Norwegian State Pollution Monitoring Programme
Long-term monitoring of environmental quality in Norwegian coastal waters

Report: 861/02
TA-number: 1918/2002
ISBN-number: 82-577-4259-7

Client: Norwegian Pollution Control Authority (SFT)
Executor: Norwegian Institute for Water Research (NIVA)

Contaminant data for sediments 1986-1997

Report 861/02

NIVA report no. 4599-2002

Norwegian Institute for Water Research

REPORT

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Title	Serial No.	Date
Joint Assessment and Monitoring Programme (JAMP). Contaminant data for sediments 1986-1997 (Norwegian State Pollution Monitoring Programme Report no. 861/02. TA-no. 1918/2002)	4599-2002	25.12.2002
	Report No. Sub-No. O-80106	Pages 230 Price
Author(s) Norman W. Green Gunnar Severinsen Åse Kristine Rogne	Topic group Marine ecology	Distribution
	Geographical area Oslofjord to Varangerfjord	Printed NIVA

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This report is a compilation of data on contaminant concentrations in sediment used in the Norwegian contribution to the Joint Assessment and Monitoring Programme (JAMP) and concerns mainly selected metals, organochlorines, polycyclic aromatic hydrocarbons that were collected during the period 1986-1997

4 keywords, Norwegian	4 keywords, English
1. Miljøgifter	1. Contaminants
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4. Norge	4. Norway

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Norman W. Green	*Kristoffer Næs*	*Jens Skei*
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CONTAMINANTS

Norwegian Institute for Water Research

O-80106

JOINT ASSESSMENT AND MONITORING PROGRAMME (JAMP)
CONTAMINANT DATA FOR SEDIMENTS 1986-1997

Oslo, 25 December 2002

Project co-ordinater: Norman W. Green

Foreword

This report presents the Norwegian data for contaminants in sediment 1986-1997 compiled for the Joint Assessment and Monitoring Programme (JAMP). JAMP is administered by the Oslo and Paris Commissions (OSPAR) and their Environmental Assessment and Monitoring Committee (ASMO). JAMP receives guidance from the International Council for the Exploration of the Sea (ICES).

The Norwegian JMP was carried out by the Norwegian Institute for Water Research (NIVA) by contract from the Norwegian Pollution Control Authority (SFT, NIVA contract 80106). Institute for Marine Research (IMR), Norwegian Institute for Air Research (NILU) and FORCE Institutes (Denmark) have also contributed.

The Norwegian contribution to the JAMP was initiated by SFT in 1981 as part of the national monitoring programme. Three main areas have been investigated: the Oslofjord and adjacent areas (Hvaler-Singlefjord area and Langesundsfjord, 1981-), Sørfjord/Hardangerfjord (1983-84, 1987-) and Orkdalsfjord area (1984-89, 1991-93, 1995-96).

The report is one of four in a series of data reports:

1. *Contaminant data for sediments 1986-1997*
   SFT report no.861/02, NIVA report no. 4599-2002
2. *Contaminant data for shellfish 1998-2001,*
   SFT report no.862/02, NIVA report no. 4600-2002
3. *Contaminant data for fish 1998-2001*
   SFT report no. 863/02, NIVA report no. 4601-2002
4. *Summary statistics for contaminants in shellfish and fish 1981-2001*
   SFT report no. 864/02, NIVA report no. 4602-2002

Because of their similarity, appendices A, B, C (biota only), D (biota only) and E concerning abbreviations, analyses, station positions and maps are the same for all four reports.

Thanks are due to my colleagues at NIVA, IMR, NILU and FORCE institutes for helping to compile this data. These have been credited earlier in JAMP data reports and the annual JAMP National Comments.

Oslo, 25 December 2002

Project co-ordinator *Norman W. Green*

Contents

1. Background and aims

The Oslo and Paris commissions were established in the seventies with the aim to protect the marine environment against anthropogenic contamination. The Oslo commission focuses on problems relating to dumping at sea in the Northeast Atlantic and Baltic areas. The Paris commission focuses on discharges from land based sources. Together, the commission (Oslo and Paris Commission - OSPAR), govern the "Joint Assessment and Monitoring Programme" (JAMP). JAMP commenced in 1995 as a continuation of the "Joint Monitoring Programme" (JMP). It receives guidance from the "International Council for the Exploration of the Sea" (ICES). Norway and other European countries, which are members of OSPAR have committed themselves to protection of the marine environment of the North East Atlantic for preventing and elimination pollution, protecting human health and ensuring sound and healthy marine ecosystems (OSPAR 1998).

The Norwegian contribution to JAMP focuses on two JAMP areas: Oslofjord-area (including the Hvaler area, Singlefjord and Langesundsfjord) and the Sørfjord/Hardangerfjord area. Orkdalsfjord, a third JAMP area, was discontinued after 1996. During 1990-95 Norway has also included other areas, mostly remote from point sources of pollution, along the coast from the Swedish border in the South to the Russian border in the North. This was in connection with the Norwegian contribution to the investigation of the North Sea (*North Sea Task Force* (NSTF) *Monitoring Master Plan* (MMP)) in 1990 when JAMP expanded to cover the area from Oslofjorden og Bergen. The programme has since also included areas farther north. In 1992 and 1994 contaminants in marine sediments were investigated from Bergen to Varangerfjorden.

An overview of the analytical methods (1981-2001) has been presented (Green *et al.* 2001a). The raw data has been presented for sediment 1986-1992 (Green & Klungsøyr 1994; Green & Rønningen 1995). Part of the results have been previously evaluated, for 1986-1994 (Green *et al.* 1995), 1996-1997 (Green *et al.* 2000) and 1990-1997 (Green *et al.* 2001b). The results have also been incorporated in European JMG regional assessments of sediment (JMG 1993).

2. Sampling

Investigations of sediment have followed the OSPAR guidelines (1990, 1997) as far as practical. The results presented are for the total fraction of the sediment (<2000μm) and are not normalised because agreement on this issue within OSPAR has not been reached.

3. Analyses

JAMP (OSPAR 1990) agreed that the concentration of at least cadmium, copper, mercury, lead, zinc and polychlorinated hydrocarbons should be monitored in sediment. In these investigations many other contaminants have also been quantified. A complete list of variables, as well as other abbreviations, used is given in by Appendix A.

An overview of the contaminants and associated analytical method codes is shown in Appendix B. A brief description of the analytical methods is given by Green *et al.* (2001a). The Institute for Marine Research was responsible for all organic analyses of sediments collected in 1990. All sediment age determinations were done by FORCE institutes (DK). Arsenic analyses were done by SINTEF-SI. The remainder of analyses were performed at the Norwegian Institute for Water Research (NIVA).

4. Comment on quality assurance and detection limit

Analytical labs have been routinely involved in international and national intercalibration exercises for quality assurance (QA), including QUASIMEME since 1994 (cf. Appendix C.). In addition the laboratories have (more regularly in recent years) analysed standard reference material in connection with analyses of the samples used in monitoring. The results of intercalibration exercises and analyses of the standard reference material is discussed in part in the annual National Comments (cf. Green *et al.*2002).

The detection limits are approximations based on 3 times the standard deviation of the 'blank' or near zero concentration of a solution. Day-to-day variations in the analytical instrument may lead to minor variation in detection limits.

5. Comment on presentation of results

An overview of the samples collected is shown in Appendix D. Appendix F. Special attention should be paid to notes and comments preceeding each Appendix.

The data is stored in MS ACCESS 1997. The tables are generated using MS ACCESS 97 and MS EXCEL 97.

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Appendix A. Abbreviations

Abbreviation[1]	English	*Norwegian*
ELEMENTS		
Al	aluminium	*aluminium*
As	arsenic	*arsen*
Cd	cadmium	*kadmium*
Co	cobalt	*kobolt*
Cr	chromium	*krom*
Cu	copper	*kobber*
Fe	iron	*jern*
Hg	mercury	*kvikksølv*
Li	lithium	*litium*
Mn	manganese	*mangan*
Ni	nickel	*nikkel*
Pb	lead	*bly*
Pb210	lead-210	*bly-210*
Se	selenium	*selen*
Ti	titanium	*titan*
Zn	zinc	*sink*
PAHs		
PAH	polycyclic aromatic hydrocarbons	*polysykliske aromatiske hydrokarboner*
ACNE	acenaphthene	*acenaften*
ACNLE	acenaphthylene	*acenaftylen*
ANT	anthracene	*antracen*
BAA [3]	benzo[*a*]anthracene	*benzo[a]antracen*
BAP [3]	benzo[*a*]pyrene	*benzo[a]pyren*
BBF [3]	benzo[*b*]fluoranthene	*benzo[b]fluoranten*
BBJKF [3]	benzo[*b,j,k*]fluoranthene	*benzo[b,j,k]fluoranten*
BBJKF [3]	benzo[b+j,k]fluoranthene	*benzo[b+j,k]fluoranten*
BBKF [3]	benzo[*b+k*]fluoranthene	*benzo[b+k]fluoranten*
BEP	benzo[*e*]pyrene	*benzo[e]pyren*
BGHIP	benzo[*ghi*]perylene	*benzo[ghi]perylen*
BIPN [2]	biphenyl	*bifenyl*
BJKF [3]	benzo[*j,k*]fluoranthene	*benzo[j,k]fluorantren*
BKF [3]	benzo[*k*]fluoranthene	*benzo[k]fluorantren*
CHR	chrysene	*chrysen*
CHRTR	chrysene+triphenylene	*chrysen+trifenylen*
COR	coronene	*coronen*
DBAHA [3]	dibenz[*a,h*]anthracene	*dibenz[a,h]anthracen*
DBA3A [3]	dibenz[*a,c/a,h*]anthracene	*dibenz[a,c/a,h]antracen*
DBP [3]	dibenzopyrenes	*dibenzopyren*
DBT	dibenzothiophene	*dibenzothiofen*
DBTC1	C_1-dibenzothiophenes	*C_1-dibenzotiofen*
DBTC2	C_2-dibenzothiophenes	*C_2-dibenzotiofen*
DBTC3	C_3-dibenzothiophenes	*C_3-dibenzotiofen*
FLE	fluorene	*fluoren*
FLU	fluoranthene	*fluoranten*

Abbreviation[1]	English	*Norwegian*
PAHs (cont.)		
ICDP [3]	indeno[*1,2,3-cd*]pyrene	*indeno[1,2,3-cd]pyren*
NAP [2]	naphthalene	*naftalen*
NAPC1 [2]	C_1-naphthalenes	*C_1-naftalen*
NAPC2 [2]	C_2-naphthalenes	*C_2-naftalen*
NAPC3 [2]	C_3-naphthalenes	*C_3-naftalen*
NAP1M [2]	1-methylnaphthalene	*1-metylnaftalen*
NAP2M [2]	2-methylnaphthalene	*2-metylnaftalen*
NAPD2 [2]	1,6-dimethylnaphthalene	*1,6-dimetylnaftalen*
NAPD3 [2]	1,5-dimethylnaphthalene	*1,5-dimetylnaftalen*
NAPDI [2]	2,6-dimethylnaphthalene	*2,6-dimetylnaftalen*
NAPT2 [2]	2,3,6-trimethylnaphthalene	*2,3,6-trimetylnaftalen*
NAPT3 [2]	1,2,4-trimethylnaphthalene	*1,2,4-trimetylnaftalen*
NAPT4 [2]	1,2,3-trimethylnaphthalene	*1,2,3-trimetylnaftalen*
NAPTM [2]	2,3,5-trimethylnaphthalene	*2,3,5-trimetylnaftalen*
NPD	Collective term for naphthalenes, phenanthrenes and dibenzothiophenes	*Samlebetegnelse for naftalen, fenantren og dibenzotiofens*
PA	phenanthrene	*fenantren*
PAC1	C_1-phenanthrenes	*C_1-fenantren*
PAC2	C_2-phenanthrenes	*C_2-fenantren*
PAM1	1-methylphenanthrene	*1-metylfenantren*
PAM2	2-methylphenanthrene	*2-metylfenantren*
PADM1	3,6-dimethylphenanthrene	*3,6-dimetylfenantren*
PADM2	9,10-dimethylphenanthrene	*9,10-dimetylfenantren*
PER	perylene	*perylen*
PYR	pyrene	*pyren*
DI-Σn	sum of "n" dicyclic "PAH"s (footnote 2)	*sum "n" disykliske "PAH" (fotnote 2)*
P-Σn	sum "n" PAH	*sum "n" PAH*
PK-Σn	sum carcinogen PAH's (footnote 3)	*sum kreftfremkallende PAH (fotnote 3)*
PAHΣΣ	DI-Σn + P-Σn etc.	*DI-Σn + P-Σn mm..*
SPAH	"total" PAH, specific compounds not quantified (outdated analytical method)	*"total" PAH, spesifikk forbindelser ikke kvantifisert (foreldet metode)*
BAP_P	% BAP av PAHΣΣ	*% BAP av PAHΣΣ*
BAPPP	% BAP of P-Σn	*% BAP av P-Σn*
BPK_P	% BAP of PK-Σn	*% BAP av PK-Σn*
PKn_P	% PK-Σn av PAHΣΣ	*% PK-Σn av PAHΣΣ*
PKnPP	% PK-Σn av P-Σn	*% PK-Σn av P-Σn*

Abbreviations (cont'd.)

Abbreviation[1]	English	*Norwegian*
PCBs		
PCB	polychlorinated biphenyls	*polyklorerte bifenyler*
CB	individual chlorobiphenyls (CB)	*enkelte klorobifenyl*
CB28	CB28 (IUPAC)	*CB28 (IUPAC)*
CB31	CB31 (IUPAC)	*CB31 (IUPAC)*
CB44	CB44 (IUPAC)	*CB44 (IUPAC)*
CB52	CB52 (IUPAC)	*CB52 (IUPAC)*
CB77 [4]	CB77 (IUPAC)	*CB77 (IUPAC)*
CB81 [4]	CB81 (IUPAC)	*CB81 (IUPAC)*
CB95	CB95 (IUPAC)	*CB95 (IUPAC)*
CB101	CB101 (IUPAC)	*CB101 (IUPAC)*
CB105	CB105 (IUPAC)	*CB105 (IUPAC)*
CB110	CB110 (IUPAC)	*CB110 (IUPAC)*
CB118	CB118 (IUPAC)	*CB118 (IUPAC)*
CB126 [4]	CB126 (IUPAC)	*CB126 (IUPAC)*
CB128	CB128 (IUPAC)	*CB128 (IUPAC)*
CB138	CB138 (IUPAC)	*CB138 (IUPAC)*
CB149	CB149 (IUPAC)	*CB149 (IUPAC)*
CB153	CB153 (IUPAC)	*CB153 (IUPAC)*
CB156	CB156 (IUPAC)	*CB156 (IUPAC)*
CB169 [4]	CB169 (IUPAC)	*CB169 (IUPAC)*
CB170	CB170 (IUPAC)	*CB170 (IUPAC)*
CB180	CB180 (IUPAC)	*CB180 (IUPAC)*
CB194	CB194 (IUPAC)	*CB194 (IUPAC)*
CB209	CB209 (IUPAC)	*CB209 (IUPAC)*
CB-Σ7	CB: 28+52+101+118+138+153+180	*CB: 28+52+101+118+138+153+180*
CB-ΣΣ	sum of CBs, includes CB-Σ7	*sum CBer, inkluderer CB-Σ7*
TECBW	Sum of CB-toxicity equivalents after WHO model, see **TEQ**	*Sum CB- toksitets ekvivalenter etter WHO modell, se **TEQ***
TECBS	Sum of CB-toxicity equivalents after SAFE model, see **TEQ**	*Sum CB-toksitets ekvivalenter etter SAFE modell, se **TEQ***

Abbreviations (cont'd.)

Abbreviation[1]	English	*Norwegian*
DIOXINs		
TCDD	2, 3, 7, 8-tetrachloro-dibenzo dioxin	*2, 3, 7, 8-tetrakloro-dibenzo dioksin*
CDDST	Sum of tetrachloro-dibenzo dioxins	*Sum tetrakloro-dibenzo dioksiner*
CDD1N	1, 2, 3, 7, 8-pentachloro-dibenzo dioxin	*1, 2, 3, 7, 8-pentakloro-dibenzo dioksin*
CDDSN	Sum of pentachloro-dibenzo dioxins	*Sum pentakloro-dibenzo dioksiner*
CDD4X	1, 2, 3, 4, 7, 8-hexachloro-dibenzo dioxin	*1, 2, 3, 4, 7, 8-heksakloro-dibenzo dioksin*
CDD6X	1, 2, 3, 6, 7, 8-hexachloro-dibenzo dioxin	*1, 2, 3, 6, 7, 8-heksakloro-dibenzo dioksin*
CDD9X	1, 2, 3, 7, 8, 9-hexachloro-dibenzo dioxin	*1, 2, 3, 7, 8, 9-heksakloro-dibenzo dioksin*
CDDSX	Sum of hexachloro-dibenzo dioxins	*Sum heksakloro-dibenzo dioksiner*
CDD6P	1, 2, 3, 4, 6, 7, 8-heptachloro-dibenzo dioxin	*1, 2, 3, 4, 6, 7, 8-heptakloro-dibenzo dioksin*
CDDSH	Sum of heptachloro-dibenzo dioxins	*Sum heptakloro-dibenzo dioksiner*
CDDO	Octachloro-dibenzo dioxin	*Oktakloro-dibenzo dioksin*
PCDD	Sum of polychlorinated dibenzo-p-dioxins	*Sum polyklorinaterte-dibenzo-p-dioksiner*
CDF2T	2, 3, 7, 8-tetrachloro-dibenzofuran	*2, 3, 7, 8-tetrakloro-dibenzofuran*
CDFST	Sum of tetrachloro-dibenzofurans	*Sum tetrakloro-dibenzofuraner*
CDFDN	1, 2, 3, 7, 8/1, 2, 3, 4, 8-pentachloro-dibenzofuran	*1, 2, 3, 7, 8/1, 2, 3, 4, 8-pentakloro-dibenzofuran*
CDF2N	2, 3, 4, 7, 8-pentachloro-dibenzofurans	*2, 3, 4, 7, 8-pentakloro-dibenzofuran*
CDFSN	Sum of pentachloro-dibenzofurans	*Sum pentakloro-dibenzofuraner*
CDFDX	1, 2, 3, 4, 7, 8/1, 2, 3, 4, 7, 9-hexachloro-dibenzofuran	*1, 2, 3, 4, 7, 8/1, 2, 3, 4, 7, 9-heksakloro-dibenzofuran*
CDF6X	1, 2, 3, 6, 7, 8-hexachloro-dibenzofuran	*1, 2, 3, 6, 7, 8-heksakloro-dibenzofuran*
CDF9X	1, 2, 3, 7, 8, 9-hexachloro-dibenzofuran	*1, 2, 3, 7, 8, 9-heksakloro-dibenzofuran*
CDF4X	2, 3, 4, 6, 7, 8-hexachloro-dibenzofuran	*2, 3, 4, 6, 7, 8-heksakloro-dibenzofuran*
CDFSX	Sum of hexachloro-dibenzofurans	*Sum heksakloro-dibenzofuraner*
CDF6P	1, 2, 3, 4, 6, 7, 8-heptachloro-dibenzofuran	*1, 2, 3, 4, 6, 7, 8-heptakloro-dibenzofuran*
CDF9P	1, 2, 3, 4, 7, 8, 9-heptachloro-dibenzofuran	*1, 2, 3, 4, 7, 8, 9-heptakloro-dibenzofuran*
CDFSP	Sum of heptachloro-dibenzofurans	*Sum heptakloro-dibenzofuraner*
CDFO	Octachloro-dibenzofurans	*Octakloro-dibenzofuran*
PCDF	Sum of polychlorinated dibenzo-furans	*Sum polyklorinated dibenzo-furaner*
CDDFS	Sum of PCDD and PCDF	*Sum PCDD og PCDF*
TCDDN	Sum of TCDD-toxicity equivalents after Nordic model, see **TEQ**	*Sum TCDD- toksitets ekvivalenter etter Nordisk modell, se **TEQ***
TCDDI	Sum of TCDD-toxicity equivalents after international model, see **TEQ**	*Sum TCDD-toksitets ekvivalenter etter internasjonale modell, se **TEQ***

Abbreviations (cont'd.)

Abbreviation[1]	English	*Norwegian*
PESTICIDES		
ALD	aldrin	*aldrin*
DIELD	dieldrin	*dieldrin*
ENDA	endrin	*endrin*
CCDAN	cis-chlordane (=α-chlordane)	*cis-klordan (=α-klordan)*
TCDAN	trans-chlordane (=γ-chlordane)	*trans-klordan (=γ-klordan)*
OCDAN	oxy-chlordane	*oksy-klordan*
TNONC	trans-nonachlor	*trans-nonaklor*
TCDAN	trans-chlordane	*trans-klordan*
OCS	octachlorostyrene	*oktaklorstyren*
QCB	pentachlorobenzene	*pentaklorbenzen*
DDD	dichlorodiphenyldichloroethane	*diklordifenyldikloretan*
	1,1-dichloro-2,2-bis-(4-chlorophenyl)ethane	*1,1-dikloro-2,2-bis-(4-klorofenyl)etan*
DDE	dichlorodiphenyldichloroethylene (principle metabolite of DDT)	*diklordifenyldikloretylen (hovedmetabolitt av DDT)*
	1,1-dichloro-2,2-bis-(4-chlorophenyl)ethylene*	*1,1-dikloro-2,2-bis-(4-klorofenyl)etylen*
DDT	dichlorodiphenyltrichloroethane	*diklordifenyltrikloretan*
	1,1,1-trichloro-2,2-bis-(4-chlorophenyl)ethane	*1,1,1-trikloro-2,2-bis-(4-klorofenyl)etan*
DDEOP	o,p'-DDE	*o,p'-DDE*
DDEPP	p,p'-DDE	*p,p'-DDE*
DDTOP	o,p'-DDT	*o,p'-DDT*
DDTPP	p,p'-DDT	*p,p'-DDT*
TDEPP	p,p'-DDD	*p,p'-DDD*
DDTEP	p,p'-DDE + p,p'-DDT	*p,p'-DDE + p,p'-DDT*
DD-nΣ	sum of DDT and metabolites, n = number of compounds	*sum DDT og metabolitter, n = antall forbindelser*
HCB	hexachlorobenzene	*heksaklorbenzen*
HCHG	Lindane	*Lindan*
	γ HCH = gamma hexachlorocyclohexane	*γ HCH = gamma heksaklorsykloheksan*
	(γ BHC = gamma benzenehexachloride, outdated synonym)	*(γ BHC = gamma benzenheksaklorid, foreldret betegnelse)*
HCHA	α HCH = alpha HCH	*α HCH = alpha HCH*
HCHB	β HCH = beta HCH	*β HCH = beta HCH*
HC-nΣ	sum of HCHs, n = count	*sum av HCHs, n = antall*
EOCl	extractable organically bound chlorine	*ekstraherbart organisk bundet klor*
EPOCl	extractable persistent organically bound chlorine	*ekstraherbart persistent organisk bundet klor*
NTOT	total organic nitrogen	*total organisk nitrogen*
CTOT	total organic carbon	*total organisk karbon*
CORG	organic carbon	*organisk karbon*
GSAMT	grain size	*kornfordeling*
MOCON	moisture content	*vanninnhold*

Abbreviations (cont'd.)

Abbreviation[1]	English	*Norwegian*
INSTITUTES		
IFEN	Institute for Energy Technology	*Institutt for energiteknikk*
FIER	Institute for Nutrition, Fisheries Directorate	*Fiskeridirektoratets Ernæringsinstitutt*
FORC	FORCE Institutes, Div. for Isotope Technique and Analysis [DK]	*FORCE Institutterne, Div. for Isotopteknik og Analyse [DK]*
IMRN	Institute of Marine Research (IMR)	*Havforskningsinstituttet*
NACE	Nordic Analytical Center	*Nordisk Analyse Center*
NILU	Norwegian Institute for Air Research	*Norsk institutt forluftforskning*
NIVA	Norwegian Institute for Water Research	*Norsk institutt for vannforskning*
SERI	Swedish Environmental Research Institute	*Institutionen för vatten- och luftvårdsforskning*
VETN	Norwegian Veterinary Institute	*Veterinærinstituttet*
SIIF	Fondation for Scientific and Industrial Research at the Norwegian Institute of Technology - SINTEF (a division, previously: Center for Industrial Research SI)	*Stiftelsen for industriell og teknisk forskning ved Norges tekniske høgskole- SINTEF (en avdeling, tidligere: Senter for industriforskning SI)*

1) After: ICES Environmental Data Reporting Formats. International Council for the Exploration of the Sea. July 1996 and supplementary codes related to non-ortho and mono-ortho PCB's and "dioxins" (ICES pers. comm.)

2) Indicates "PAH" compounds that are dicyclic and not truly PAH's typically identified during the analyses of PAH, include naphthalenes and "biphenyls".

3) Indicates PAH compounds potentially cancerogenic for humans according to IARC (1987), i.e., categories 2A+2B (possibly and probably carcinogenic).

4) Indicates non ortho- co-planer PCB compounds ie., those that lack Cl in positions 1, 1', 5, and 5'

*) The Pesticide Index, second edition. The Royal Society of Chemistry, 1991.

Other abbreviations *andre forkortelser*

	English	*Norwegian*
TEQ	"Toxicity equivalency factors" for the most toxic compounds within the following groups:	*"Toxisitetsekvivalentfaktorer" for de giftigste forbindelsene innen følgende grupper.*
	• polychlorinated dibenzo-p-dioxins and dibenzofurans (**PCDD/PCDFs**). Equivalents calculated after Nordic model (Ahlborg 1989) [1] or international model (Int./EPA, cf. Van den Berg *et al.*, 1998) [2]	• *polyklorerte dibenzo-p-dioksiner og dibenzofuraner (**PCDD/PCDF**). Ekvivalentberegning etter nordisk modell (Ahlborg 1989) [1] eller etter internasjonal modell (Int./EPA, cf. Van den Berg et al. 1998) [2]*
	• non-ortho and mono-ortho substituted chlorobiphenyls after WHO model (Ahlborg *et al.*, 1994) [3] or Safe (1994, cf. NILU pers. comm.)	• *non-orto og mono-orto substituerte klorobifenyler etter WHO modell (Ahlborg et al., 1994) [3] eller Safe (1994, cf. NILU pers. medd.)*
ppm	parts per million, mg/kg	*deler pr. milliondeler, mg/kg*
ppb	parts per billion, μg/kg	*deler pr. milliarddeler, μg/kg*
ppp	parts per trillion, ng/kg	*deler pr. tusen-milliarddeler, ng/kg*
d.w.	dry weight basis	*tørrvekt basis*
w.w.	wet weight or fresh weight basis	*våtvekt eller friskvekt basis*

[1]) Ahlborg, U.G., 1989. Nordic risk assessment of PCDDs and PCDFs. Chemosphere 19:603-608.

[2]) Van den Berg, Birnbaum, L, Bosveld, A. T. C. and co-workers, 1998. Toxic equivalency factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife. Environ Hlth. Perspect. 106:775-792.

[3]) Ahlborg, U.G., Becking G.B., Birnbaum, L.S., Brouwer, A, Derks, H.J.G.M., Feely, M., Golor, G., Hanberg, A., Larsen, J.C., J.C., Liem, A.K.G., Safe, S.H., Schlatter, C., Wärn, F., Younes, M., Yrjänheikki, E., 1994. Toxic equivalency factors for dioxin-like PCBs. Report on a WHO-ECEH and IPSC consultation , December 1993. Chemosphere 28:1049-1067.

Appendix B.
Analytical overview

Sorted by:

- Contaminant, year, laboratory, intercalibration

Abbreviations are defined in Appendix A. and Appendix C.

Contamin.	**Contaminant defined in Appendix A.**
Mon. Year	**Monitoring year**
Lab.	**Analytical laboratory (cf. Appendix A.)**
Intercalibr. +basis	**Intercalibration exercise (cf. Appendix C.) and basis where W = wet weight and D = dry weight .**
Detect limit	**"Normal" detection limit**
Count below d.lim	**Number of analyses below normal detection limit**
N (<) above d.lim	**Number of analyses where detection limit was higher than normal.**

Contamin.	Mon. Lab. Year	Inter-calibr. +basis	Analys method code	Detect limit (ppb)	Total value count	Count below d.lim	N (<) above d.lim
ACNE	1992-NIVA	D	369	~1	23	23	
	1994-NIVA	D	369	1	24	23	
	1996-NIVA	D	369	1	10		
	1997-NIVA	D	369	1	18		
ACNLE	1992-NIVA	D	369	~1	23	23	
	1994-NIVA	D	369	1	24	23	
	1996-NIVA	D	369	1	10		
	1997-NIVA	D	369	1	18		
AL	1987-NIVA	D	352	~0.001	28		
	1990-NIVA	D	352	~0.001	128		
ALD	1990-IMRN	D	760	~0.05	14	14	
ANT	1990-IMRN	D	769	~1	14	14	
	1992-NIVA	D	369	~1	24	24	
	1994-NIVA	D	369	1	24	22	
	1996-NIVA	D	369	1	10		
	1997-NIVA	D	369	1	18		
AS	1994-NIVA	D	354	500	12		
BAP	1990-IMRN	D	769	~1	14	14	
	1992-NIVA	D	369	~1	23	23	
	1994-NIVA	D	369	1	24	12	
	1996-NIVA	D	369	1	10		
	1997-NIVA	D	369	1	18		
BBF	1992-NIVA	D	369	~1	23	23	
	1994-NIVA	D	369	1	24	9	
BBJKF	1996-NIVA	D	369	1	10		
	1997-NIVA	D	369	1	18		
BBKF	1990-IMRN	D	769	~1	14	14	
BEP	1990-IMRN	D	769	~1	14	14	
	1992-NIVA	D	369	~1	23	23	
	1994-NIVA	D	369	1	24	8	
	1996-NIVA	D	369	1	10		
	1997-NIVA	D	369	1	18		
BGHIP	1990-IMRN	D	769	~1	14	14	
	1992-NIVA	D	369	~1	24	24	
	1994-NIVA	D	369	1	24	9	
	1996-NIVA	D	369	1	10		
	1997-NIVA	D	369	1	18		
BIPN	1992-NIVA	D	369	~1	23	23	
	1994-NIVA	D	369	1	24	21	
	1996-NIVA	D	369	1	10		
	1997-NIVA	D	369	1	18		
BJKF	1992-NIVA	D	369	~1	14	14	
	1994-NIVA	D	369	1	24	11	
BAA	1990-IMRN	D	769	~1	14	14	
	1992-NIVA	D	369	~1	24	24	
	1994-NIVA	D	369	1	24	11	
	1996-NIVA	D	369	1	10		
	1997-NIVA	D	369	1	18		
CB101	1990-IMRN	8B D	760	~0.05	14	14	
	1992-NIVA	8C D	360	~0.05	24	24	
	1994-NIVA	8Z D	360	0.05	24		12
	1996-NIVA	D	360	0.2	10		
	1997-NIVA	D	360	0.2	18		
CB105	1990-IMRN	D	760	~0.05	14	14	
	1992-NIVA	8C D	360	~0.05	24	24	
	1994-NIVA	8Z D	360	0.05	24		24
	1996-NIVA	D	360	0.2	10		

Contamin.	Mon. Lab. Year	Inter-calibr. +basis		Analys method code	Detect limit (ppb)	Total value count	Count below d.lim	N (<) above d.lim
	1997-NIVA		D	360	0.2	18		
CB118	1990-IMRN	8B	D	760	~0.05	14	14	
	1992-NIVA	8C	D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		13
	1996-NIVA		D	360	0.2	10		
	1997-NIVA		D	360	0.2	17		
CB128	1990-IMRN		D	760	~0.05	14	14	
CB138	1990-IMRN	8B	D	760	~0.05	14	14	
	1992-NIVA	8C	D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		12
	1996-NIVA		D	360	0.2	10		
	1997-NIVA		D	360	0.2	18		
CB149	1990-IMRN		D	760	~0.05	14	14	
CB153	1990-IMRN	8B	D	760	~0.05	14	14	
	1992-NIVA	8C	D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		12
	1996-NIVA		D	360	0.05	10		
	1997-NIVA		D	360	0.05	18		
CB156	1990-IMRN		D	760	~0.05	14	14	
	1992-NIVA		D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		22
	1996-NIVA		D	360	0.2	10	1	
	1997-NIVA		D	360	0.2	18	2	
CB170	1990-IMRN		D	760	~0.05	14	14	
CB180	1990-IMRN	8B	D	760	~0.05	14	14	
	1992-NIVA	8C	D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		13
	1996-NIVA		D	360	0.2	10		
	1997-NIVA		D	360	0.2	18		
CB209	1992-NIVA	8C	D	360	~0.05	24	24	
	1994-NIVA	8C	D	360	0.05	24		12
	1996-NIVA		D	360	0.2	10	1	
	1997-NIVA		D	360	0.2	18	1	
CB28	1990-IMRN	8B	D	760	~0.05	14	14	
	1992-NIVA	8C	D	360	~0.05	23	23	
	1994-NIVA	8Z	D	360	0.05	24		2
	1996-NIVA		D	360	0.2	10		
	1997-NIVA		D	360	0.2	18		
CB31	1990-IMRN	8B	D	760	~0.05	14	14	
CB52	1990-IMRN	8B	D	760	~0.05	14	14	
	1992-NIVA	8C	D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		2
	1996-NIVA		D	360	0.2	10		
	1997-NIVA		D	360	0.2	18		
CD	1986-NIVA	7C	D	352	~0.001	24	24	
	1987-NIVA	7C	D	352	~0.001	25	25	
	1990-NIVA		D	353	~0.001	14	14	
	1990-NIVA	7E	D	353	~0.001	114	114	
	1992-NIVA	7E	D	353	~0.001	107	107	
	1994-NIVA	7Z	D	353	1	114		
	1996-NIVA		D	353	200	23	22	
	1997-NIVA		D	353	200	27	15	
CHR	1990-IMRN		D	769	~1	14	14	
	1992-NIVA		D	369	~1	24	24	
CHRTR	1994-NIVA		D	369	0.5	24		
	1996-NIVA		D	369	0.5	10		
	1997-NIVA		D	369	0.5	18		
COR	1992-NIVA		D	369	~1	24	24	

Contamin.	Mon. Lab. Year	Inter-calibr. +basis		Analys method code	Detect limit (ppb)	Total value count	Count below d.lim	N (<) above d.lim
CORG	1986-NIVA		D	390	~1	18	18	
	1987-NIVA		D	390	~1	28	28	
	1990-NIVA		D	390	~0.2	128	128	
	1992-NIVA		D	390	~0.2	107	107	
	1994-NIVA		D	390	200000	114		
	1996-NIVA		D	390	200000	23		
	1997-NIVA		D	390	200000	27		
CR	1994-NIVA	7Z	D	353	5	12		
CTOT	1994-NIVA		D	390	1000000	12		
	1996-NIVA		D	390	1000000	23		
	1997-NIVA		D	390	1000000	27		
CU	1986-NIVA	7C	D	351	~0.01	24	24	
	1987-NIVA	7C	D	351	~0.01	28	28	
	1990-NIVA	7E	D	351	~0.01	128	128	
	1992-NIVA	7E	D	351	~0.01	107	107	
	1994-NIVA	7Z	D	351	10	114		
	1996-NIVA		D	351	10	23		
	1997-NIVA		D	351	10	27		
DBA3A	1992-NIVA		D	369	~1	24	24	
	1994-NIVA		D	369	1	23	11	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
DBAHA	1990-IMRN		D	769	~1	14	14	
DBP	1992-NIVA		D	369	~1	24	24	
DBT	1990-IMRN		D	769	~1	14	14	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
DBTC1	1990-IMRN		D	769	~1	14	14	
DBTC2	1990-IMRN		D	769	~1	14	14	
DBTC3	1990-IMRN		D	769	~1	14	14	
DDEOP	1990-IMRN		D	760	~0.05	14	14	
DDEPP	1990-IMRN		D	760	~0.05	14	14	
	1992-NIVA		D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		12
	1996-NIVA		D	360	0.05	10		
	1997-NIVA		D	360	0.05	18		
DDTOP	1990-IMRN		D	760	~0.05	14	14	
DDTPP	1990-IMRN		D	760	~0.05	14	14	
	1996-NIVA		D	999	0.7	10		5
	1997-NIVA		D	999	0.7	18		3
FLE	1990-IMRN		D	769	~1	14	14	
	1992-NIVA		D	369	~1	24	24	
	1994-NIVA		D	369	1	24	23	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
FLU	1990-IMRN		D	769	~1	14	14	
	1992-NIVA		D	369	~1	24	24	
	1994-NIVA		D	369	1	24	10	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
GSAMT	1996-NIVA		D	miss	miss	31		
	1996-VKID		D	miss	miss	35		
	1997-NIVA		D	miss	miss	45		
	1997-VKID		D	miss	miss	47		
HCB	1990-IMRN		D	760	~0.05	14	14	
	1992-NIVA		D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		10
	1996-NIVA		D	360	0.1	10		

Contamin.	Mon. Lab. Year	Inter-calibr. +basis		Analys method code	Detect limit (ppb)	Total value count	Count below d.lim	N (<) above d.lim
	1997-NIVA		D	360	0.1	18		
HCHA	1990-IMRN		D	760	~0.05	14	14	
	1992-NIVA		D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		23
	1996-NIVA		D	360	0.2	10	2	
	1997-NIVA		D	360	0.2	18	1	
HCHB	1990-IMRN		D	760	~0.05	14	14	
HCHG	1990-IMRN		D	760	~0.05	14	14	
	1992-NIVA		D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		15
	1996-NIVA		D	360	0.2	10	1	
	1997-NIVA		D	360	0.2	18	1	
HG	1986-NIVA	7C	D	350	~0.01	24	24	
	1987-NIVA	7C	D	350	~0.01	28	28	
	1990-NIVA	7E	D	350	~0.01	128	128	
	1992-NIVA	7E	D	350	~0.01	107	107	
	1994-NIVA	7Z	D	350	10	114	2	
	1996-NIVA		D	350	10	23		
	1997-NIVA		D	350	10	27		
ICDP	1990-IMRN		D	769	~1	14	14	
	1992-NIVA		D	369	~1	24	24	
	1994-NIVA		D	369	1	24	12	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
LI	1990-NIVA	7E	D	353	~0.001	14	14	
	1992-NIVA	7E	D	353	~0.001	107	107	
	1994-NIVA	7E	D	353	1	114		
	1996-NIVA		D	353	1	23		
	1997-NIVA		D	353	1	27		
MOCON	1994-NIVA		D	340	~1	62		
	1996-NIVA		D	340	~1	31		
	1996-VKID		D	340	~1	35		
	1997-VKID		D	340	~1	47		
NAP	1990-IMRN		D	769	~1	14	14	
	1992-NIVA		D	369	~1	23	23	
	1994-NIVA		D	369	1	24	18	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
NAP1M	1992-NIVA		D	369	~1	23	23	
	1994-NIVA		D	369	1	24	19	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
NAP2M	1992-NIVA		D	369	~1	23	23	
	1994-NIVA		D	369	1	24	17	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
NAPC1	1990-IMRN		D	769	~1	14	14	
NAPC2	1990-IMRN		D	769	~1	14	14	
NAPC3	1990-IMRN		D	769	~1	14	14	
NAPD2	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
NAPD3	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
NAPDI	1992-NIVA		D	369	~1	23	23	
	1994-NIVA		D	369	1	24	18	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
NAPT2	1996-NIVA		D	369	1	10		

Contamin.	Mon. Year Lab.	Inter-calibr. +basis		Analys method code	Detect limit (ppb)	Total value count	Count below d.lim	N (<) above d.lim
	1997-NIVA		D	369	1	18		
NAPT3	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
NAPT4	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
NAPTM	1992-NIVA		D	369	~1	23	23	
	1994-NIVA		D	369	1	24	24	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
NI	1994-NIVA	7Z	D	353	50	12		
NTOT	1994-NIVA		D	390	1000000	114		
	1996-NIVA		D	390	1000000	23		
	1997-NIVA		D	390	1000000	27		
OCS	1992-NIVA		D	360	~0.05	24	24	
	1994-NIVA		D	360	0.05	24		24
	1996-NIVA		D	360	0.1	10		
	1997-NIVA		D	360	0.1	18	1	1
PA	1990-IMRN		D	769	~1	14	14	
	1992-NIVA		D	369	~1	24	24	
	1994-NIVA		D	369	1	24	11	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
PAC1	1990-IMRN		D	769	~1	14	14	
PAC2	1990-IMRN		D	769	~1	14	14	
PAM1	1992-NIVA		D	369	~1	24	24	
	1994-NIVA		D	369	1	24	17	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
PAM2	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
PAMD1	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
PAMD2	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
PB	1986-NIVA	7C	D	352	~0.05	24	24	
	1987-NIVA	7C	D	352	~0.05	28	28	
	1990-NIVA		D	353	~0.05	14	14	
	1990-NIVA	7E	D	353	~0.001	114	108	
	1992-NIVA	7E	D	353	~0.001	107	107	
	1994-NIVA	7Z	D	353	1	114		
	1996-NIVA		D	353	1	23		
	1997-NIVA		D	353	1	27		
PB210	1990-VKID		D	650	~1	70	26	
	1992-VKID		D	650	~1	56	15	
	1994-VKID		D	650	~1	62	25	
	1996-VKID		D	650	~1	11		
	1997-VKID		D	650	~1	21	3	
PER	1990-IMRN		D	769	~1	14	14	
	1992-NIVA		D	369	~1	23	23	
	1994-NIVA		D	369	1	24	3	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
PYR	1990-IMRN		D	769	~1	14	14	
	1992-NIVA		D	369	~1	24	24	
	1994-NIVA		D	369	1	24	12	
	1996-NIVA		D	369	1	10		
	1997-NIVA		D	369	1	18		
QCB	1992-NIVA		D	360	~0.05	24	24	

Contamin.	Mon. Lab. Year	Inter-calibr. +basis		Analys method code	Detect limit (ppb)	Total value count	Count below d.lim	N (<) above d.lim
	1994-NIVA		D	360	0.05	24		22
	1996-NIVA		D	360	0.05	10		
	1997-NIVA		D	360	0.05	18		
SPAH	1990-IMRN		D	769	~1	14	14	
TDEOP	1990-IMRN		D	760	~0.05	14	14	
TDEPP	1990-IMRN		D	760	~0.05	14	14	
	1992-NIVA		D	360	~0.05	24	24	
	1994-NIVA	8Z	D	360	0.05	24		21
	1996-NIVA		D	360	0.2	10		
	1997-NIVA		D	360	0.2	18		
ZN	1986-NIVA	7C	D	351	~0.1	24	24	
	1987-NIVA	7C	D	351	~0.1	28	28	
	1990-NIVA	7E	D	351	~0.01	128	128	
	1992-NIVA	7E	D	351	~0.1	107	107	
	1994-NIVA	7Z	D	351	100	114		
	1996-NIVA		D	351	100	23		
	1997-NIVA		D	351	100	27		
Sum of counts						8030	3986	260

~ > converting to ppb ignored, due to missing unit

Appendix C.
Participation in intercalibration exercises

Participation in intercalibration exercises

General: The main contributor to JAMP has been NIVA which has participated in nearly all QUASIMEME exercises relevant to the parameter and tissues monitored since 1994. The following lists other exercises.

Sea water:

4H ICES/JMG Fifth Round Intercalibration on Trace Metals in Sea Water - Section 4, analysis for Hg - 1983 - (5/TM/SW:4).

4I JMG Sixth Intercalibration on Trace Metals in Estuarine Waters - 1986 - (6/TM/SW).

4Z Intercalibration exercise for SIIF/SERI (Cd) and NIVA/IAMK (IAMK=Chalmers Inst., Göteborg) - 1985.

Seabed sediment:

7E ICES, First Intercalibration Exercise on Trace metals in Marine Sediments - 1984 - (1/TM/MS).

8B ICES/OSPAR, First Intercomparison Exercise on Organochlorines (individual chlorobiphenyl congeners) in Marine Sediments - Phase 1, analysis of standard solutions - 1989 - (1/OC/MS:1).

8C ICES/OSPAR, First Intercomparison Exercise on Organochlorines (individual chlorobiphenyl congeners) in Marine Sediments - Phase 2, analysis of standard solutions - 1991 - (1/OC/MS:2).

8B ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 1 - (analysis of standard solutions) - 1989 - (1/OC/MS-1).

8C ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 2 - 1990 - (1/OC/MS-2).

8D ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3a (1/OC/MS-3a) 1991.

8E ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3b - (1/OC/MS-3b) 1992.

8F ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 4 - (1/OC/MS-4) 1993.

Marine biota:

1E ICES, Fifth Intercalibration Exercise on Trace Metals in Biological Tissues - 1978 - (5/TM/BT).

1F ICES, Sixth Intercalibration Exercise on Trace Metals (Cadmium and Lead only) in Biological Tissues - 1979 - (6/TM/BT).

1G ICES, Seventh Intercalibration Exercise on Trace Metals in Biological Tissues - Part A - 1983 - (7/TM/BT).

1H	ICES, Seventh Intercalibration Exercise on Trace Metals in Biological Tissues - Part B - 1985 - (7/TM/BT) (preliminary report 1987).
1Z VETN	Interlabcalibration exercise with VETN and SIIF 1983, mercury and cadmium in cod filet and liver.
1Z NIVA	Interlabcalibration exercise with VETN, NACE and NIVA 1986 (Hg, Cd, Cu, Pb and Zn in 6 samples).
2D	ICES Fourth Intercalibration Exercise on Organochlorines (mainly PCBs) in Biological Tissues (Sample No.5) - 1979 - (4/OC/BT).
2E	ICES Fifth Intercalibration Exercise on Organochlorines (PCBs only) in Biological Tissues - 1982 - (5/OC/BT).
2G	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 1 - (analysis of standard solutions) - 1989 - (7/OC/BT-1).
2H	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 2 - 1990 - (7/OC/BT-2).
2I	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3a - (7/OC/BT-3a) 1991.
2J	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3b - (7/OC/BT-3b) 1992.
2K	ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 4 - (7/OC/BT-4) 1993.
2Z VETN	Interlabcalibration exercise with VETN among others, 1983, PCB and HCB in cod liver.
2Z NACE	Interlabcalibration exercise with NACE, VETN and SIIF 1986 (PCB (all labs), DDE, OCS, HCB and DCB (NACE and VETN).

Appendix D.
Overview of localities and sample counts 1986-1997

Station positions are shown on maps in Appendix E. .

jmpco: JAMP area code (J99 = unclassified)
jmpst: station code (sorted geographically along the coast from the Oslofjorden (in the south) to Varangerfjord (Russian border)
stnam: station code
Lon: Longitude
Lat: Latitude
icear: ICES area

STATIONS AND SAMPLE COUNT FOR SEDIMENT

jmpco	jmpst	stnam	Lat	Lon	icear	1986	1987	1990	1992	1994	1996	1997
J26	30S	Steilene	59° 49.10'	10° 33.80'	48G05	8		34			5	
J26	35S	Holmestrand-Mølen	59° 28.96'	10° 31.74'	47G04	6					5	
J26	35S	Holmestrand-Mølen	59° 30.0'	10° 35.70'	48G06	2		3				
J26	36S	Færder area	59° 1.55'	10° 32.99'	47G06	6						
J26	36S	Færder area	59° 0.40'	10° 41.60'	47G09	2		40				
J26	36S	Færder area	59° 2.50'	10° 46.60'	47G09						56	
J99	77S	Arendal area	58° 24.20'	9° 1.80'	45F91			43				29
J99	15S	Lista area	58° 1.0'	6° 34.30'	45F66			32				5
J99	22S	Bømlo area	59° 25.90'	4° 50.20'	47F47			29				5
J99	24S	Sotra	60° 15.10'	4° 33.30'	49F45			3				
J99	27S	Stadtlandet (east of)	62° 9.30'	5° 21.30'	53F56				30			
J63	52S	Tyssedal	60° 6.90'	6° 32.90'	49F66			3				5
J63	56S	Kvalnes	60° 13.70'	6° 35.60'	49F65			29				5
J63	57S	Krossanes	60° 23.10'	6° 40.70'	49F67			3				5
J62	63S	Ranaskjær	60° 23.60'	6° 27.10'	49F64			3				5
J62	67S	Strandebarm	60° 13.50'	6° 5.10'	49F62			28				28
J62	69S	Kvinnheradsfjorden	60° 1.30'	5° 56.10'	49F59			3				5
J65	82S	Flakk	63° 27.5'	10° 11.8'	55G01		8					
J65	84S	Trossavika	63° 21.70'	9° 57.40'	55F97		8		3			
J65	89S	Thamshavn	63° 19.8'	9° 52.5'	55F98		4		3			
J65	90S	Outer Orkdalsfjord	63° 27.40'	10° 3.0'	55G01		8		30			
J99	93S	Raudøya (northeast of)	64° 22.70'	10° 27.80'	57G04				30			
J99	95S	Rodø (east of)	66° 41.80'	13° 9.90'	62G32				31			
J99	98S	Skrova (south of)	68° 7.0'	14° 41.0'	65G49				30			
J99	99S	Lundøy (north of)	68° 5.80'	15° 10.10'	65G53				30			
J99	41S	Vågsfjorden	68° 56.25'	17° 5.24'	66G71					34		
J99	42S	Malangen	69° 30.38'	18° 6.77'	68G83					3		
J99	43S	Kvænangen	70° 3.31'	21° 7.94'	69H13					34		
J99	44S	Sørøysund	70° 25.91'	22° 31.83'	69H24					3		
J99	45S	Revsbotn	70° 42.86'	24° 26.65'	70H45					34		
J99	46S	Porsangerfjorden	70° 52.93'	26° 11.89'	70H61					28		
J99	47S	Laksfjord	70° 54.96'	26° 55.11'	70H67					3		
J99	48S	Tanafjord	70° 52.54'	28° 38.53'	70H84					33		
J99	49S	Syltefjord	70° 33.94'	30° 19.91'	70J03					3		
J99	10S	Varangfjorden	69° 56.7'	30° 6.70'	68J01					29		

Appendix E.
Map of stations

Station positions 1986-1997
(cf. Appendix D.)

Appendix E. (cont.) Map of stations

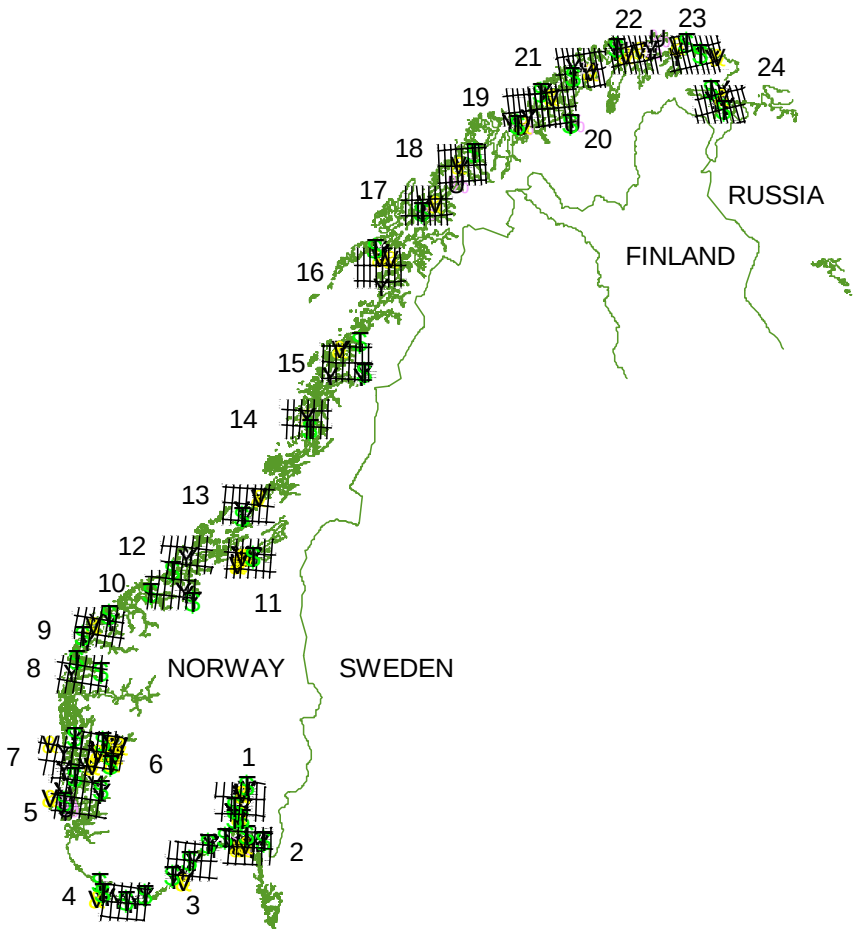
NOTES

For a few stations the geolocation has varied somewhat in order to collect sufficient material (e.g., st. 36B and 98A) or investigate local geographical variations (e.g., in the inner Oslofjord and Sørfjord). Hence, the same station name may appear more than once on a map.

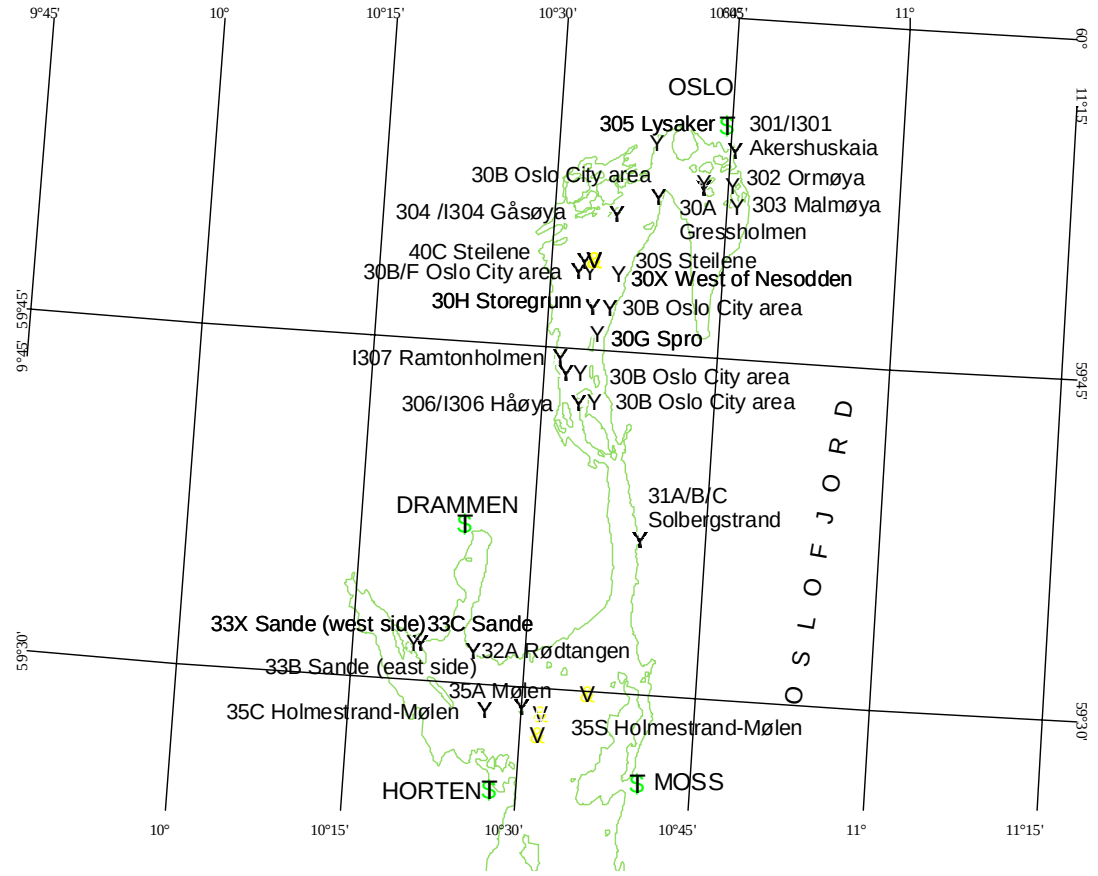
The letter A following the station identification number indicates that blue mussels were sampled. The letter B indicates sampling for cod and the letter F indicates sampling for flatfish. This system for fish is not consistent for some older stations (30, 33, 52 and 67) where only the letter B is used indicating that either cod or flatfish or both were sampled. An encircled dot indicates a mussel, shrimp or fish station. The letter G indicates sampling for dog whelks and S indicates sampling for sediment. A square and pentegon symbol indicates the position for sampling dog whelks or sediment, respectively.

The letter "I" preceeding the station identification number indicates an INDEX station for determining a "pollution" index. The letter R indicates a station for evaluating a "reference" index. Only blue mussels are used for these indices. The indices are based on a selection of JAMP and INDEX stations (cf. Green *et al.* 2002).

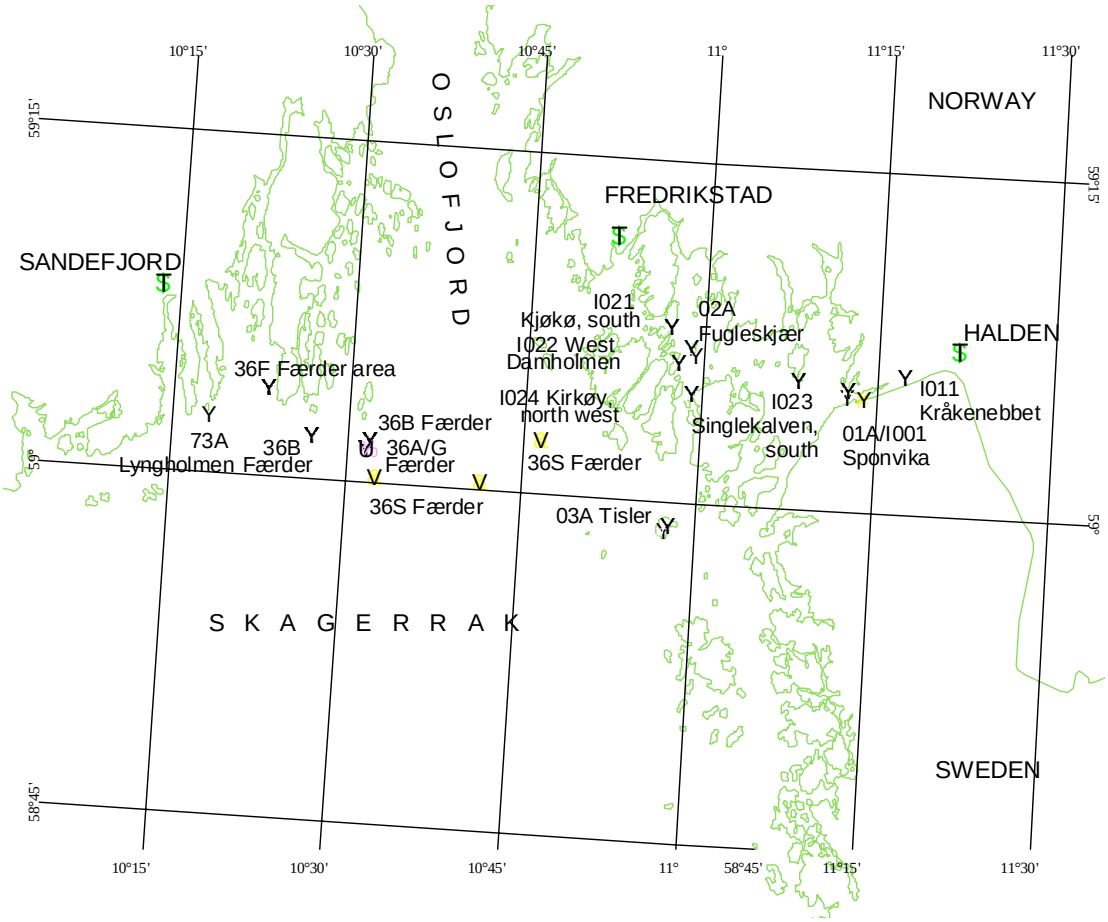
The maps are generated using ArcView GIS version 3.3.



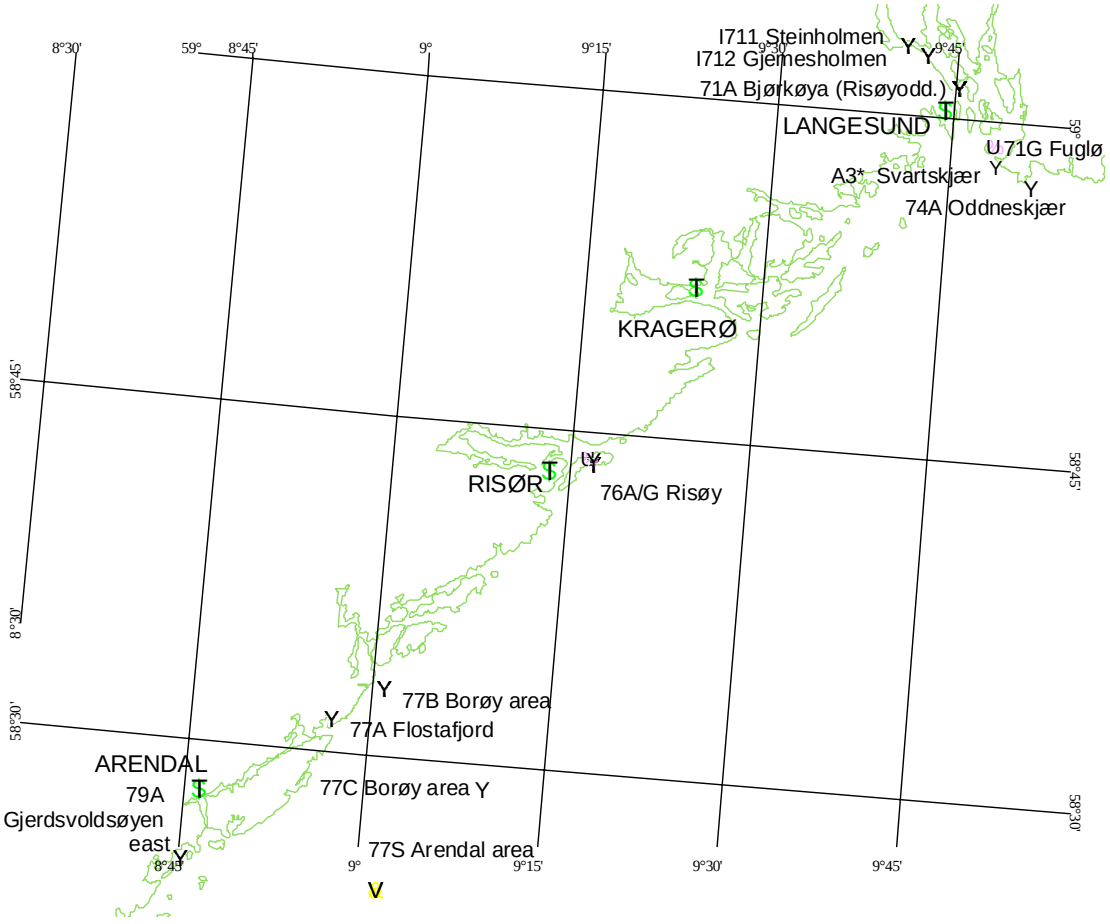
JAMP stations Norway. Numbers indicate map reference.


OSLO
305 Lysaker
301/I301
Akershuskaia
30B Oslo City area
302 Ormøya
304 /I304 Gåsøya
30A
303 Malmøya
Gressholmen
40C Steilene
30S Steilene
30B/F Oslo City area
30X West of Nesodden
30H Storegrunn
30B Oslo City area
30G Spro
I307 Ramtonholmen
30B Oslo City area
306/I306 Håøya
30B Oslo City area
O S L O F J O R D
DRAMMEN
31A/B/C
Solbergstrand
33X Sande (west side)
33C Sande
32A Rødtangen
33B Sande (east side)
35A Mølen
35C Holmestrand-Mølen
35S Holmestrand-Mølen
HORTEN
MOSS
9°45'
10°
10°15'
10°30'
10°45'
11°
11°15'
59°45'
59°30'
60°

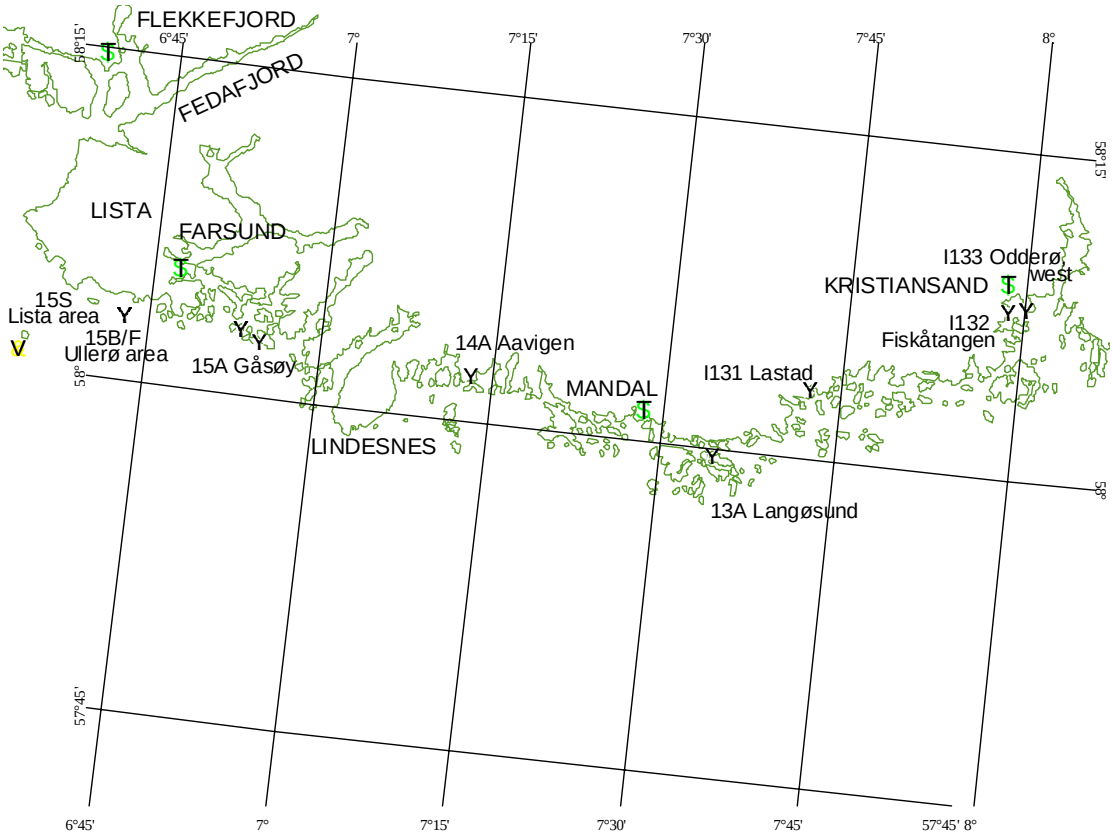
MAP 1


10°15'
10°30'
10°45'
11°
11°15'
11°30'
59°15'
59°
58°45'
O S L O F J O R D
NORWAY
FREDRIKSTAD
SANDEFJORD
I021
Kjøkø, south
02A
Fugleskjær
HALDEN
I022 West
Damholmen
36F Færder area
I024 Kirkøy,
north west
I023
Singlekalven,
south
I011
Kråkenebbet
01A/I001
Sponvika
73A
36B
Lyngholmen
36B Færder
36A/G
Færder
36S Færder
36S Færder
03A Tisler
S K A G E R R A K
SWEDEN

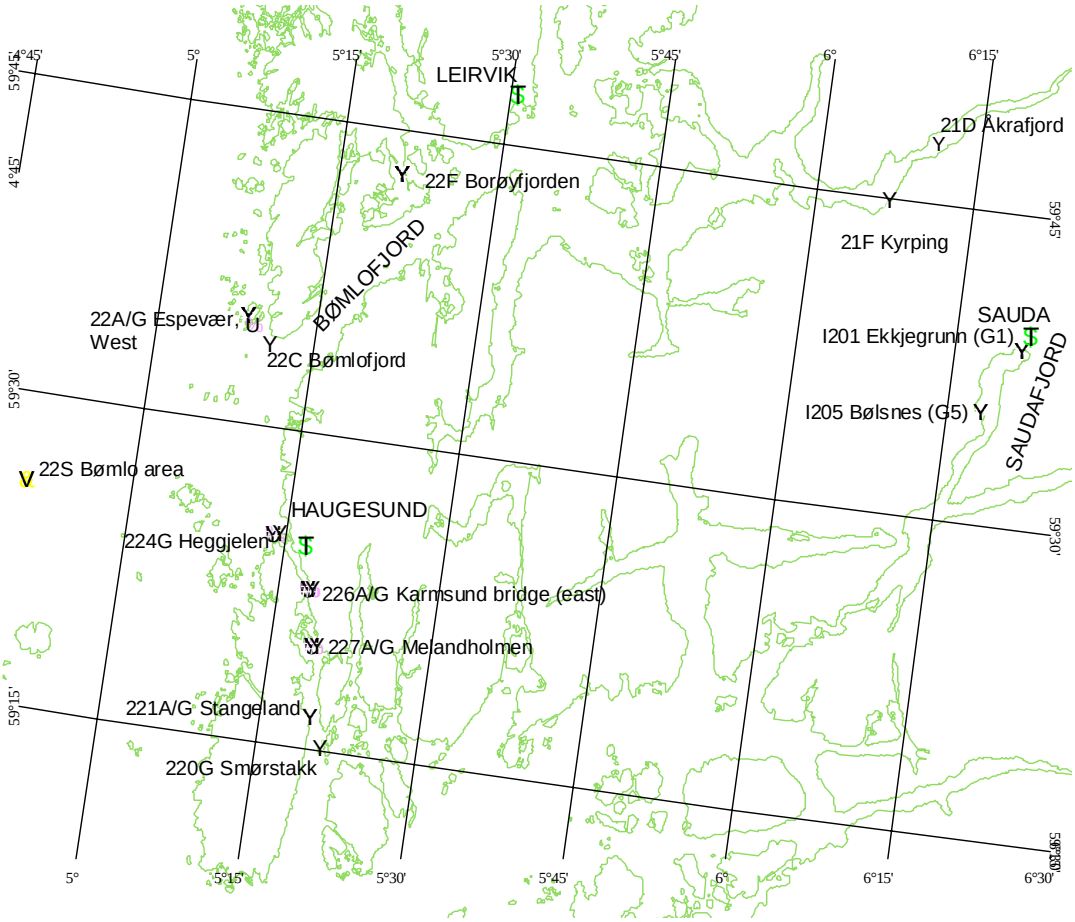
MAP 2


I711 Steinholmen
I712 Gjemesholmen
71A Bjørkøya (Risøyodd.)
LANGESUND
U71G Fugløy
A3* Svartskjær
74A Oddneskjær
KRAGERØ
RISØR
76A/G Risøy
77B Borøy area
77A Flostafjord
77C Borøy area
ARENDAL
79A
Gjerdsvoldsøyen
east
77S Arendal area
8°30'
59°
8°45'
9°
9°15'
9°30'
9°45'
58°45'
58°30'

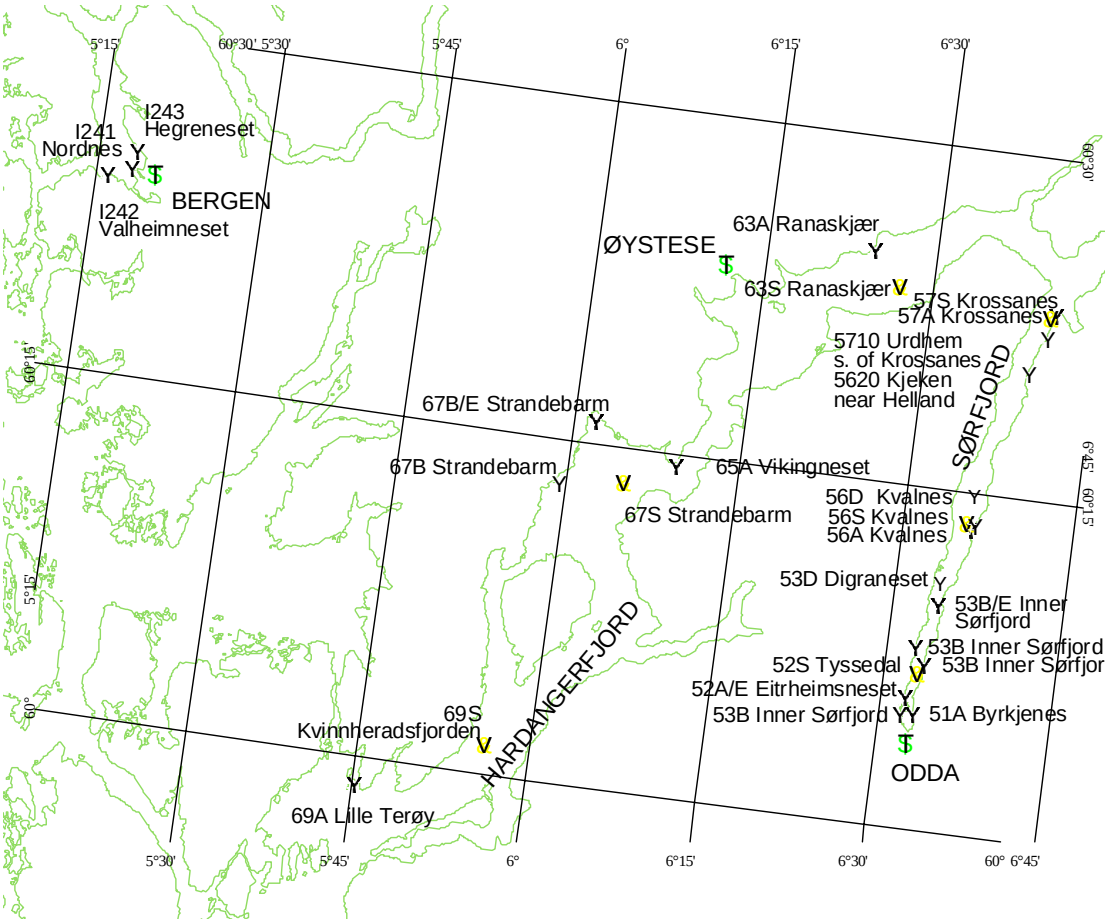
MAP 3


FLEKKEFJORD
FEDAFJORD
LISTA
FARSUND
15S
Lista area
15B/F
Ullerø area
15A Gåsøy
14A Aavigen
MANDAL
LINDESNES
I131 Lastad
13A Langøsund
I133 Odderøya west
KRISTIANSAND
I132
Fiskåtangen
6°45'
7°
7°15'
7°30'
7°45'
8°
58°15'
58°
57°45'

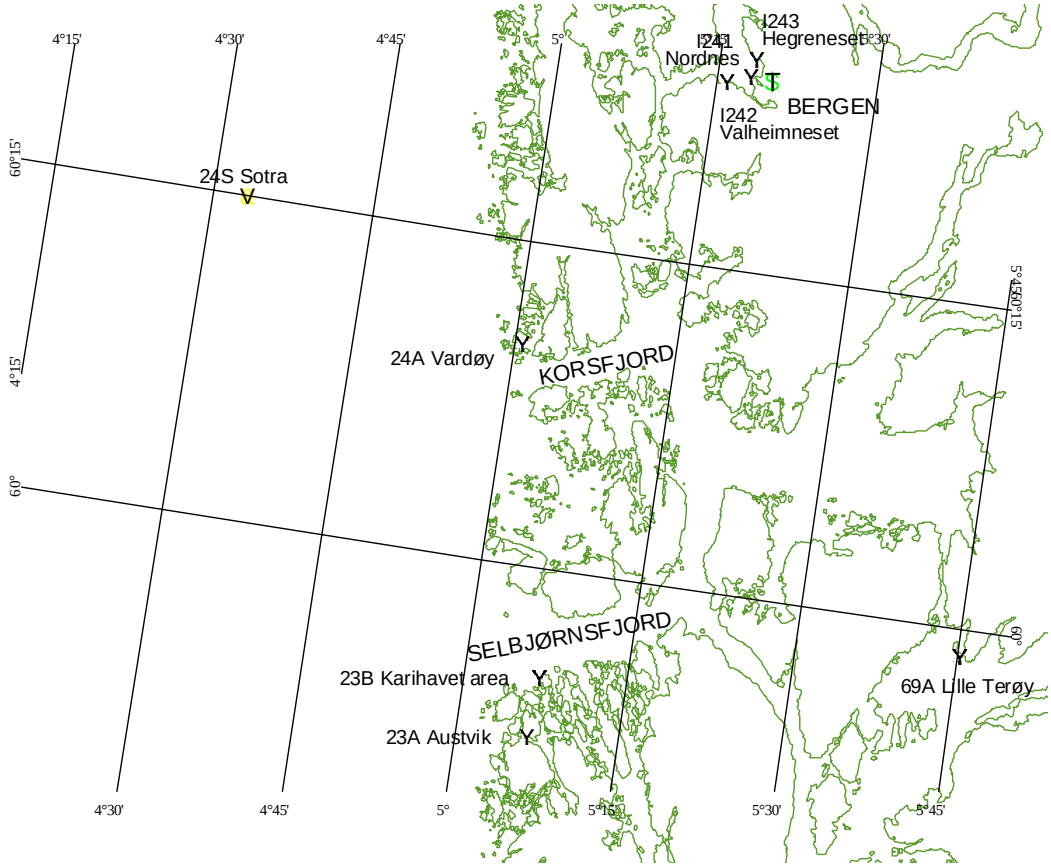
MAP 4


LEIRVIK
21D Åkrafjord
22F Borøyfjorden
21F Kyrping
BØMLOFJORD
22A/G Espevær, West
22C Bømlofjord
SAUDA
I201 Ekkjegrunn (G1)
SAUDAFJORD
I205 Bølsnes (G5)
22S Bømlo area
HAUGESUND
224G Heggjelen
226A/G Karmsund bridge (east)
227A/G Melandholmen
221A/G Stangeland
220G Smørstakk
4°45'
5°
5°15'
5°30'
5°45'
6°
6°15'
6°30'
59°45'
59°30'
59°15'

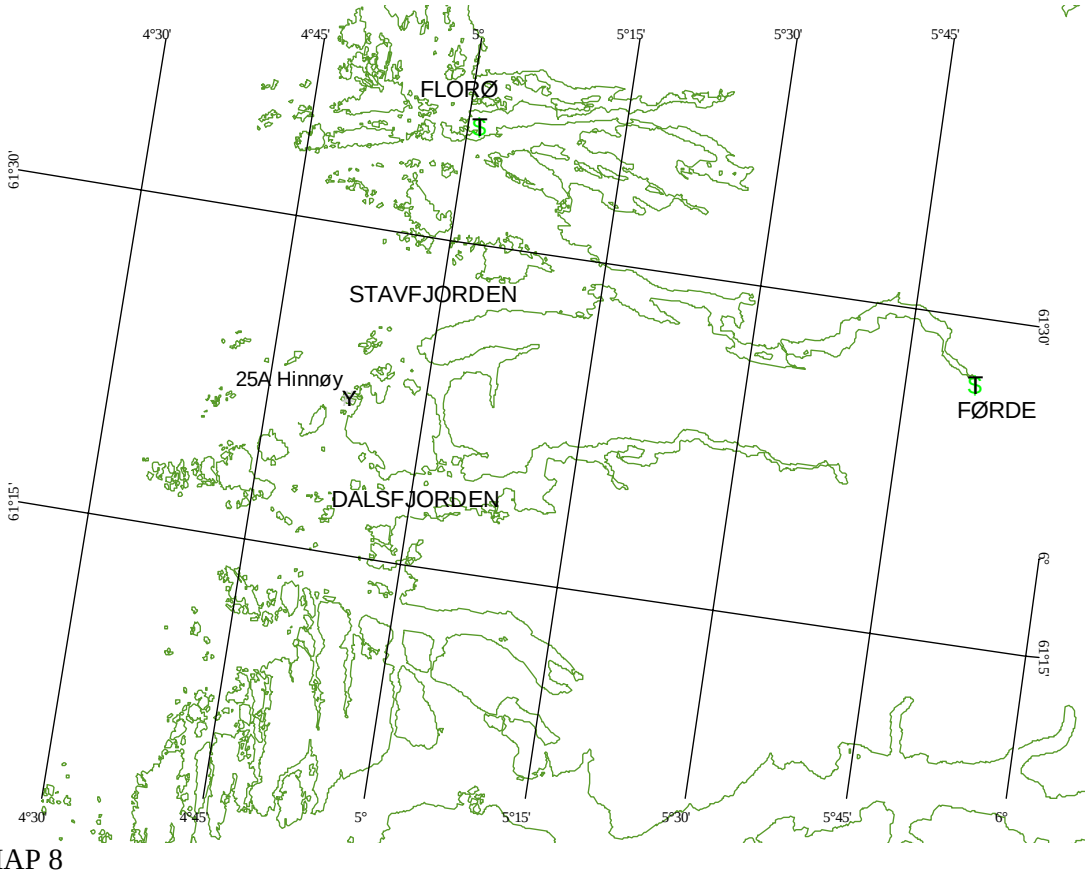
MAP 5


I243
I241 Hegreneset
Nordnes
BERGEN
I242
Valheimneset
ØYSTESE
63A Ranaskjær
63S Ranaskjær
57S Krossanes
57A Krossanes
5710 Urdheim
s. of Krossanes
5620 Kjeken
near Helland
SØRFJORD
67B/E Strandebarm
67B Strandebarm
65A Vikingneset
67S Strandebarm
56D Kvalnes
56S Kvalnes
56A Kvalnes
53D Digraneset
53B/E Inner Sørfjord
53B Inner Sørfjord
52S Tyssedal
53B Inner Sørfjor
52A/E Eitrheimsneset
53B Inner Sørfjord
51A Byrkjenes
HARDANGERFJORD
69S
Kvinnheradsfjorden
69A Lille Terøy
ODDA
5°15'
5°30'
5°45'
6°
6°15'
6°30'
60°30'
60°15'
60°

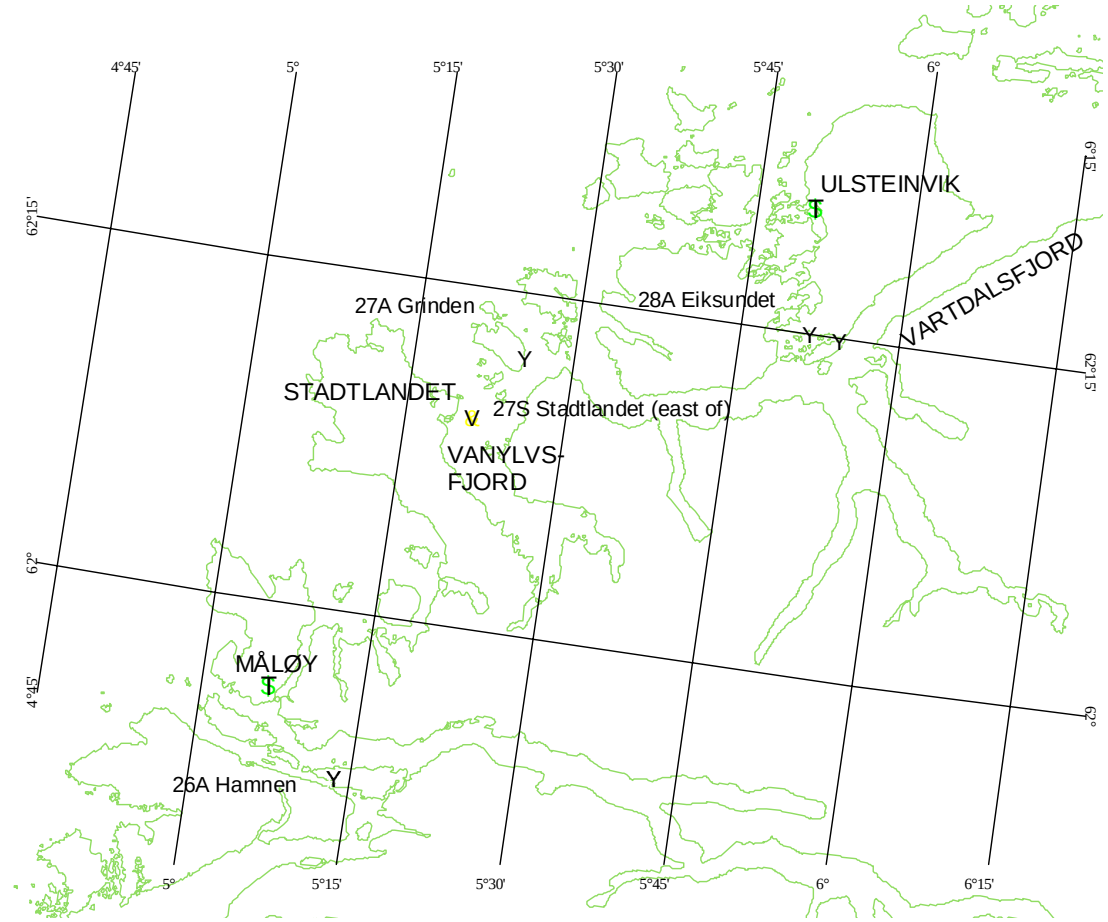
MAP 6


I243
Hegreneset
I241
Nordnes
I242
Valheimneset
BERGEN
24S Sotra
24A Vardøy
KORSFJORD
SELBJØRNSFJORD
23B Karihavet area
23A Austvik
69A Lille Terøy
4°15'
4°30'
4°45'
5°
5°15'
5°30'
5°45'
60°15'
60°
60°15'
60°

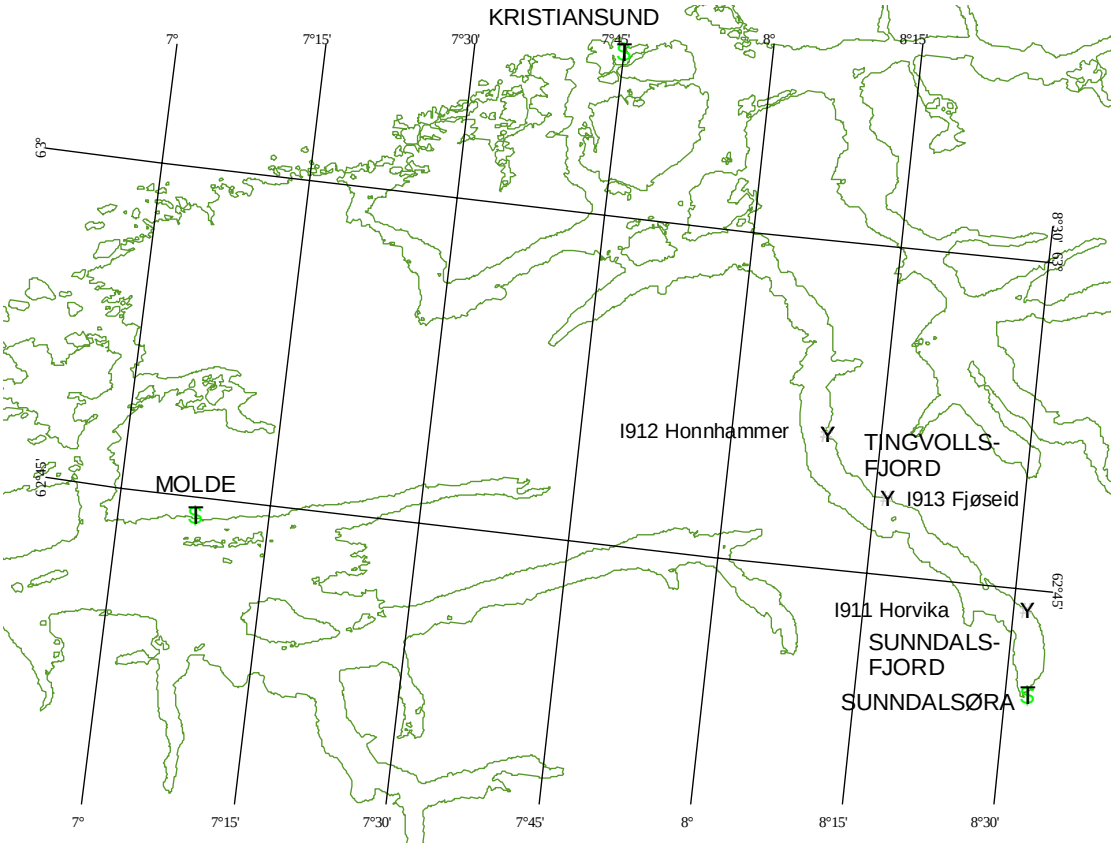
MAP 7


FLORØ
STAVFJØRDEN
25A Hinnøy
FØRDE
DALSFJORDEN
4°30'
4°45'
5°
5°15'
5°30'
5°45'
6°
61°30'
61°15'

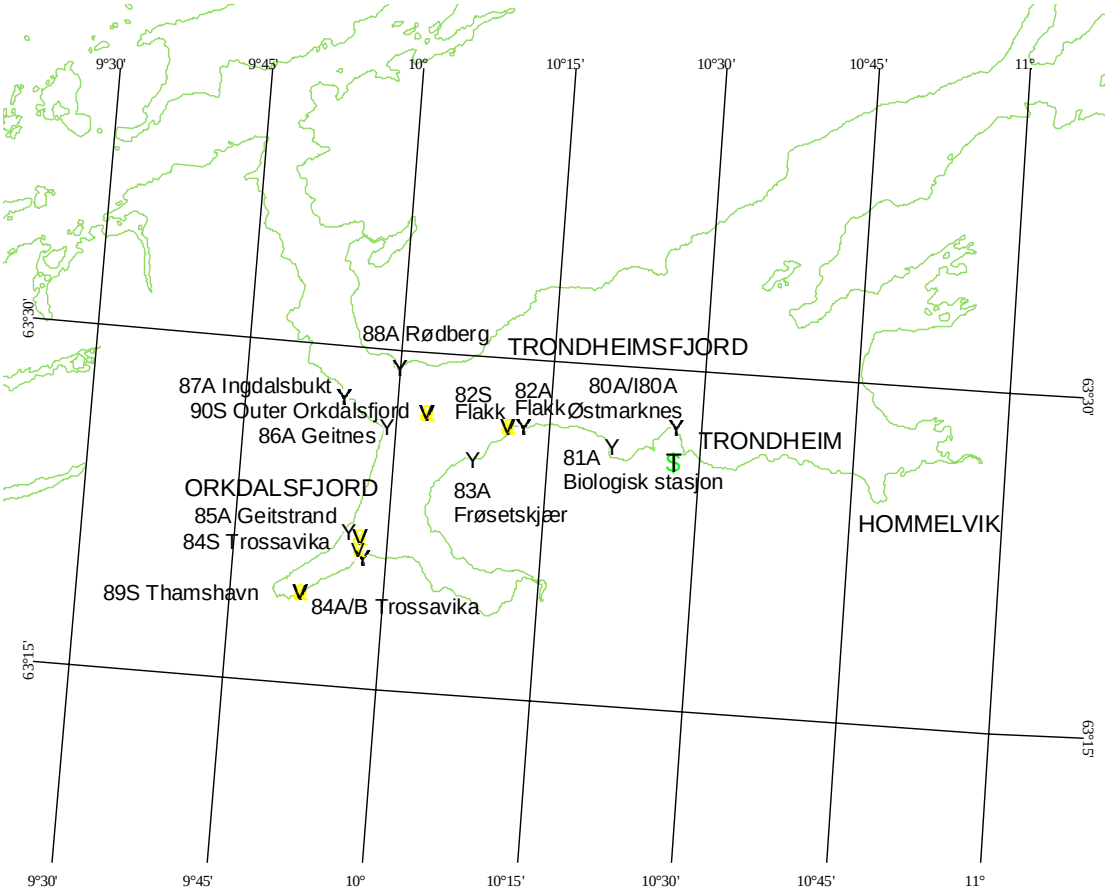
MAP 8


4°45'
5°
5°15'
5°30'
5°45'
6°
6°15'
62°15'
62°
ULSTEINVIK
27A Grinden
28A Eiksundet
VARTDALSFJORD
STADTLANDET
27S Stadtlandet (east of)
VANYLVS-
FJORD
MÅLØY
26A Hamnen

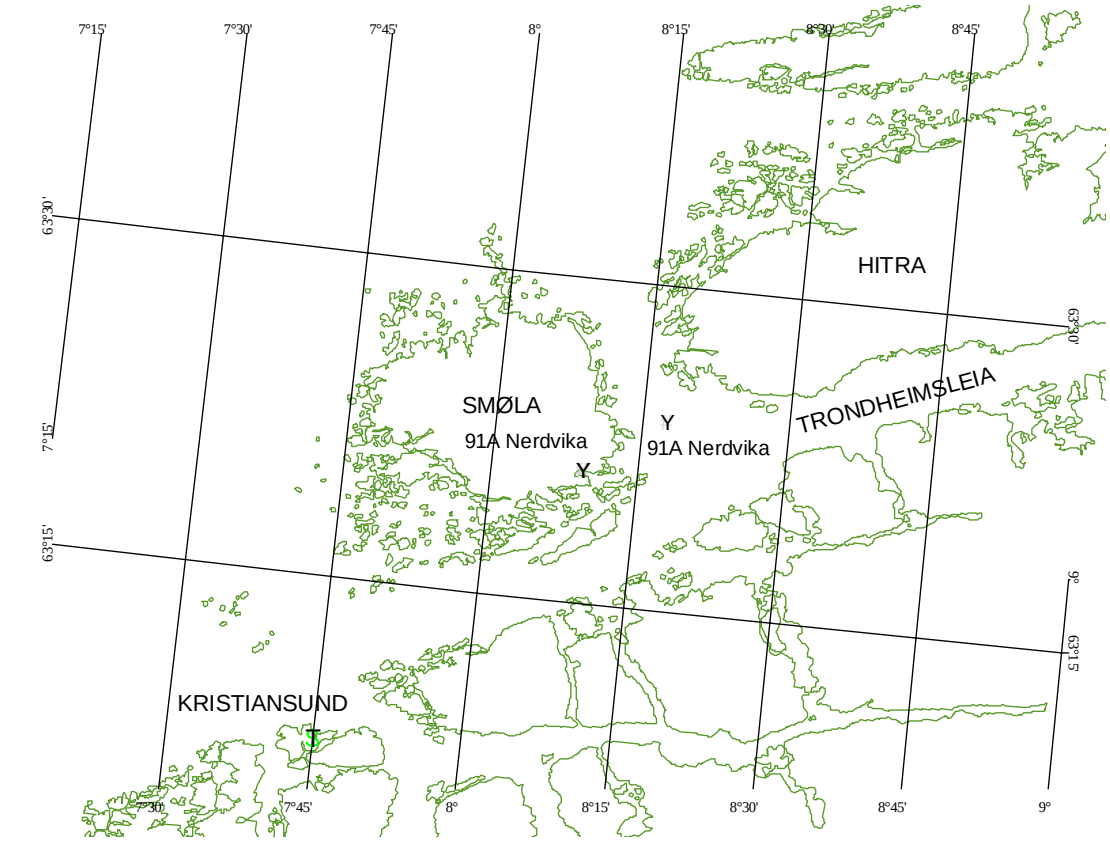
MAP 9


7°
7°15'
7°30'
7°45'
8°
8°15'
8°30'
63°
62°45'
KRISTIANSUND
I912 Honnhammer
TINGVOLLS-
FJORD
I913 Fjøseid
MOLDE
I911 Horvika
SUNNDALS-
FJORD
SUNNDALSØRA

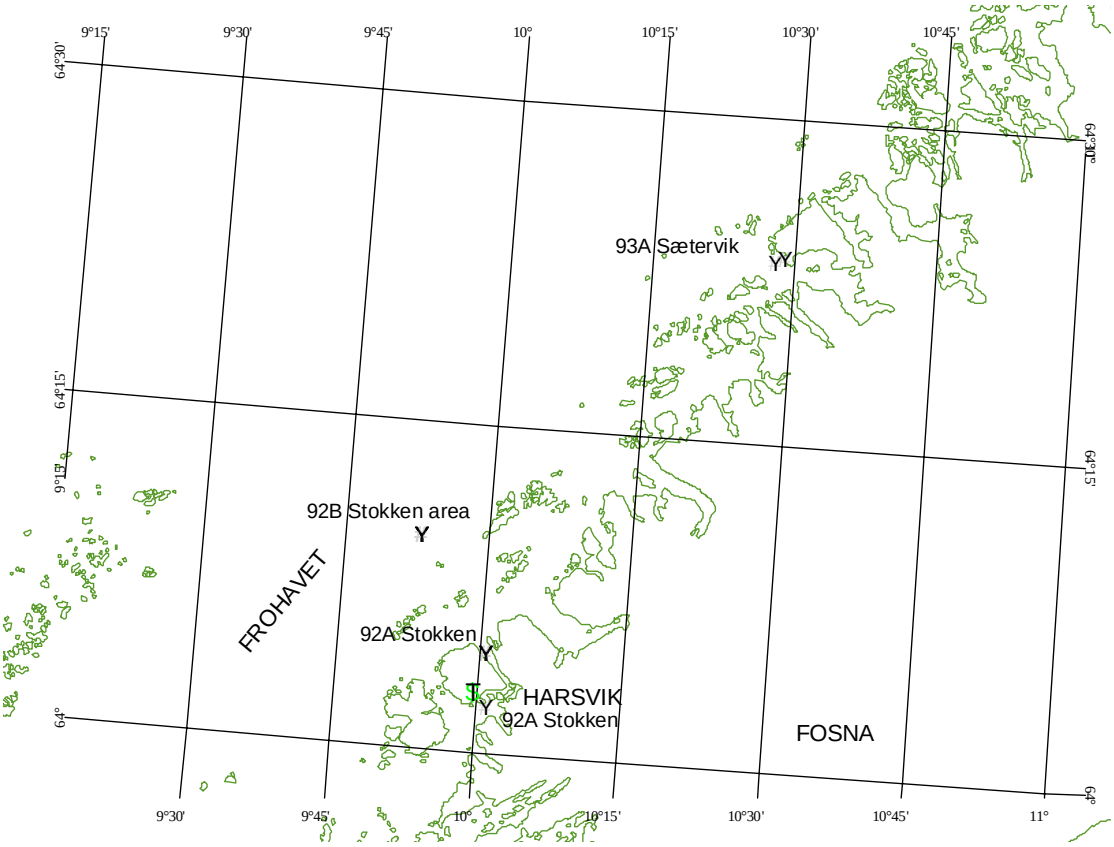
MAP 10


9°30'
9°45'
10°
10°15'
10°30'
10°45'
11°
63°30'
63°15'
88A Rødberg
TRONDHEIMSFJORD
87A Ingdalsbukt
90S Outer Orkdalsfjord
86A Geitnes
82S
82A
Flakk
Flakk
80A/I80A
Østmarknes
TRONDHEIM
81A
Biologisk stasjon
ORKDALSFJORD
85A Geitstrand
84S Trossavika
83A
Frøsetskjær
HOMMELVIK
89S Thamshavn
84A/B Trossavika

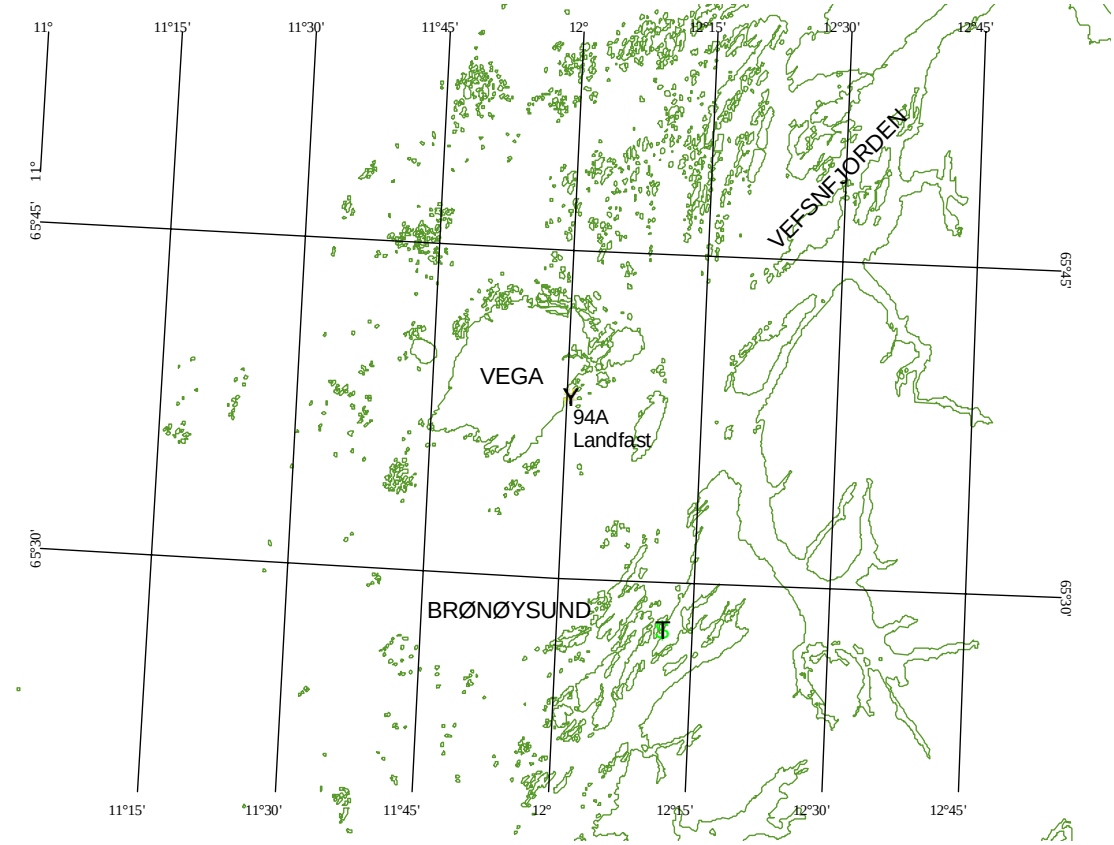
MAP 11


7°15'
7°30'
7°45'
8°
8°15'
8°30'
8°45'
9°
63°30'
63°15'
HITRA
TRONDHEIMSLEIA
SMØLA
91A Nerdvika
91A Nerdvika
KRISTIANSUND

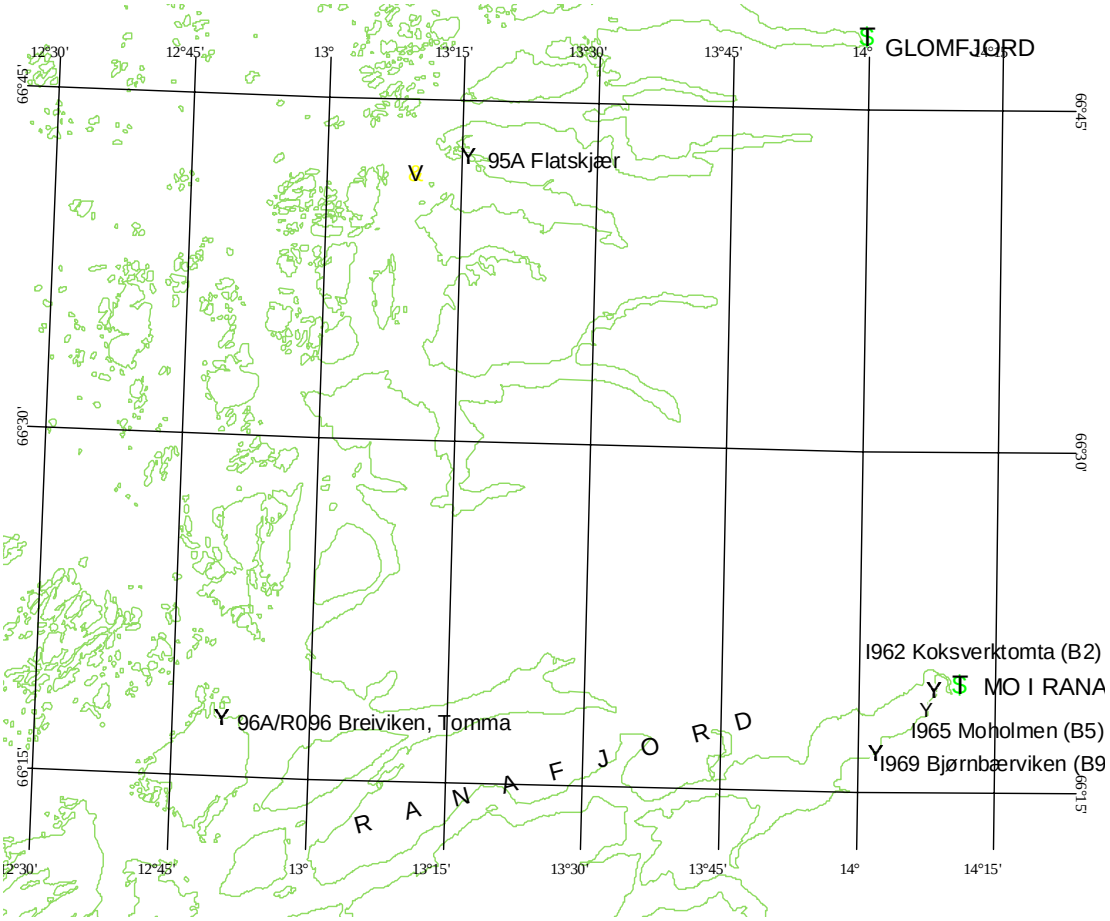
MAP 12


9°15'
9°30'
9°45'
10°
10°15'
10°30'
10°45'
64°30'
64°15'
64°
93A Sætervik
92B Stokken area
FROHAVET
92A Stokken
HARSVIK
92A Stokken
FOSNA
9°30'
9°45'
10°
10°15'
10°30'
10°45'
11°

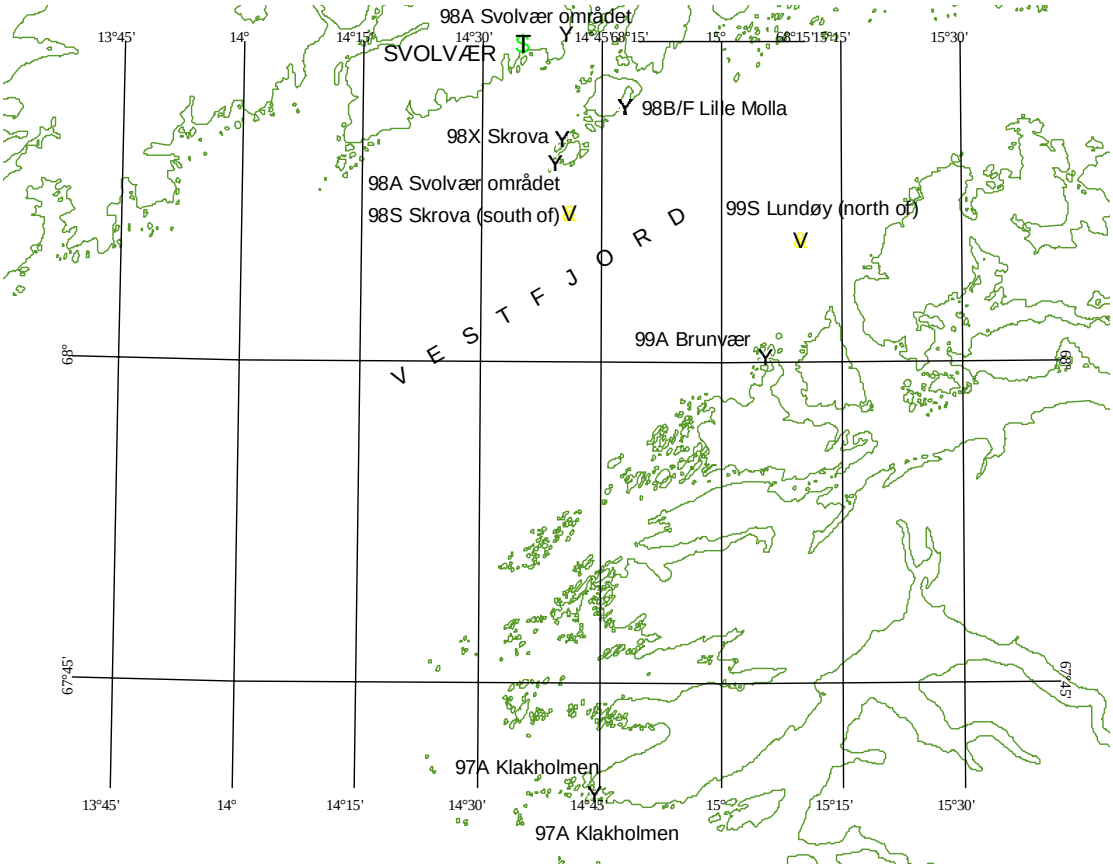
MAP 13


11°
11°15'
11°30'
11°45'
12°
12°15'
12°30'
12°45'
65°45'
65°30'
VEFSNFJORDEN
VEGA
94A
Landfast
BRØNØYSUND
11°15'
11°30'
11°45'
12°
12°15'
12°30'
12°45'

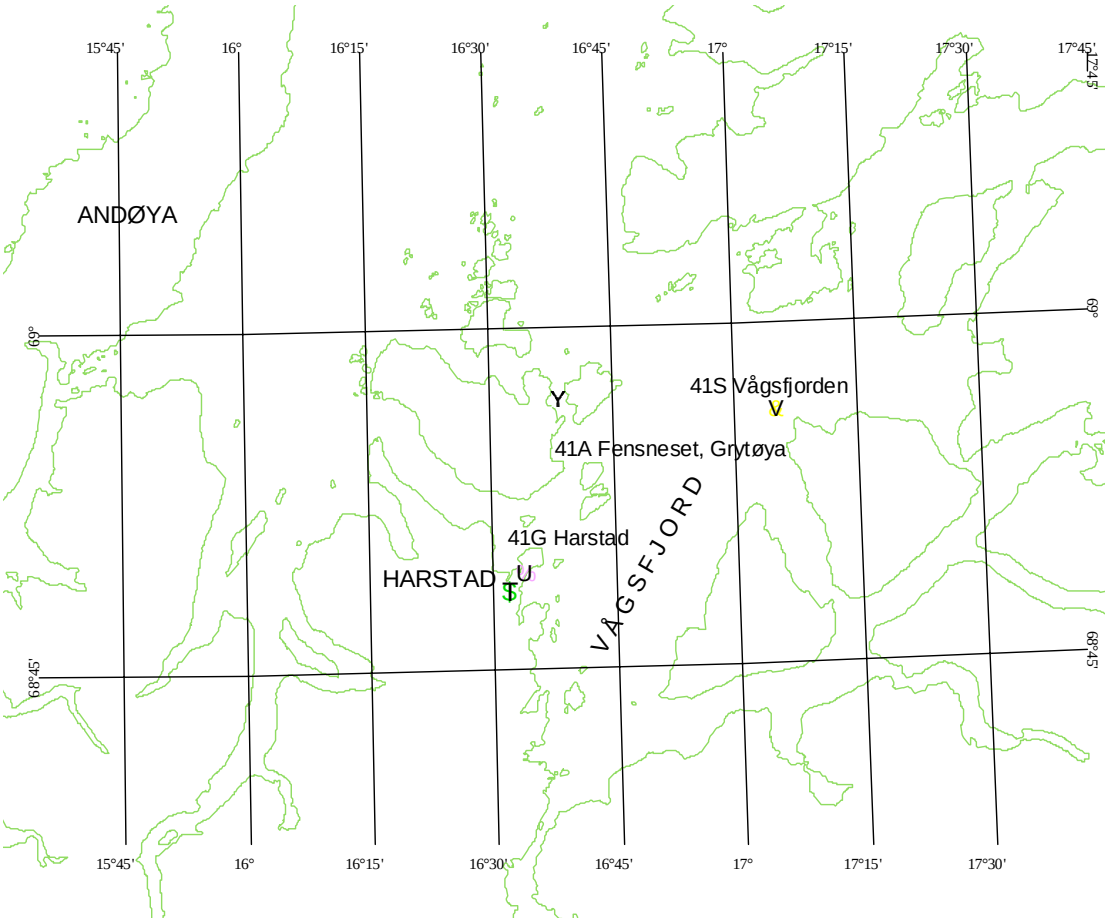
MAP 14


GLOMFJORD
95A Flatskjær
I962 Koksverktomta (B2)
MO I RANA
I965 Moholmen (B5)
I969 Bjørnbærviken (B9
96A/R096 Breiviken, Tomma
RANAFJORD
12°30'
12°45'
13°
13°15'
13°30'
13°45'
14°
14°15'
66°45'
66°30'
66°15'

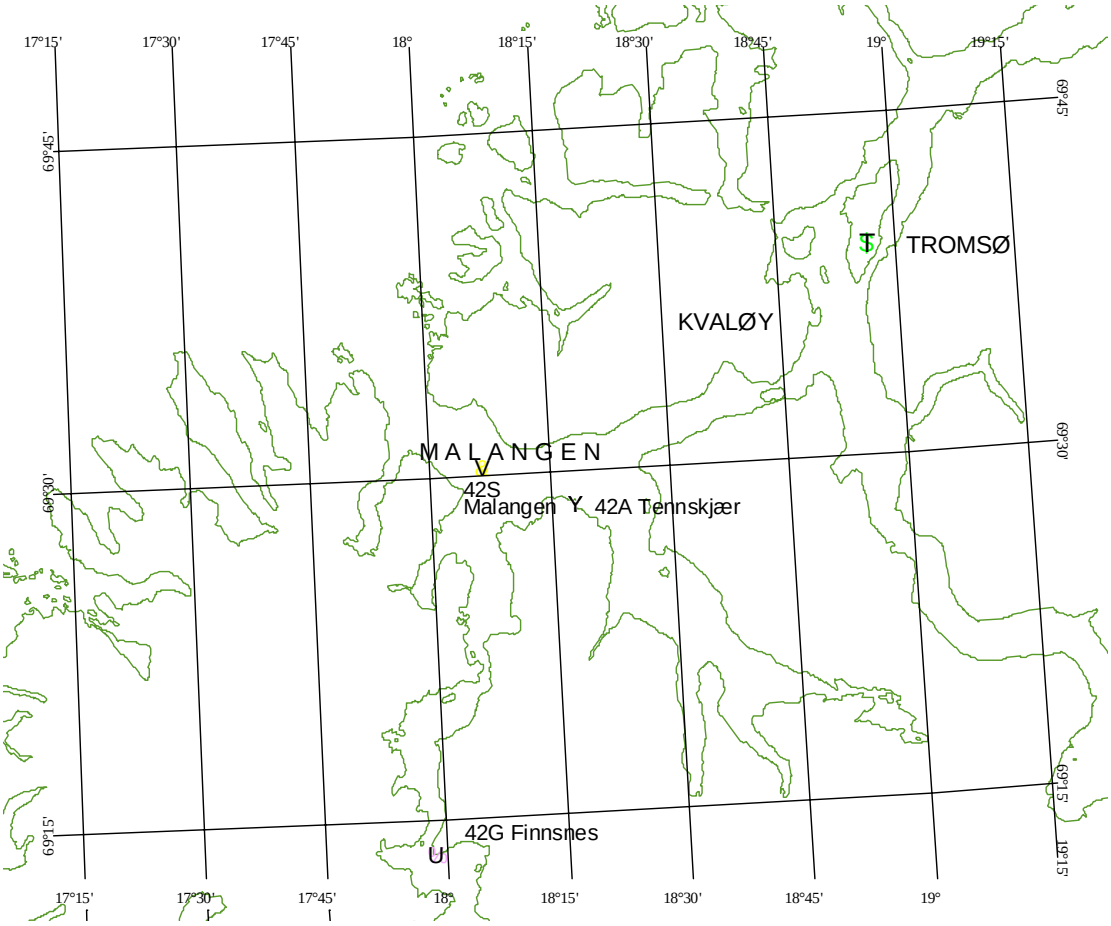
MAP 15


98A Svolvær området
SVOLVÆR
98B/F Lille Molla
98X Skrova
98A Svolvær området
98S Skrova (south of)
99S Lundøy (north of)
VESTFJORD
99A Brunvær
97A Klakholmen
97A Klakholmen
13°45'
14°
14°15'
14°30'
14°45'
15°
15°15'
15°30'
68°
67°45'

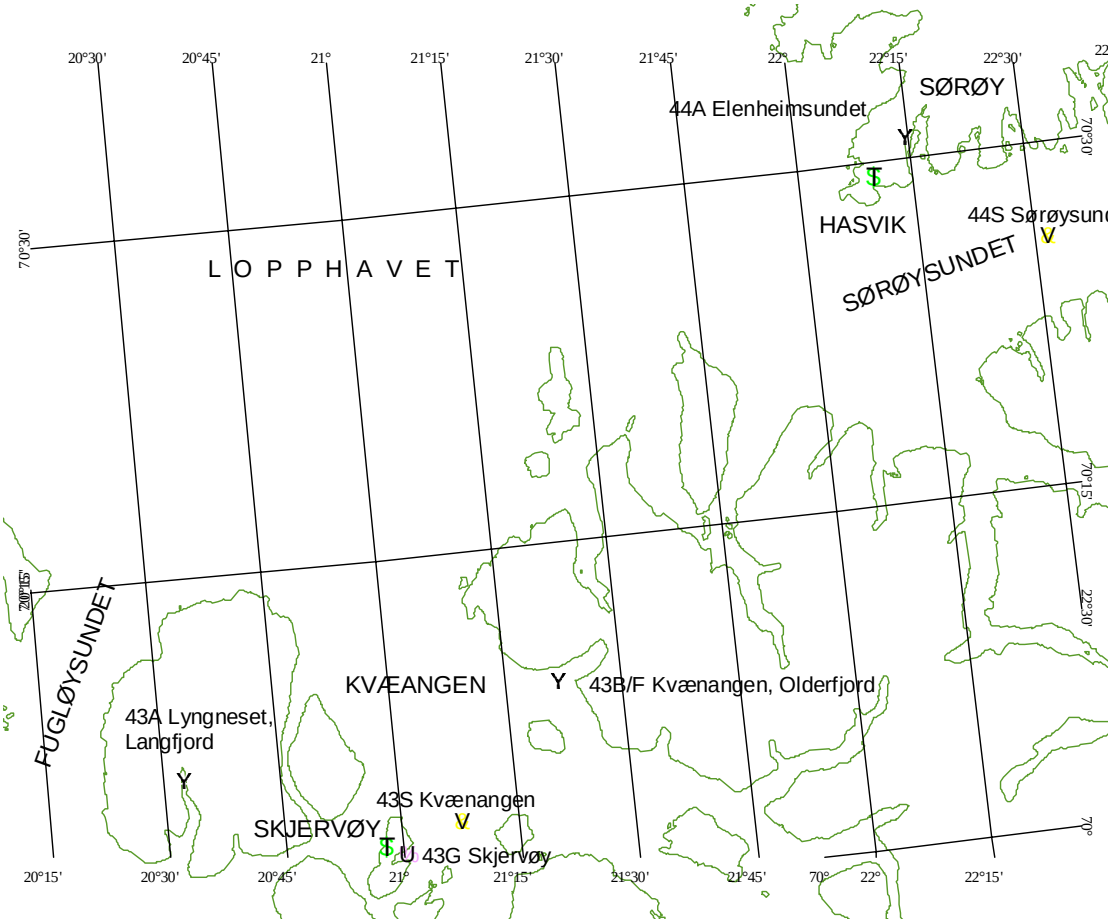
MAP 16


15°45'
16°
16°15'
16°30'
16°45'
17°
17°15'
17°30'
17°45'
ANDØYA
69°
68°45'
41S Vågsfjorden
Y
41A Fensneset, Grytøya
41G Harstad
HARSTAD
U
VÅGSFJORD

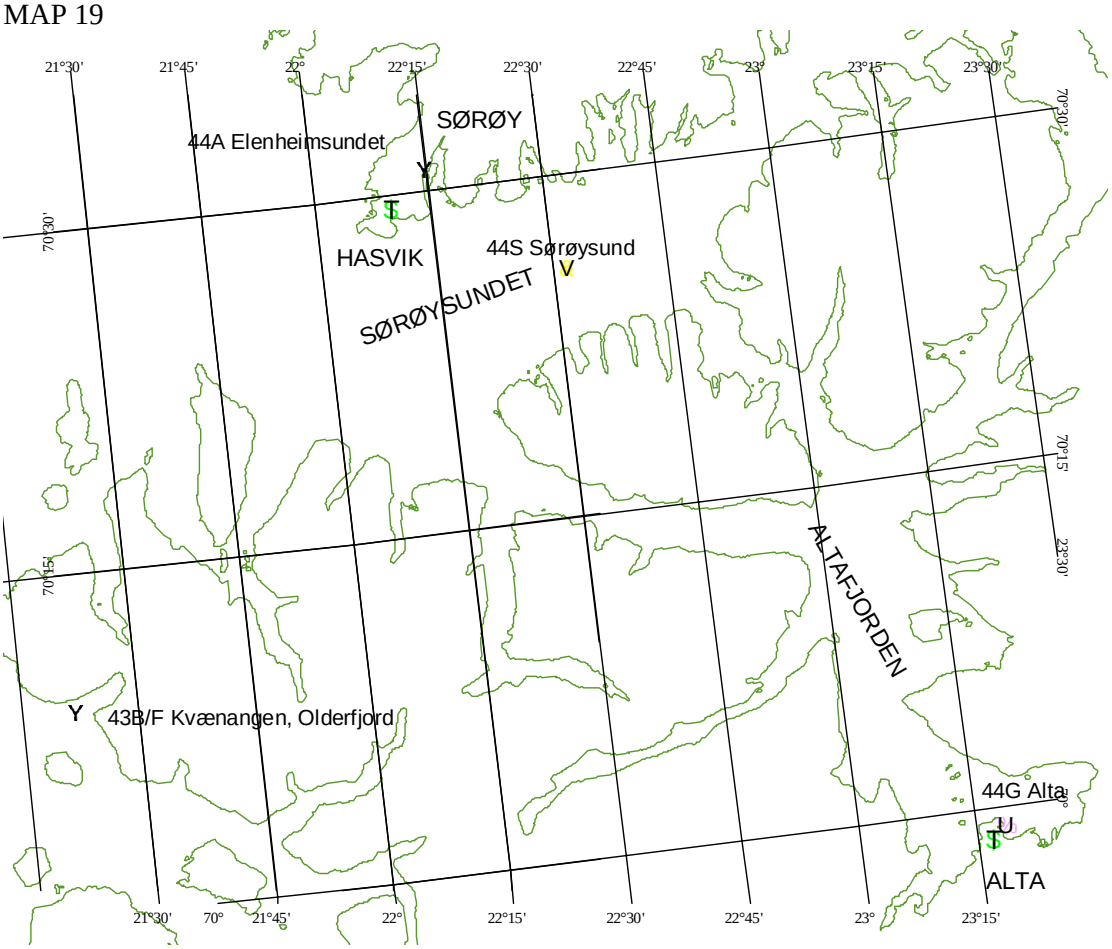
MAP 17


17°15'
17°30'
17°45'
18°
18°15'
18°30'
18°45'
19°
19°15'
69°45'
69°30'
69°15'
TROMSØ
KVALØY
MALANGEN
42S
Malangen Y
42A Tennskjær
42G Finnsnes
U

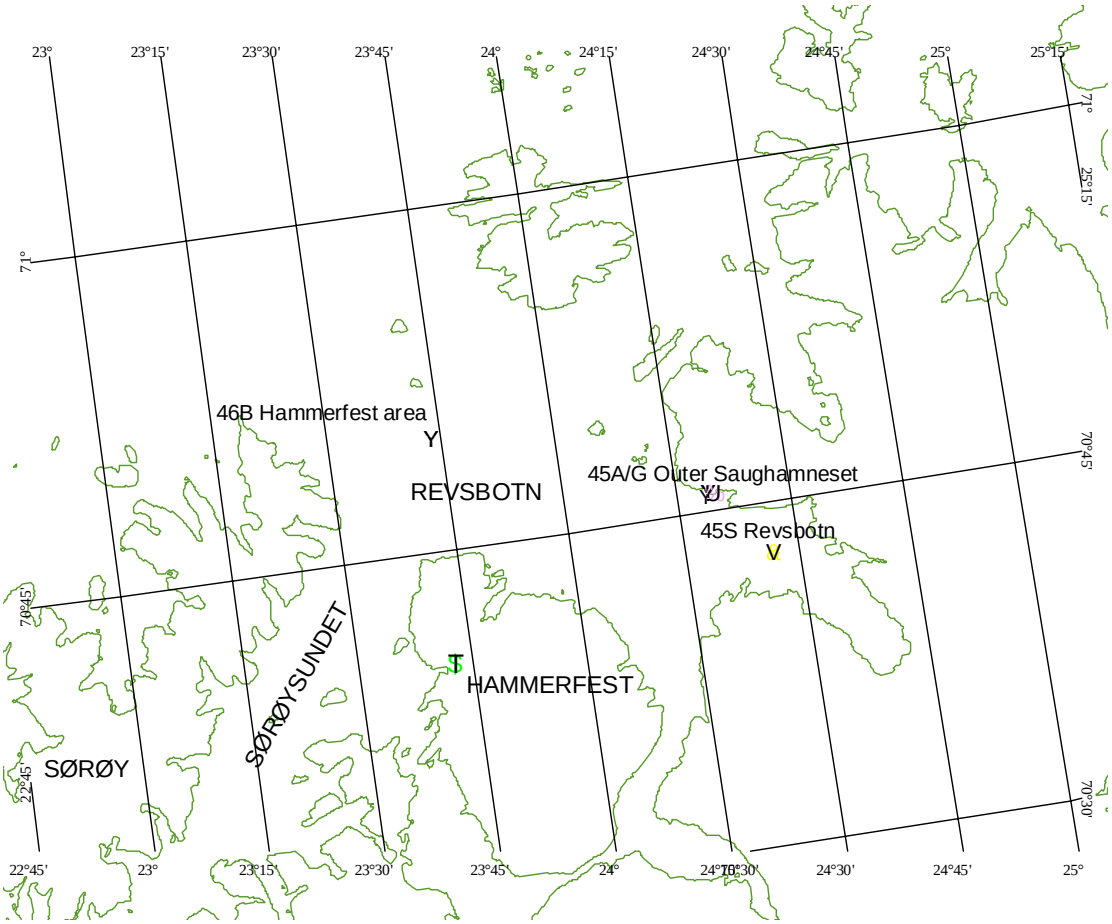
MAP 18


SØRØY
44A Elenheimsundet
HASVIK
44S Sørøysund
SØRØYSUNDET
L O P P H A V E T
FUGLØYSUNDET
KVÆANGEN
43B/F Kvænangen, Olderfjord
43A Lyngneset, Langfjord
43S Kvænangen
SKJERVØY
U 43G Skjervøy

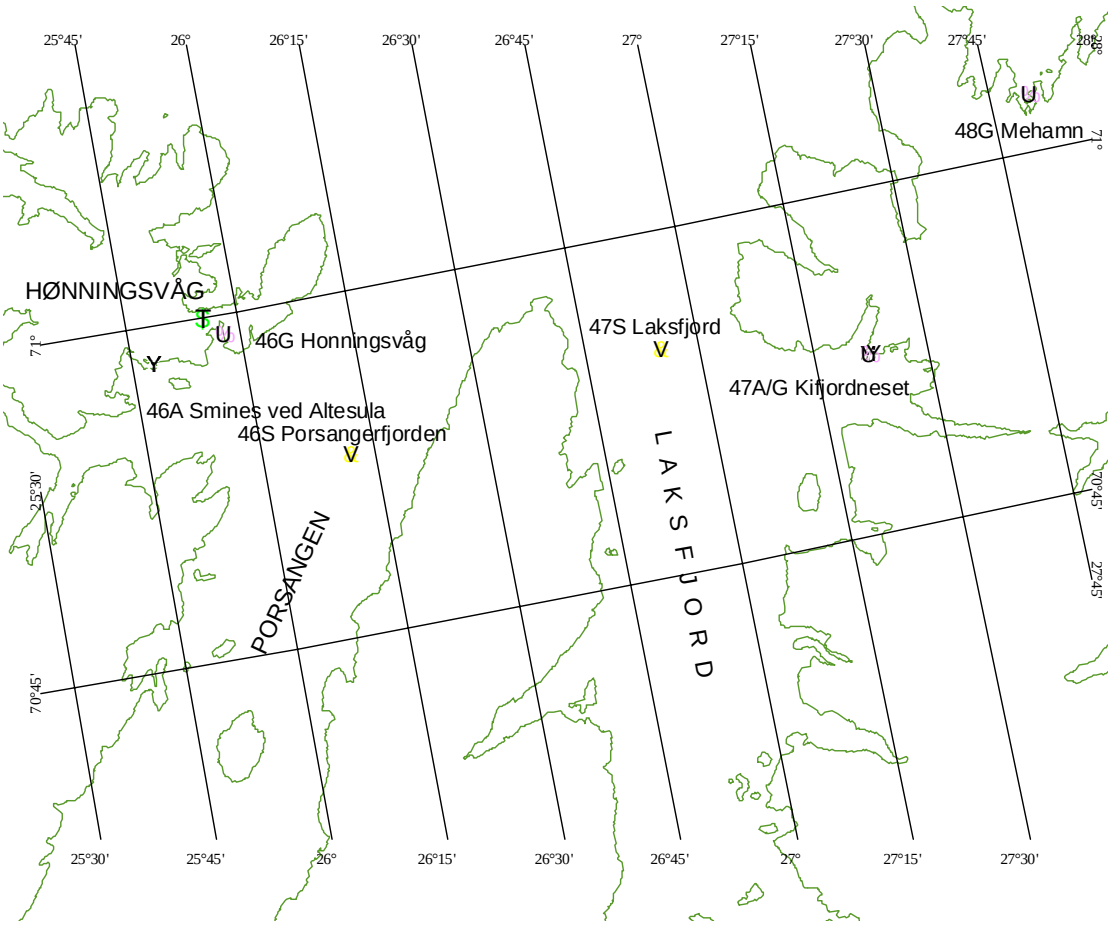
MAP 19


SØRØY
44A Elenheimsundet
HASVIK
44S Sørøysund
SØRØYSUNDET
ALTAFJORDEN
43B/F Kvænangen, Olderfjord
44G Alta
U
ALTA

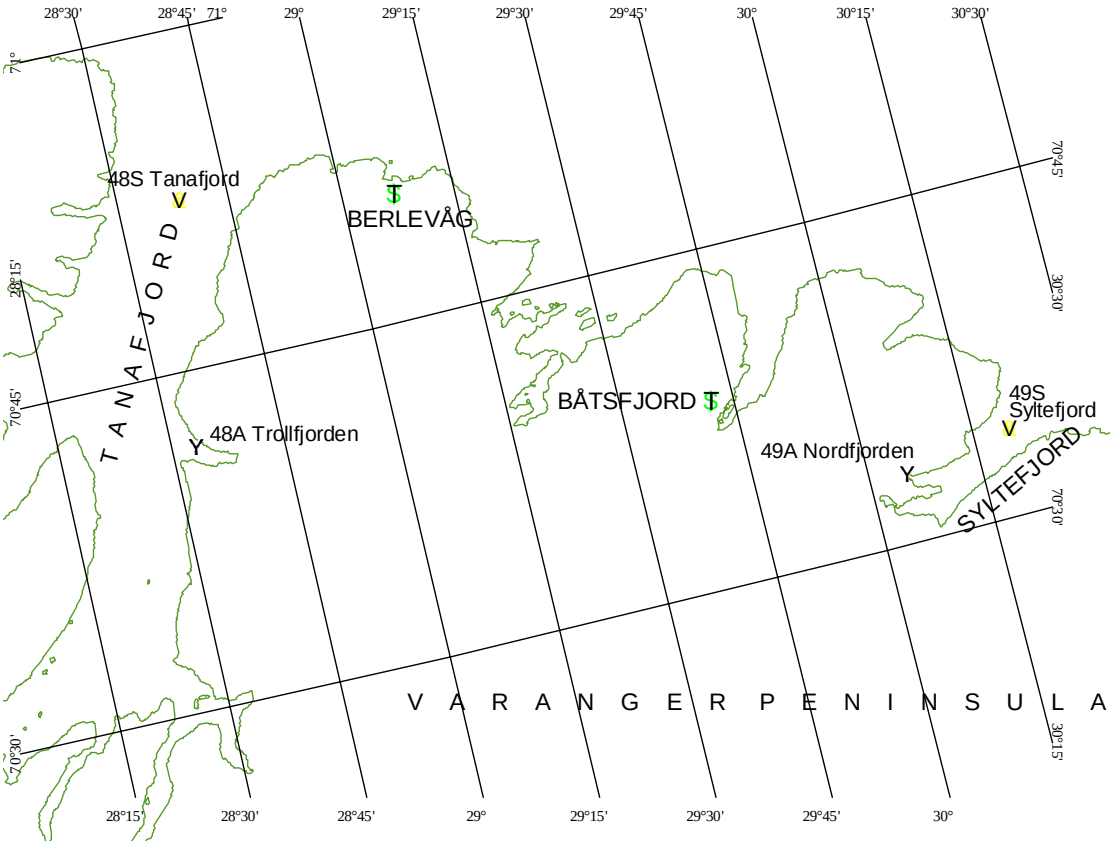
MAP 20


46B Hammerfest area
Y
REVSBOTN
45A/G Outer Saughamneset
U
45S Revsbotn
V
SØRØYSUNDET
HAMMERFEST
SØRØY

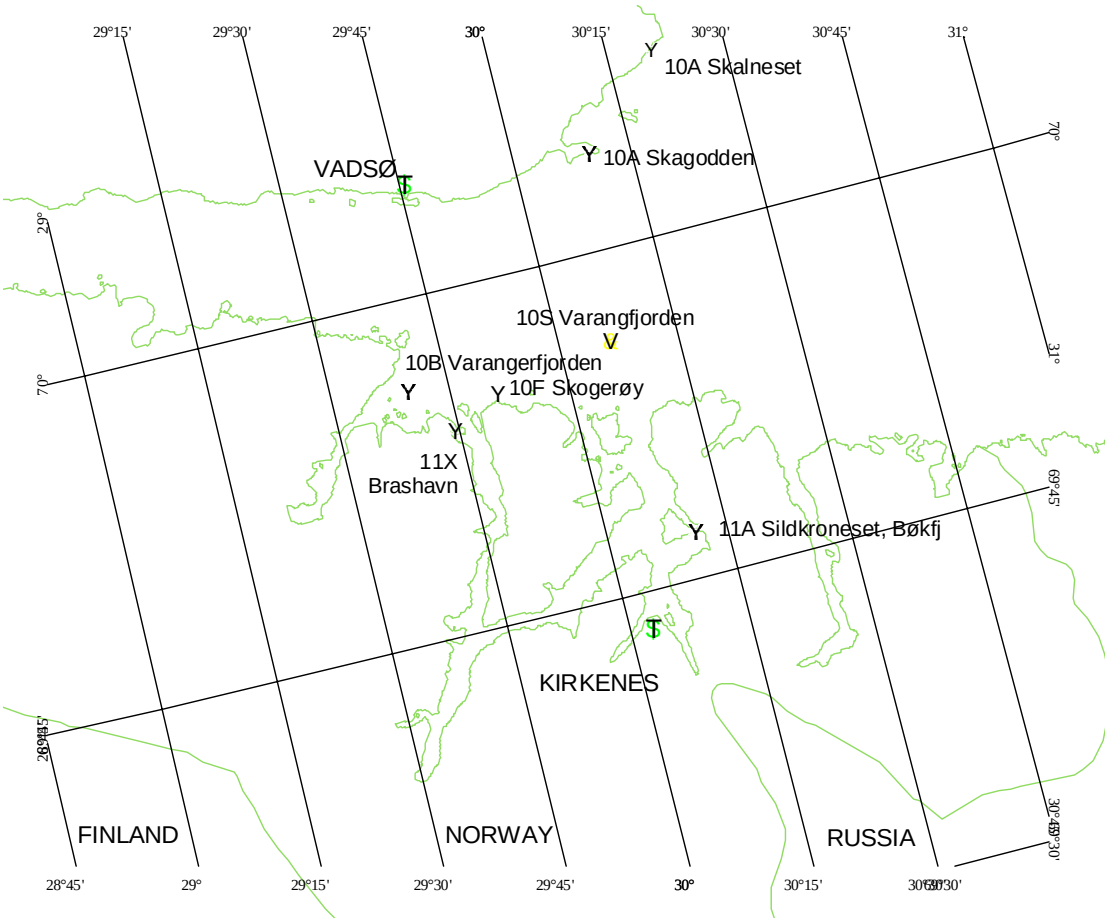
MAP 21


48G Mehamn
U
HØNNINGSVÅG
46G Honningsvåg
U
Y
47S Laksfjord
V
47A/G Kjfjordneset
U
46A Smines ved Altesula
46S Porsangerfjorden
V
PORSANGEN
LAKSFJORD

MAP 22


48S Tanafjord
BERLEVÅG
TANAFJORD
BÅTSFJORD
49S
Syltefjord
48A Trollfjorden
49A Nordfjorden
SYLTEFJORD
VARANGERPENINSULA

MAP 23


10A Skalneset
VADSØ
10A Skagodden
10S Varangfjorden
10B Varangerfjorden
10F Skogerøy
11X
Brashavn
11A Sildkroneset, Bøkfj
KIRKENES
FINLAND
NORWAY
RUSSIA

MAP 24

Appendix F.
SEDIMENT 1986-1997
RAW DATA

NOTES

This appendix presents mean concentrations of the contaminants found in sediment. All data are on a dry weight basis. Three units of measure are used: **ppt** (parts per thousand), **ppm** (parts per million, mg/kg), and **ppb** (parts per billion, μg/kg). The numeric values shown have been printed with a fixed number of digits and do not necessarily indicate analytical precision. Refer also to the comments preceding the table.

The sample area code refers to the official JAMP designation and for some areas this may be undefined (J99).

Sample area Geographically beginning with those stations near the Swedish border and continuing around the coast to the Russian border (cf., maps, Appendix E). The sample area code refers to the official JAMP designation and for some areas this may be undefined (J99).

Locality Station name and postion.The data are sorted geographically along the coast from the Swedish border in the south to the Russian border in the north *viz* (cf., maps, Appendix E): 30S, 35S, 36S, 77S, 15S, 22S, 24S, 52S, 56S, 57S, 63S, 67S, 69S, 27S, 89S, 84S, 82S, 90S, 93S, 95S, 99S, 98S, 41S, 42S, 43S, 44S, 45S, 46S, 47S, 48S, 49S, and 10S.

Type refers to sample method: where GC=gravity corer (used by NIVA).

Diameter refers to inner diameter (mm) of GC

The abbreviations for analytical laboratory and variable name are explained in Appendix A. Analysis codes have been described Green *et al.*(2001a). An overview of variables, detection limits and data count are given in recent JAMP annual reports (cf., Green *et al.* 2002).

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Appendix G.
SEDIMENT 1986-1997
MEAN CONCENTRATIONS

NOTES

This appendix presents mean concentrations of the contaminants found in sediment. All data are on a dry weight basis and include count, mean and standard deviation for parallel samples, if relevant. Three units of measure are used: **ppt** (parts per thousand), **ppm** (parts per million, mg/kg), and **ppb** (parts per billion, μg/kg). The numeric values shown have been printed with a fixed number of digits and do not necessarily indicate analytical precision. Refer also to the comments preceding the table.

The sample area code refers to the official JAMP designation and for some areas this may be undefined (J99).

Sample area Geographically beginning with those stations near the Swedish border and continuing around the coast to the Russian border (cf., maps, Appendix E). The sample area code refers to the official JAMP designation and for some areas this may be undefined (J99).

Locality Station name and postion. The data are sorted geographically along the coast from the Swedish border in the south to the Russian border in the north *viz* (cf., maps, Appendix A): 30S, 35S, 36S, 77S, 15S, 22S, 24S, 52S, 56S, 57S, 63S, 67S, 69S, 27S, 89S, 84S, 82S, 90S, 92S, 95S, 99S, 98S, 41S, 42S, 43S, 44S, 45S, 46S, 47S, 48S, 49S, and 10S.

Type refers to sample method: where GC=gravity corer (used by NIVA).

Diameter refers to inner diameter (mm) of GC

The abbreviations for analytical laboratory and variable name are explained in Appendix A. Analysis codes have been described Green *et al.*(2001a). An overview of variables, detection limits and data count are given in recent JAMP annual reports (cf., Green *et al* 2002.).

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