Photo: Eiliv Leren

There is a small cabin on **Kapp Koburg**, on the northwest side of the island. It was built by Superintendant Merckoll in 1936 and is used as a service cabin. See list of cabins in Chapter 1.

Abeløya (Chart no. 507)
Abeløya lies in an east-north-easterly direction from Kongsøya, and the two islands are separated by **Lydiannasundet**, about 7 nautical miles wide. Abeløya is the smallest of the three larger islands in the archipelago. It has the shape of a right angle and has a length from south to the east point of about 9 km, while the width is about 2 km. The island is low with the highest point (20) inside **Lernerneset** in the northwest. The coast is cut up by many bays on the south side of Abeløya, and there are numerous islets and skerries in this area.

The waters round the island have been visited little through the years, and therefore knowledge of the depths and possible anchorages, etc, is sparse.

FLATØYA, Abeløya SE, viewed from SSE Photo: Eiliv Leren

HOPEN viewed from S Photo: Eiliv Leren

Hopen

(Chart no 505)

GENERAL DESCRIPTION

Hopen is a solitary Arctic Oceanic island in the Barents Sea. It lies in about the same latitude as the south point of Spitsbergen and 115 nautical miles east from it.

Several names have been mentioned in connection with the discovery of the island but the most likely was by the English whaling skipper Thomas Marmaduke who discovered the island in 1613, and that it was named after his vessel «Hopewell».

The island was first properly charted after the World War II, but it was before the war that the fishery consultant Thor Iversen carried out some charting and also supplied worthwhile additions to the information on the island.

WEATHER, ICE AND STREAM CONDITIONS

The weather conditions on Hopen are most unfavourable, with considerable fog and rain. See also the climatic tables in chapter 1, which illustrate this. During the last war, a German meteorological station was established in Husdalen on Hopen, and this is still maintained by the Norwegian state.

The island is surrounded by ice during the period November/December – June/July, but there can be large variations from year to year as the ice conditions are dependent on the transportation of ice between Svalbard and Franz Josef Land.

The tidal stream, which changes at high and low water, rushes around the island with unusual strength and in some places, especially around the south and north points, it sets up a violent sea which can be dangerous to smaller vessels.

THE LANDSCAPE

Hopen is 33 km long and 1.5–2 km wide. It rises out of the sea from the plateau which extends from Bjørnøya up towards Hopen and thence across to Edgeøya. The island appears as a long and relatively high mountain ridge and it is made up of alternating strata of slate and limestone. The rock has little resistance to frost, and is easily split apart to pebbles and then weathered to gravel and clay. During the course of time, this has been transported downwards, particularly on the east side where there are areas that are lower and fl tter than on the west side.

The island has distinctive mountain summits along the ridge, of which **Iversenfjellet** (371) on the south side of the island is the highest. The mountain slopes are generally very steep and often run right into the sea. Outstanding terraces up to about 100 m can also be seen on Hopen. This applies particularly at a height of 30 m above the sea where there are of old beach lines in which traces of tree stumps and whale bones have been found. Vegetation is very sparse. It is mainly represented by moss and a number of other hardy plants. All together they amount to probably around thirty species. During the period when the island is surrounded by ice, polar bears and arctic foxes often visit it, while the small blue fox is resident. There are also many birds, especially auks, which leave the island at the end of August.

Walrus sculls and skeletal remains are found in several places on the east side, suggesting that the island must have previously had a large walrus population. Today the walrus is seen only sporadically in the sea or on the ice.

There are no rivers or water on the island and all fresh water comes from melted snow or rain water.

Anchorages in Hopen

The island has no sheltered bays that may serve as harbours. It is so shallow inshore along the whole island that at 100–200 m from the shore very little sea is required to set up breakers which make it difficult to land from a boat. On the east side of the island this shoal area extends a kilometre or more out from the shore in some places.

HOPEN METEOROLOGICAL STATION, Hopen Radio, Husdalen Photo: Eiliv Leren

Both sides of the island are today used as anchorages to avoid bad weather or to transship from hunting vessels to mother ships of up to 20,000 tons.

If there is a need to land, a boat channel to the shore may be found in the deepest and calmest water that is without breakers over a longish period of time. Experience has shown that it is best to land on the east side of the island where vessels can proceed carefully to anchor in depth of 10–15 m.

The meteorological station stands on the southeast of the island, in **Husdalen**, about seven kilometres from the south point.

During WWII from 1943 to 1945 the German air force and navy had a meteorological station there. The Meteorological Institute set up a station in 1947 and it has been in service since then.

THE STATION BUILDINGS on Hopen Photo: NHS

THE STATION BUILDING Photo: NHS

LIVING ROOM at the station Photo: NHS

Landing ground at Hopen Photo: NHS

It is staffed by four personnel who are engaged for six monthly periods. Their duties include meteorological observation and maintenance of the station. Hopen is an important landing and bunkering place for helicopters, especially in connection with the rescue services.

The station has 4–6 huskies. They function mainly as guard dogs when polar bears make their visits. They also serve as sledge dogs.

The coastguard transports supplies in the summer, usually once in July and again in September.

Hopen does not have a harbour so everything must be transferred from ship to shore by small boats. Vessels can anchor off the station in 11 m of water about 5 cables from the shore. The station has two red triangles that mark a channel in towards the shore where landing is possible.

Due south of the station, in Husdalen, is the cabin Nilsebu. It was built by August Olofsson and his hunting companions in 1908. Nilsebu was named after the hunter Vilhelm Nilsen who used the cabin in 1908–09. The cabin was partly restored in 1973. See list of cabins in chapter 1.

Leading marks showing the boat channel to the station
Photo: NHS

KOEFOEDHYTTA, Hopen Photo: NHS

Near **Egsetstranda**, about 1.6 km south of the station, is «Camp Skakk/Skinhuset». It was originally for storing bear meat, and built by the station staff in the summer of 1963. See list of cabins in Chapter 1.

A Russian aircraft, a TU-16, crashed above the beach on the slopes of **Werenskioldfjellet** (318) in August 1978. The whole crew of seven perished. The wreckage of the plane is still scattered over the area.

Further south, on **Koefoeodden**, there are two cabins. Sørhytta/Rudihytta are about 5.8 km from the station. They were built by August Olofsson and his companions in the summer of 1908.

The hunter Henry Rudi used these cabins as hunting lodges.

KOEFOEDODDEN viewed from E Photo: Eiliv Leren

BJØRNSTRANDA, vis-à-vis the station, Hopen W Photo: Eiliv Leren

BJØRNEBU with NORDHYTTA/RUSSEHYTTA behind Photo: NHS

«NILUBUA», Hopen Photo: NHS

The most southerly, Koefoedhytta, which lies about 6.1 km from the station, was built by the Meteorological Institute of Norway and the Norwegian Polar Institute in 1992. See list of cabins in Chapter 1. On Koefoedodden there is an astronomic point set on a small, dark pillar, erected and recorded by the Svalbardkontorets/Norwegian Polar Institute expedition of the summer of 1939. Here there is also evidence of Norske Fina's oil exploration drilling in 1971.

On **Bjørnestranda**, vis-à-vis the station on the west side of the island is Johnshytta which was built by steward Johanes Nygård in 1955-56 during his service on the station. The extension was added in 1967. The cabin is in poor condition. See list of cabins in Chapter 1.

In **Russevika**, about 7.5 km north from the station, there are two cabins built by August Olofsson and his hunting companions in 1908. One accommodated wartime shipwrecked Russian sailors from November 1942 until October 1943. The other cabin is Bjørnebu which was built by the station staff in 1971. See list of cabins in Chapter 1.

Norsk Fina laid a small airstrip, «Småhumpen Airport» on the beach near **Småhumpen**, north of Russevika.

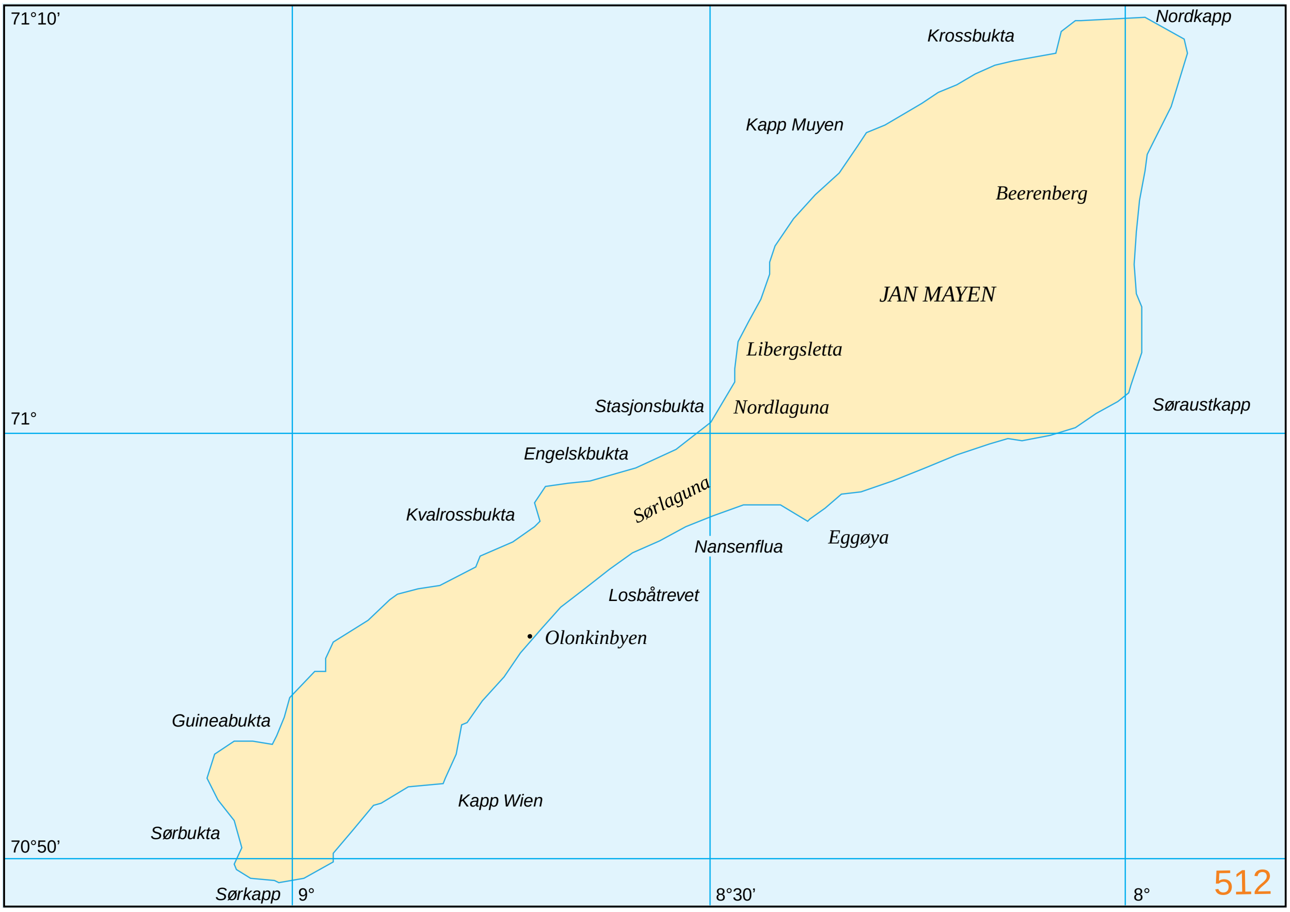
The airport building consisted of a campervan and a barrack room.

«Nilubua» is on **Thorkelsenskaret**, about 11.8 km north-northeast from the station. The barracks arrived in Hopen in 1982 and was used in connection with surveying. In 1986 it was moved to Thorkelsenskaret were it now stands. See list of cabins in Chapter 1.

BEISARHYTTA, Hopen Photo: NHS

Beisarhytta is situated on **Braastadskaret**, about 19.8 km north of the station. It was built by August Hansen and his hunting companions in 1923. The cabin was demolished and rebuilt by Birger Angell-Jakobsen of Norsk Fina in 1973 and named Beisaren after the hunter Berner Jørgensen. See list of cabins in Chapter 1.

HOPEN viewed from N Photo: Eiliv Leren


71°10'
Nordkapp
Krossbukta
Kapp Muyen
Beerenberg
JAN MAYEN
Libergsletta
Stasjonsbukta
Nordlaguna
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71°
Engelskbukta
Sørlaguna
Kvalrossbukta
Nansenflua
Eggøya
Losbåtrevet
Olonkinbyen
Guineabukta
Kapp Wien
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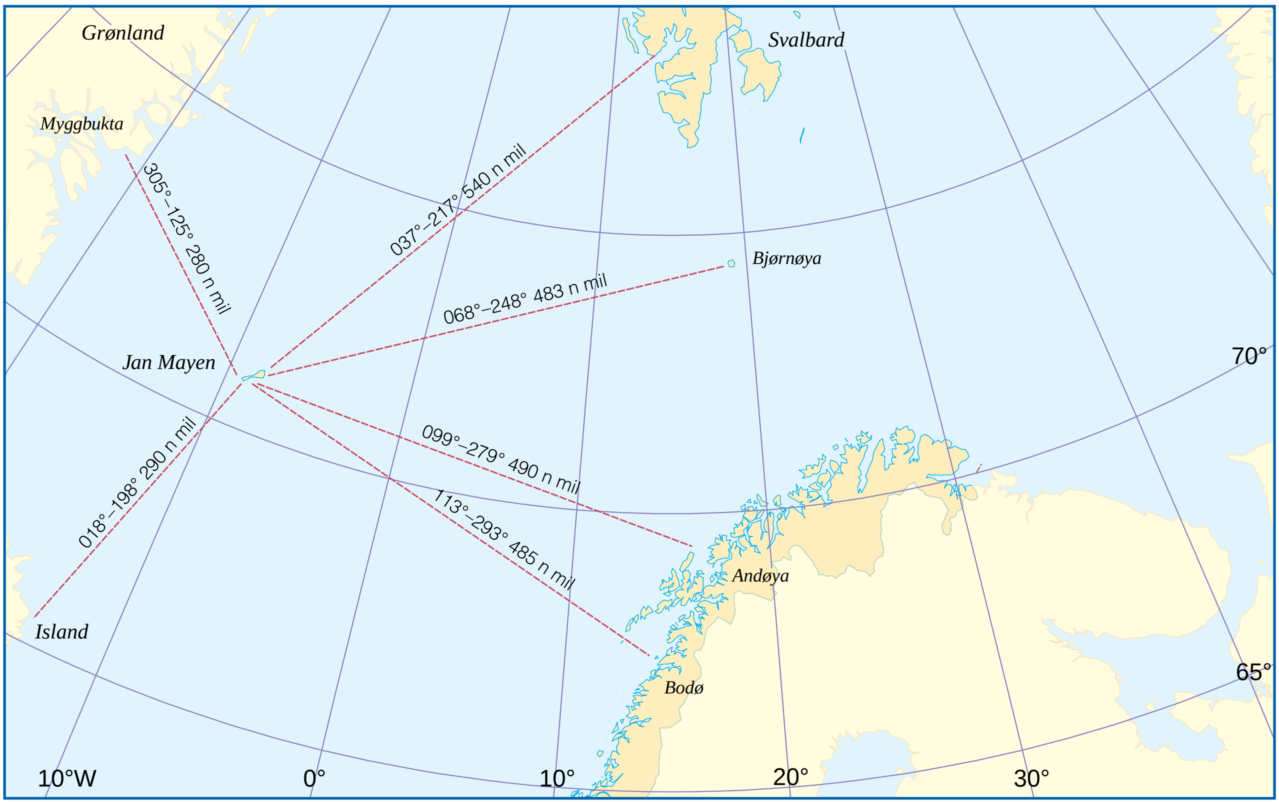
70°50'
Sørkapp
9°
8°30'
8°
512


Grønland
Svalbard
Myggbukta
305°–125° 280 n mil
037°–217° 540 n mil
Bjørnøya
068°–248° 483 n mil
Jan Mayen
70°
099°–279° 490 n mil
018°–198° 290 n mil
113°–293° 485 n mil
Andøya
Island
Bodø
65°
10°W
0°
10°
20°
30°

Jan Mayen

(Chart nos. 303, **512**, 515)

GENERAL DESCRIPTION

Jan Mayen lies isolated on the boundary between the Norwegian and Greenland Seas with its north point at 71°10'N latitude, i.e., about the same latitude as Nordkapp on the Norwegian coast. The island is about 54 km long with a surface area of 379 km^2. The distances in nautical miles to other countries are: Greenland 280, Iceland 290, coast of Møre (Norway) 580, Andenes (Norway) 490, and the mouth of Isfjorden in Svalbard 540.

HISTORY

The earliest known account which could concern Jan Mayen comes from the Irish monk St Brandanus who, a little before the year 600, arrived at a «black and scorched island, where it boomed and banged».

The island was certainly discovered several times in connection with the whaling near Svalbard during the 17th century, and it received several names. Skipper Jan Jacobsz May was there in 1614, and despite several having been there before him, his name became connected with the island. There is evidence which indicates that William Hudson was the first to (again) discover the island in his vessel «Hopewell» but as usual at the time the discovery was kept secret so as not to tempt other whalers there.

During the years to 1642, there was Iively whale and seal hunting near the island, with Kvalrossbukta among the most important centres. After a long quiet period traffic again became busier with the development of Norwegian whale and seal hunting around the middle of the last century.

During the present period, fishing for herring, and later capelin, has been the most important occupation in Jan Mayen waters.

The first scientific expeditions to Jan Mayen lasted only a few days. The most important were by the Swiss naturalist Carl Vogt in 1861 and by professor H Mohn in 1877, with «Den Norske Nordhav ekspedisjonen». On this last expedition, a sketch map of the island was prepared, based on William Scoresby's chart of 1817 of the east coast and also of the waters around the island. An Austro-Hungarian expedition under von Wohlgemuth overwintered in the first «Polar year» 1882–83, and carried out a thorough mapping for the prevailing conditions (1:100,000) and a scientific examination of the island. The expedition's station was placed approximately in the middle of the lowest part of the island, and was later used as a hunting station.

In 1921, Hagbard Ekerold established the first meteorological station on the island in a small cabin near Jamesonbukta. The year after this «Gamlestasjonen» (The Old Station) was taken over by the «Weather Warnings for North Norway». The station was destroyed during the World War II and rebuilt just north of Nordlaguna. A more modern station was erected in 1949 just above, on Libergsletta, before it was final y moved to Olonkinbyen in 1962.

Norwegian Defence Communication had erected a station here for the LORAN and CONSOL navigation systems.

The ruins of the oldest station are now known as «Eldste Metten» (The Oldest Met), while the station on Libergsletta is known as «Gamle Metten» (The Old Met).

During the period 1949–54, Norwegian Polar Research Institute carried out air photography for topographic mapping of the island, and surveying the waters (see topographic maps Nord-Jan and Sør-Jan, scale 1:50 000 and Chart No. 512 at 1:100 000.

PUBLIC ADMINISTRATION

By Royal Decree of 8.5 1929, Jan Mayen came under the kingdom of Norway. Previously Jan Mayen was administered by the District Governor of Svalbard. From 1st January 1995 the administration of Jan Mayen came under the control of the Governor of Nordland. Policing duties are by the police commander in Salten who is represented on the island by the station commander on Olonkinbyen.

The possibilities of visiting Jan Mayen as a tourist are limited. Difficult accessibility and demanding climatic conditions make the island little suited to tourism. There are no regular landing facilities for tourism or other interests.

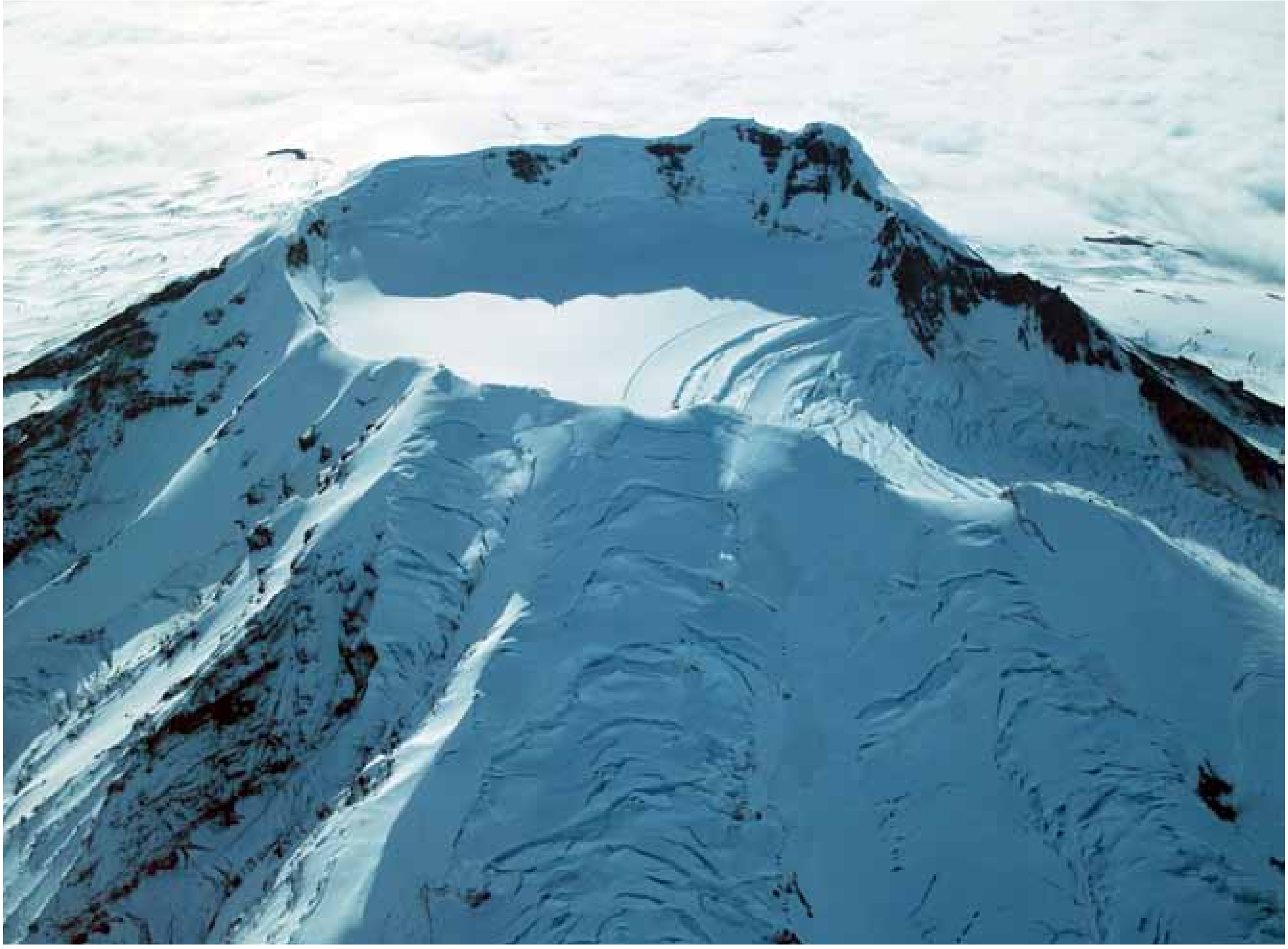
There is no civil airport, natural or manmade harbour or accommodation or service facilities. Fishing vessels and cruise ships pass regularly. Depending on the weather it is possible to reach the island by small boats from larger vessels. Today there is a limit on the number landings from smaller cruise ships and some private boats, mostly in Båtvika and Kvalrossbukta. The number of passengers going ashore is estimated to be about 500 each year.

Foreign nationals wishing to visit Jan Mayen must obtain permission to do so in advance. Visits of duration less than twenty-four hours require consent from the island's station commander. Visits of up to one week require permission from the police commander in Salten. Visits longer than this require permission from the Department of Justice. Regulation of 1st June 1962 on access by foreigners to Jan Mayen.

Source: Protection Plan for Jan Mayen, report 2007-4. Norwegian Directorate for Nature Management.

NATURAL CONDITIONS

Jan Mayen is a volcanic island and assumed to be on the north end of the mid- Atlantic Ridge (MAR). Recent research, however, indicates that Jan Mayen is not part of the MAR, but that the island lies on the break zone between two MAR's. Jan Mayen has a micro climate and the island and the area surrounding it is therefore an isolated part of the continental shelf, separated from the shelf by a substratum of continental crust. The island is orientated SW-NE and has a varying nature from one end to the other.



The summit of BEERENBERG (2277) Photo: Eiliv Leren

The northern part of the island spreads to a width of up to 15 km and is covered by the imposing mountain massif, **Beerenberg**, with a large glacier filled crater on the top. This is surrounded by smaller peaks with **Haakon VII Topp** (2277) as the highest point on the island. The snow-covered summit of the mountain is visible at a range of up to 100 nautical miles, often as a peak showing above the mist or fog belts.

Beerenberg is Norway's only active Volcano, and the last large eruption took place in 1970 from several craters that formed on the northeast side of the mountain. During this eruption, a glacier arm melted and the lava formed about 3 km^2 of new land. A smaller eruption also occurred in 1985.

Apart from the low land round the northeast corner, the coast round the northern part of Jan Mayen largely consists of 100–400 m high cliffs. Three of the glaciers in the east have fronts to the sea, and same applies to the north side. Otherwise the glacier arms stretch down on all sides from the mountain to about the 300 m height contour. The narrow central part of the island diminishes to width of only about 3 km, and this is the lowest part of the island with summits under 300 m. The island can be crossed here without ascending more than 30 m.

On the southern part of the island the mountains rise to a 500–700 m high crater landscape with **Rudolftoppen** (769) as the highest. And the island is about 6 km wide. Furthest south, the mountain massif descends vertically to the sea on the east side, while the landscape slopes evenly down to a comparatively narrow, low plain on west side.

At the north and south ends of the island, the plains consist of crevassed, coke-like lava masses. Characteristic of Jan Mayen are the numerous rocks which stand up from the sea as the remains of old lava streams, in parts with solid rock. Otherwise, there are also many beaches with gravel and sand that exist, particularly in the narrow, central part of the island.

FLORA AND FAUNA

For natural reasons, the flo a of Jan Mayen is poor in variety. In similarity with Svalbard, a type of willow is the only «tree» which grows there. It creeps along the ground and only becomes a few centimetres high. A new specie, Tundravia, was discovered in 2007 and Jan Mayen is only known habitat in Norway. About 70 species of vascular plants are recorded, of which many can be found in the mountains of Norway. Approximately 150 lichens are also on the island. Otherwise, it is the common grey moss which is the most dominant, and which gives the landscape a greenish appearance. The moss covers the old lava summits and here coke rubble lies just below the carpet of moss.

Even though the rainwater quickly soaks through the porous surface, the vegetation still gets sufficient moisture from the frequent fog which lies over the island.

The arctic fox is the only mammal which is native to Jan Mayen. Previously, the blue fox comprised 90 % and the white fox 10 % of the stock, but trapping disturbed the status; being now about half of each kind. In the hunting season 1906–07, for example, 200–300 foxes were trapped. Since small rodents do not exist on Jan Mayen the fox is known as a «coastal fox», as to a large degree it lives on sea birds. The mountain fox on Jan Mayen has been protected for many years but this came too late and it is considered that the stock is not enough for the island at present.

The polar bear occurs only as a temporary visitor on Jan

Mayen during the periods in winter when the pack ice from the Greenland Sea pushes up to the island but in spring time it is no longer possible. Seabirds nest on the steep cliffs out on the coast, and recent records (2010) show that the bird population compares with that of Bjørnøya but the nesting cliffs are less spectacular. The fulmar is the most abundant species. It is accepted that there are bout thirty species of nesting birds, while about 100 visiting species have been recorded.

There appears to be a small stock of ringed seal and bearded seal near the island but they are not hunted in an organised way.

In the waters round Jan Mayen, the Greenland seal and hooded seal arrive with the pack ice, particularly from Vesterisen and Denmark Strait, where there were formerly large numbers killed, but where now the hunting is as good as ended.

There has not previously been any regular fishing for herring and cod in the waters around Jan Mayen. The occurrences are too irregular that commercial fishing is no longer of interest. This is in contrast with the waters closer to Iceland. Fishing for capelin, however, has increased considerably since a use has been found for this variety.

*With the exception of the glacier Rivers on Beerenberg, most of the water and lakes formed on the island during the summer snow-melting dry up. This also applies to **Sørlaguna**, the largest of the «Lakes». None of these fresh water systems have been scientifically researched. The only large permanent lake on the island is **Nordlaguna** (1.5 km^2 and about 40 m deep). The lake is separated from the sea by a sandbank which is several metres high and 150–200 m wide, surrounded by steep cliffs and containing brackish water. The sandbank «Bommen» has become narrower in the last few years and the sea washed over during the winter storms of 2001–02.*

Røyebestanden in Nordlaguna has probably been isolated from the sea between 1500–4000 years and it is reasonable to assume that nature has developed special adaptations, although this has not been investigated. Neither has meticulous research of the complete ecosystem in Nordlaguna been carried out, so the possibility of finding endemic species cannot be ruled out.

Source: Protection Plan for Jan Mayen, report 2007-4, Norwegian Directorate for Nature Management

WEATHER CONDITIONS

As indicated by the position of the island, Jan Mayen has a pronounced polar-maritime climate. The mean temperature of the warmest month (August) is not higher than about 5 °C. The winter, on the other hand, is relatively mild, with the coldest months (February–March) having a mean temperature of about -6 °C. Therefore the mean annual temperature change is rather small. In this respect the ocean – the great heat store – plays an important part, having a moderating effect on the annual range of the temperature. The highest observed temperature since WWII is 18.1 °C, the lowest -28.4 °C. (See also climatic data in Table 1 in Chapter 1).

Another important factor determining the weather conditions is the fact that the island is situated in an area which is strongly affected by low pressure passages. In winter particularly the low pressures may be very intense bringing mild air from the south, and are additionally associated with precipitation and strong winds. In January close to 25 % of all wind observations exceed 6 Beaufort (i.e. Strong breeze).

In July the corresponding frequency is about 1 %. The towering volcano Beerenberg may often create unpredictable wind conditions. The wind may come in violent gusts, which is especially dangerous for smaller boats in exposed coastal waters.

The mean annual amount of precipitation is about 700 mm. As is usual in these regions, the autumn months get the largest amounts. The frequency of fog (visibility below 1 km) is high, particularly during the summer season. In July fog is reported in nearly 20 % of all weather observations, while the frequency in January is about 4 %. The sun is continuously above the horizon from 14th May to 30th July, and continuously below the horizon from 20th November to 21st January.

CURRENT CONDITIONS

Jan Mayen lies in the boundary waters between the East Greenland Current and an eddy from the North Atlantic Current, both of them running in the same direction here, and causing a south-westerly main current. (See Fig 17, chapter I).

The tidal range varies between 50 cm and 120 cm, and causes a north going current with rising and a south going current with falling water.

With the addition of the variable depth conditions, irregular current conditions are thereby produced round the island. Accurate observations have not been made, but from experience it can be said in general that there is a south-westerly fl w of 0.5–1.0 knots, sometimes rising to 1.5 knots. At spring tides, the fl w can become north going inshore along the northwest coast. Irregular fl ws (eddies) can occur because of the bottom conditions, particularly on **Straumflaket** south of the island and round **Sørkapp**.

SEA TEMPERATURE

The temperature of the water layers is very variable because of current conditions with the consequent variations in the pack ice limits. Ice and weather conditions show great variations during the course of the year and over shorter periods.

Sub-zero temperatures have been observed down to about 50 m below the sea surface on the Jan Mayen Bank. On the other hand, 4–8 plus degrees have been measured down to about 25 m, with zero degrees occurring first t 300–400 m depth.

The waters around Jan Mayen

(Chart no. 512)

By keeping a distance of 1 nautical mile from the coast vessels can sail safely outside the 20 m contour around the whole of Jan Mayen. The exception, however, is the area near Sørkapp and Losbåten, where vessels should be kept 1.5 nautical miles from the coast.

In the north, the great depths run right up to the island from Søraustkapp to Nordvestkapp. **Lundquistflaket** stretches out north-westwards about 15 nautical miles from the centre part of the island towards **Marøbanken** with 133 m in the shallowest part.

A shoal ridge, **Stimen**, stretches out westwards from the south end of the island from about 2 nautical miles off land and 8 nautical miles south-south-westwards. There is a series of shoal heads here, with 123 m at the shallowest. Between this ridge and land, **Hoybergrenna** has increasing depths from about 350 m to 700 m to southwards, and here also there are peaks which reach 100–200 m above the surrounding seabed.

From Sør-Jan, **Jan Mayenbanken** stretches southwards out to sea with increasing depths. The depth is then about 500 m at a distance of about 40 nautical miles south of the island. The most northerly part of Jan Mayenbanken, **Straumflaket**, stretches from about 4 nautical miles south of Sør-Jan and thence 10 nautical miles southwards. The shallowest part of the bank is **Bouwensonbåene**, 6 m, which lies 9 nautical miles south-southeast of Sørkapp. There are also other shoals on this bank which reach up to depths of 11–12 m.

Sarsbanken extends about 20 nautical miles eastwards from

SØRKAPP viewed from S Photo: Eiliv Leren

Jan Mayen, with depths of 250–300 m. The bottom then falls away to great depths on the north side of Sarsbanken.

The southeast coast (Chart no 512)
Along the 6 nautical miles between Sørvestkapp and Kapp Wien there is a continuous undulating cliff about 150–300 m descending vertically to the sea or to a fairly narrow beach line. Small landslips often occur along this coast.

The westerly headland of **Sørvestkapp** (214) ends in a sharp «beak» as a kind of portal over a conspicuous hole, about 20 m high, that goes right through the rock. **Sjuskjera**, the largest of which is **Merganserskjeret**, extend about 0.5 nautical miles westwards from Sørvestkapp. The rock is 2 cables from the shore, is 27 m high and inaccessible, with a goose-like profil . A couple of the other rocks are about 3 m high and are almost like large stones in appearance, while the others are rocks awash.

«Jørns Hule» is a cabin that stands by **Sørbukta**. It was erected in 2006 and is equipped with food, water, fuel and sleeping bags. See list of cabins in Chapter 1.

The sound between «Portalen» and Merganserskjeret can be passed in a depth of 7 m by steering closest to the rock. By keeping the trapezium shaped *Hoyberg* (68) *near the west end of Sørbukta touching Merganserskjeret* vessels go clear of the rocks awash further eastwards.

Further eastwards on the south side of **Sørkapp** (70º49.6'N 08°59.1'W) it is un-navigable up to 3 cables from shore. Due south of ness the 20 m contour extends from the shore about 1 nautical mile, with 13 m outermost towards the edge. There is also a 10 m shoal 1.2 nautical miles south of Sørkapp, 2–3 cables outside the 20 m contour.

Below Sørkapp itself there is a low point and a small rock that is the most southerly point of Jan Mayen (70º49'N).

FYRTÅRRNET with KAPP WIEN viewed from S Photo: Eiliv Leren

The station area in OLONKINBYEN Photo: Eiliv Leren

From Sørkapp the coast continues 1 nautical mile east-north-east-wards towards Hjelmen (341) with the easily recognised points and skerries, **Kjeglene**, lying off. Further north-east-wards there is Fugleodden which forms the westerly limit of **Hornbækbukta**. To east, the bay is bounded by **Kapp Wien** and is about 2.2 nautical miles wide. Vessels find good shelter in Hornbækbukta against winds from the north-westerly quarter, anchoring in 10–20 m depth, but the northern part of the bay has uneven bottom, with shallower, sharp peaks.

Furthest east into the bay, about 0.5 nautical miles south of Kapp Wien, there is **Fyrtårnet**. It is a 47 m high rock, narrower at the base than higher up, and is quite the most remarkable natural sailing mark on the coast. The conical **Flykollen** (419) on the inner side of Kapp Wien is also easy to recognise where it runs in an even curve down to the cape itself, which in turn is comparatively low and outermost divided.

There is a stretch of about 3 nautical miles from Kapp Wien to Kapp Traill in the northeast. It is very foul to about 0.75 nautical miles from the shore in **Brotvika**, just on the northeast side of Kapp Wien. There is also a couple of high, basalt rocks out in the sea. **Schiertzegga** (378) lies just west of Kapp Traill with a stair-shaped and splintered profile towards the northeast, and with a «hat» on the highest point. As a rule, the lowest ledge will be visible beneath the fog and is easily recognisable by a point which is separated from the rest of the shore by a deep hollow.

Rekvedbukta extends northeast and eastwards in a curve from Kapp Traill to Eggøya (217). The bay is about 8 nautical miles long, and along the first 1.5 nautical miles north-eastwards from Kapp Traill, the coast consists of a low, heavily splintered cliff edge. In the middle of this stretch, however, **Båtvika** is a comparatively good boat harbour with a sandy beach on the north side, which provides room for hauling up boats. Båtvika is the first place where it is possible to land when sailing along this stretch northwards from Sørkapp, and the bay serves as the nearest harbour to Olonkinbyen.

Olonkinbyen is the only inhabited place on Jan Mayen and «the town» serves as a base for the staff and the operation of the communal infrastructure and services and for the LORAN station. The meteorological Institute established its first station on Jan Mayen in 1921–22 and occupied the island (1922 and 1926) on behalf of the State.

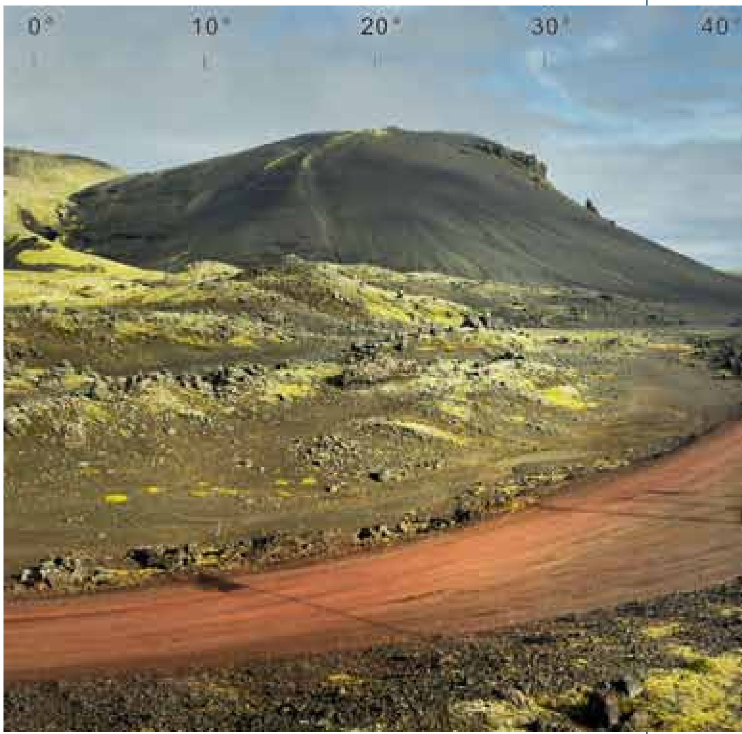
OLONKINBYEN Photo: NHS

The outdoors swimming pool PLAYA DEL ALGE
Photo: NHS

After the Second World War the station was moved to the northwest side of the island and 1962 it was then moved to its present position on the southeast side where the Ministry of Defence established its LORAN station. This little community has the name «Olonkinbyen».

The coast radio station is operated by satellite from Bodø.

Currently the Ministry of Fisheries and Coast Affairs (FKD) has overall responsibility for the operation of the LORAN system, the communal infrastructure and services on the island. The Ministry of Defence operates it on behalf of the State and has presently a staff of 40 personnel on the island. In addition



The airstrip «JAN MAYENSFIELD» viewed from SW

to operating the LORAN station and communal infrastructure it also supervises the reference stations for the satellite navigation systems EGNOS and Galileo (from 2011).

The meteorological observation service has a staff of four who have responsibility radio probe releases and synoptic weather observations. The meteorological station is located three kilomtres from Olonkinbyen, near the airstrip.

From Olonkinbyen and north-westwards towards Rekvedbukta, with the Met station and the airstrip Photo: Eiliv Leren

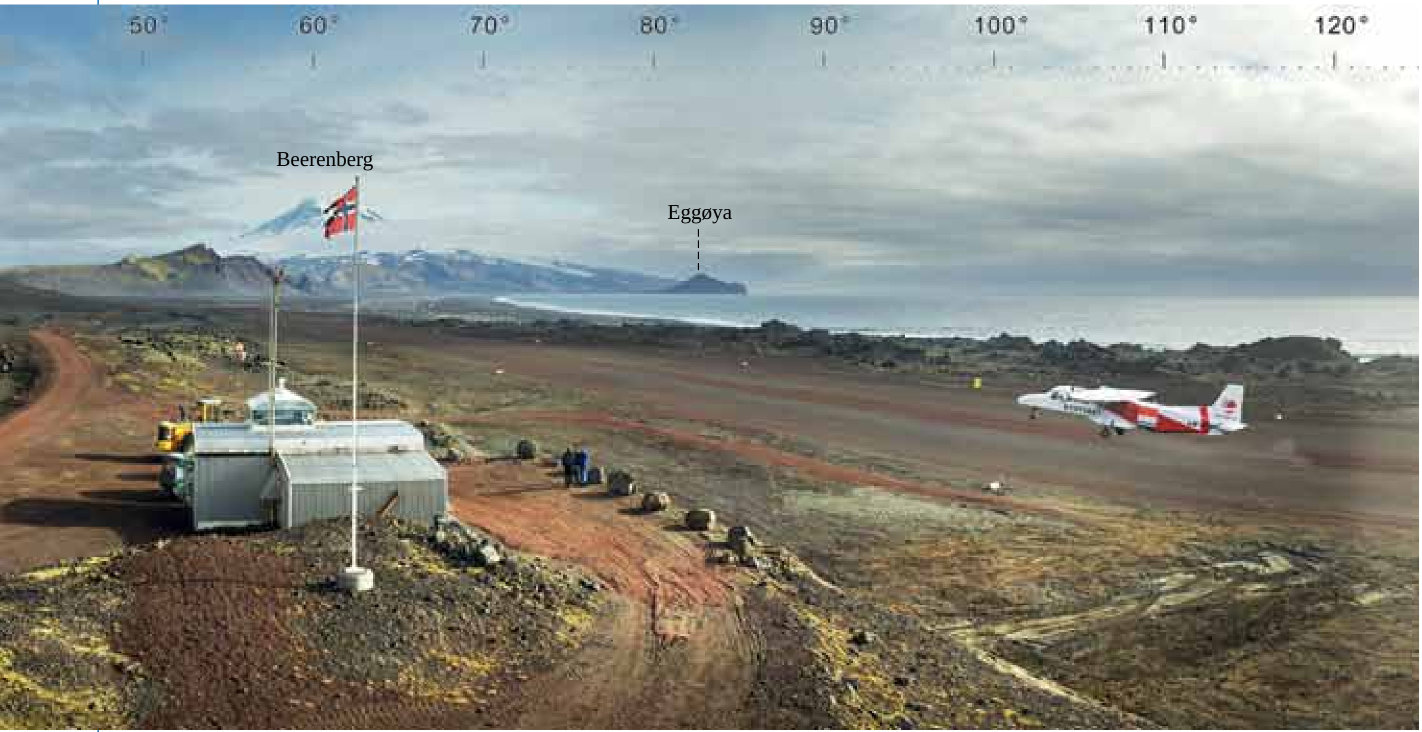


Photo: Eiliv Leren

All transport on the island is by car. All supplies are delivered eight times each year by the Ministry of Defence's Hercules aircraft. Fuel and heavier goods are delivered by boat during the summer months.

From Olonkinbyen there is a road across to Kvalrossbukta which lies on the other side of the island. During easterly wind conditions landing in **Båtvika** will be very difficult, and in such circumstances Kvalrossbukta is an excellent harbour. In the beach area north-eastwards along **Rekvedbukta** masts have been erected for radio and navigation systems, including a Met station furthest south. Just east of the met station there is an airstrip and due south from it, at the north end of **Helenesanden** there are two cabins. «Helenehytta», an old maintained hunting cabin and «Nikkebu», which was built as a copy of the firs named. See list of cabins in Chapter 1.

The whole coast line along Rekvedbukta consists of a low beach plain. This is the site of Jan Mayen's airstrip, a 1585 m long gravel runway which is mainly used by the Ministry of Defence's Hercules C-130 and the Coast Guard's Dornier. The airstrip was laid in 1960.

HELENEHYTTA and NIKKEBU, Helenesanden
Photo: Susan Barr

The large **Sørlaguna** is within the beach area and in the spring it can extend to a length of 8.5 km with a depth of 1–2 feet. Through the summer it more or less dries out and in dry years it covers only a comparatively small area in the south. In approximately the centre of the lagoon on its north side, is the great basalt rock, **Søyla** (114) which is a conspicuous landmark.

Losbåten (70°55.7'N 08°39.5'E) is a small islet lying south of the radio station and about 7 cables from land. From the islet, **Losbåtrevet**, a shoal about 3 m deep extends 6 cables east-south-eastwards. (The name Losbåten (pilot boat) comes from the period when the islet was a 19 m high, inaccessible rock similar to Fyrtåmet. On the old charts from the whaling period, both these rocks had the legend «A rock (or cliff) like a sail». Losbåten toppled over during a storm on 1 February 1950). On the inner side of Losbåten, there is clear water with about 15 m depth a little closer to the islet than to the shore.

The dangerous 2 m shoal, **Nansenflua**, lies in the northern part of Rekvedbukta, a good 1 nautical mile from land and 1.7 nautical miles west-south-west of Eggøya with *the two points on the island in line*. Nansenflua is an underwater rock with a small top surface and vertical sides about 20 m. (Nansenflua was named after the inspection vessel, «Fridtjof Nansen», which sank in 1940 after striking this previously unknown shoal).

Rekvedbukta is otherwise clear with an evenly rising seabed except for a 13 m shoal about 1 nautical mile northeast of Losbåten. When vessels avoid the shoals described, they can anchor throughout the bay in westerly to northerly weather. With such weather conditions fog usually rolls across the low, central part of the island. With westerly winds, vessels anchor best in **Bjørnegat** between Losbåten and Båtvika, while with northerly winds the best shelter is right in the east of **Eggøybukta**. Smaller vessels can lie here with the wind due northeast if they go far into the bay. Particularly in strong winds, large clouds of sand swirl up from the plain and are driven outwards.

EGGØYA viewed from SE Photo: Eiliv Leren

Eggøya (217) is the remains of an old crater, and is really a peninsula. The outer part is so cut away by the sea that it forms a bay between two steep points. A small islet on the south side, **Eggøykalven**, is also eroded by the sea. Old photographs show a quite high islet. The inner side of Eggøya forms an even slope down towards the plain which consists of a sand layer which probably covers the remains of old ice. When crossing to the plain, there is the experience of treading through the top of the sand layer, while on the upper part of the peninsula hot steam can rise from fissu es.

From Eggøya the coast runs a further 8 nautical miles east-north-eastwards to Søraustkapp, and this stretch is fairly straight. The large sandy plain behind Eggøya opens on to the 1 nautical mile wide **Jamesonbukta**.

KAPP WOHLGEMUTH viewed from SW Photo: Eiliv Leren

KJERULFBREEN Photo: Eiliv Leren

Eastwards from Jamesonbukta there is a 1 nautical mile wide belt with lava rocks, and **Turnbukta** cuts in a little way in the northern part of this. Some projecting points, together with a couple of skerries, provide a considerable lee against swell and the bay is therefore well suited for hauling up boats.

Vessels can anchor in depths of 15–20 m, shell sand, off **Ullringsanden**. There is a small cabin «Ulla» that was built in 1992, by the lagoon. See list of cabins in Chapter 1.

Further east-north-eastwards from the lava belt there is a new sand plain, Ullringsanden, with a lagoon beneath a red crater wall, **Kreklinghaugen** (61). The sandy plain then stretches to Kapp Håp as a rather narrow strip along the foot of the mountain.

Presidentsteinen is a 12 m high, easily identified islet just off the shore, barely 1 nautical mile west-south-west of Kapp Håp.

There is a 10 m shoal, **Gouwenaerbåen**, about 9 cables from land off Jamesonbukta, but otherwise the waters between Eggøya and Søraustkapp are clear with even shoaling towards the shore.

The East coast (Chart no. 512)

Along a stretch of about 3 nautical miles round Søraustkapp, the mountain sides plunge down into the sea from heights between 200–300 m and Søraustkapp itself appears as a beak in the cliff edge at about the middle of this area. The coast then continues just about as steeply northwards to **Austbukta**. Several glacier arms push down on this stretch, and two of the fronts are in the sea. The northern front is really two parallel glaciers, **Prins Haralds Bre** and **Frielebreen**, which join at the lower end.

On the stretch from the above mentioned glacier fronts and further northwards to **Austkapp**, the coastline is new as a result of the lava masses which burst out during the volcanic eruption of 1970. About 3 km^2 of new land was formed on this occasion, and because of the influence of the sea and the steep sea bed, it cannot be assured that the shore has settled. North of this «new land», there is a low cliff edge between Austkapp and Nordkapp which rises up to a height of about 70 m midway between the capes. The coast here forms the end of the Beerenberg ridge to northeast and has several craters. The two largest are the most conspicuous with **Sarskrateret** (264), and the outermost cliff, **Hohenloherkrateret** (121).

Nowhere off the east coast does the 20 m contour reach further out than 5 cables.

Austbukta and **Clandeboyebukta** were previously the only places around the island where vessels could shelter well in south-westerly weather. Volcanic eruptions may, however, have changed the seabed conditions – which before were steep – outside the danger line. Strong katabatic winds can occur off the coast here.

The North coast (Chart no. 512)

Nordkapp (71°09.6'N 07°58.01'W) lies in almost exactly the same latitude as Nordkapp on the Norwegian coast. From Nordkapp, the fl t Koksletta extends with a width of 600–1200 m across to Krossbukta about 2.5 nautical miles further west. As the name implies, the surface of Koksletta is made up of coke-like lava.

With southerly winds **Nordbukta**, just west of Nordkapp provides good anchorage for smaller vessels, but the bottom falls steeply outside the danger line.

Krossbukta is a larger and better harbour for southerly and easterly wind directions and has an excellent sandy beach. The bottom here rises evenly up from 50 m in towards land. Vessels can anchor in depths of 15–17 m, sand bottom.

The coast further 7 nautical miles south-westwards towards **Kapp Muyen** (107) is little suited for landing, particularly in the northern part where the mountain seems to fall almost vertically from a height of about 400 m. Three glacier arms emerge with fronts in the sea on this stretch, with the massive **Weyprechtbreen** as the largest.

POLHEIM Photo: Susan Barr

«ANDERSENHYTTA», Jan Mayen oldest cabin with the copy «SUSABU» Photo: Susan Barr

The West coast (Chart no. 512)
S-wards from Kapp Muyen, a coastal plain gradually widens out, with some steep cliffs to the sea in between, before joining Libergsletta. The coastal waters in this stretch are clear with the exception of a 10 m shoal 3 cables from the shore just south of Kapp Muyen, a rock awash I cable off Fugleberget near Nordlaguna, and a 5 m shoal 1.5 cables off the shore north of Danielsenkrateret.

In **Vestbukta** is the cabin Polhein, built in 1940 and restored in 2009. See list of cabins in Chapter 1.

Fugleberget forms the separation between **Stasjonsbukta** and **Maria Muschbukta** both of which are excellent anchorages when the weather permits.

«*GAMLE METTEN*» Photo: Susan Barr

NORDLAGUNA viewed from NE Photo: Eiliv Leren

On **Libergsletta** there are the buildings of the former radio station («Gamle Metten»). The station was built in 1948–49 and was used by the Meteorological Institute and Jan Mayen Radio up to 1962. Just down from «Gamle Metten» is «Susabu» which was built in 2008 and is a replica of the Dobbel Anders hunting cabin built in 1908. See list of cabins in Chapter 1.

South of Libergsletta there is **Nordlaguna** 1.5 km^2 in area and 40 m deep. It is separated from the sea by a low 150–200 m wide beach bank. Nordlaguna is the only lake with permanent water all year and has a population of char, which have, presumably, been isolated from the sea for 1500–4000 years. The water is very brackish.

KVALROSSBUKTA viewed from SSE Photo: Eiliv Leren

The southwest coast (Chart no. 512)

Brielletårnet with its height of 91 m is the same formation type as Fyrtårnet on the southeast coast. The tower is linked to the land by **Kvalrossen** (157) and together they form the most conspicuous landmark on the west side of the island.

Kvalrossbukta is on the south side of Kvalrossen and in favourable weather it is the best harbour along the whole of the coast. There is a road between Kvalrossbukta and Olonkinbyen with Båtvika so there is a safe route during all wind directions (In the 1600's the whale hunters had their main station with defence works in Kvalrossbukta). In Kvalrossbukta there is a cabin called «Puppebu» that was built in 1997 and Hvalrosshytta which is unusable. See list of cabins in Chapter 1.

The bays further south-westwards were also used by the whale hunters but with the exception of the most northerly, **Tømmerbukta**, and the most southerly, Guineabukta, they are particularly not suitable harbours. In many places landing is impossible owing to an almost continuous cliff edge which in the north forms the distinctive grey and wide **Lavastraumen**. It comes down from the mountains in the interior of Sør Jan and ends in the sea at **Kapp Rudsen** (70°56.2'N 08°53.5'W). To the south of Tømmerbukta is «Olsbu», built in 1933 and restored in 2004. The cabin has a bed and a woodburning stove. See list of cabins in Chapter 1.

HVALROSSHYTTA, unusable (2010) Photo: Susan Barr

OLSBU, hunting cabin Photo: Susan Barr

«*CAMP MARGARETH*» Photo: Susan Barr

The waters south-westwards from Kapp Rudsen are relatively foul with many rocks close to the shore and with shoals out to 1.5 cables from the coast. The coast on this stretch is much dissected by small inlets and in their time used by the whalers for hauling up their vessels for repairs. Names such as **Hoepstockbukta**, **Sjuhollendarbukta** and **Titeltbukta** are well known from history. On the first named there is the cabin «Vera» which was erected in 2004 as a replacement for the old one which was damaged by landslip. The cabin has eight beds, gas jets and an outside toilet. See list of cabins in Chapter 1.

Between the latter two bays **Fuglesøya** (14) is a good sea mark, about 1 cable from the shore. In Titeltbukta there is «Camp Margareth», a cabin that was built in1929 and restored in 2007. The cabin has beds and a wood-burning stove, See list of cabins in Chapter 1.

Vessels can anchor in 10–12 m of water in **Guineabukta**, which is a usable harbour in the right wind direction. «Guineahuken», a cabin in the bay, is a shelter of matting under a timber construction.

Between Guineabukta and **Sørbukta** there is Kraterfl a with Richterkrateret (108), Hoyberg (68) and Arnethkrateret (111). The plain between the latter two and Sørbukta has a coke-covered surface, with «upright figures» in some places. Sørbukta is a very much used harbour which gives excellent shelter from winds between north-north-east and east, where vessels can anchor in depths of 15–17 m, on sand.

Distance tables

Distance tables shows distances in nautical mil (1 n mil = 1,852 m)

	Mouth of Isfjorden	Bjørn-øya	Jan Mayen	Kapp Farvell	Andøya	Bodø	Torsvåg	Hammer-fest
Mouth of Isfjorden	-	238	540	1 600	520	670	480	460
Bjørnøya	238	-	556	1 656	290	440	230	220
Jan Mayen	540	483	-	1 100	490	485	540	630
Kapp Farvell (Grønland)	1 600	1 656	1 100	-	1 560	1 530	1 674	1 753
Myggbukta (Grønland)	570	675	280	1 050	750	780	864	1 063
Murmansk	658	420	810	2076	443	563	356	250
Kirkenes	808	370	760	2026	322	535	329	227
Hammerfest	460	210	638	1798	193	313	106	-
Torsvåg	480	230	600	1745	114	236	-	106
Tromsø	535	310	570	1714	72	194	42	341
Andøya	520	290	483	1660	-	155	114	193
Bodø	670	523	485	1620	138	-	236	313
Harstad	576	355	555	1598	38	117	123	422
Trondheim	1 000	779	665	1570	439	300	535	834
Ålesund	1 088	867	620	1475	527	388	623	700
Bergen	1 249	1 028	720	1520	683	544	779	856
Stavanger	1 439	1 169	780	1 560	786	647	882	959
Oslo	1 624	1 403	1 088	1 764	1 057	918	1 153	1 230
Tyne	1 607	1 386	990	1 497				
Hull	1 692	1 471	1 100	1 615				
Hamburg	1 732	1 511	1 103	1 789				
St. Johns (New Foundland)	2 250	2 435	1 890	812				

Bjørnøya[1]	Bjørnøya[1]															
Sørkapp	123	Sørkapp														
Hornsund	180	57	Hornsund													
Sveagruva	248	125	104	Sveagruva												
Mouth of Isfjorden	238	115	90	70	Mouth of Isfjorden											
Longyarbyen	268	145	115	100	30	Longyarbyen										
Ny-Ålesund	308	185	150	150	90	120	Ny-Ålesund									
Norskøysundet	350	227	202	192	133	163	67	Norskøysundet								
Verlegenhuken	401	264	264	243	184	214	118	51	Verlegenhuken							
Sjuøyane	458	307	310	300	241	271	175	108	60	Sjuøyane						
Storøya[2]	355	290	305	415	405	435	475	192	138	82	Storøya					
Kvitøya[2]	370	313	325	438	428	458	498	218	170	118	35	Kvitøya				
Heleysundet[2]	265	150	207	275	265	295	335	305	250	193	117	138	Heleysundet			
Freemannsundet[2]	215	120	165	245	235	265	305	312	268	212	130	150	25	Freemannsundet		
Kongsøya[2]	285	235	292	360	350	380	408	262	210	150	84	75	84	75	Kongsøya	
Hopen	145	116	165	241	231	261	301	343	240	283	145	220	134	120	134	Hopen

1 Herwighamna
2 S om Spitsbergen

The distance Mouth of Isfjorden – Kapp Ziehen (E of Barentsøya)= 285 n mil N/S of Spitsbergen

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