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Biological Effects Methods, Norwegian monitoring 1997-2001

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Abstract

The results for application of biological effects methods in JAMP 1997-2001 are presented and included the monitoring of cod and/or flatfish (15 stations) along the coast of Norway from Oslo to Bergen, Lofoten and Varangerfjord. The methods evaluated are quantification of bile-concentrations of 1-OH-pyrene (pyrene metabolite), activity/inhibition of the enzyme δ-aminolevulinic acid dehydrase (ALA-D), activity of 7-ethoxyresorufin-*O*-deethylase (EROD; activity of cytochrome P4501A) and hepatic concentrations of metallothionein. Of the four methods investigated, OH-pyrene, ALA-D and EROD, provide useful information about how and whether contaminants affect fish. The results for the fourth method, hepatic metallothionein, could not clearly be related to metal effects in the areas investigated.
It is recommended to continue the biological effects programme for Atlantic cod at the same stations for three methods: OH-pyrene, ALA-D and EROD. The results for metallothionein did not indicate clear effects and the use of this method should be discontinued. The same three methods should also be continued for flounder, but there is a need for a reference site for this species. Flounder is found in the most contaminated coastal areas and estuaries both in Norway and other European countries. It is therefore important to enhance the database for biological effects in this species. This report is part of the Norwegian contribution to the SIME 2003 meeting administrated by OSPAR.

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1. Biologiske effekter	1. Biological effects
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JOINT ASSESSMENT AND MONITORING PROGRAMME (JAMP)

BIOLOGICAL EFFECTS METHODS,

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Foreword

This report presents the results from the biological effects monitoring as applied in the Norwegian Joint Assessment and Monitoring Programme (JAMP) 1997-2001. 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). ASMO has delegated implementation of part of the programme to the Working Group on Concentrations, Trends and Effects of Substances in the Marine Environment (SIME). The Norwegian 1997-2001 investigations are directed to particular JAMP issues relating to contaminants and implemented by SIME.

This contribution to the Norwegian JAMP for 1997-2001 was carried out by the Norwegian Institute for Water Research (NIVA) by contract from the Norwegian Pollution Control Authority (SFT), (NIVA contract O-80106). It was initiated by NIVA in 1997 as part of the national monitoring programme. It now comprises five fjord areas: the Oslofjord, Lista, Sørfjord/Hardangerfjord to the open coast, Lofoten and Varangerfjord.

Thanks are due to many colleagues at NIVA, especially: Unni Efraimsen, Åse Kristine Rogne, Sigurd Øxnevad, Tom Tellefsen for field work, sample preparations, data entry; Torgunn Sætre, Alfhild Kringstad, Einar Brevik and colleagues for organic analyses; Norunn Følsvik and Torgunn Sætre for organotin analyses; Bente Hiort Lauritzen and her colleagues for metal analyses; Randi Romstad and her colleagues for biological effects measurements, Gunnar Severinsen for data programme management and operation; and to the authors Ketil Hylland and Anders Ruus (biological effects methods), and Mats Walday (organotin). Thanks go also to the numerous fishermen and their boat crews for which we have had the pleasure of working with.

Oslo,28 February 2003.

Norman W. Green
Project co-ordinator

Contents

1. Executive Summary / *Sammendrag*

Biological effects methods, BEM or biomarkers were introduced in the Norwegian JAMP in 1997. The purpose of these markers is, by investigations on molecular/cell/individual level, to give warning signals if ecosystems are affected by toxic compounds, i.e. contaminants, and to assist in establishing an understanding of the specific mechanisms involved. Biomarkers can, in other words, provide information regarding *the effects* of xenobiotics, and not simply their concentrations in environmental matrices. This report assesses the use of biological effects methods within the Norwegian JAMP 1997-2001, leading to conclusions and recommendations for future use of such methods.

The biological effects methods measured are OH-pyrene (pyrene metabolite; specificity for PAH), δ-aminolevulinic acid dehydrase (ALA-D; specificity for lead), cytochrome P4501A activity (EROD; specificity for planar hydrocarbons) and metallothionein (MT; specificity for Cd, Cu, Zn, [Hg]). Through the five years of monitoring, these BEMs have been determined in cod from eight stations and flatfish from seven stations along the coast from the Oslofjord to the Russian border. Six of the seven flatfish stations were near the cod stations.

The results from this investigation indicate that the measurement of PAH metabolites in bile (exemplified by 1-OH-pyrene) is a reliable method to quantify the extent of PAH contamination in marine coastal systems. The results from this programme also provide a putative background level for 1-OH-pyrene for Atlantic cod and plaice. Furthermore, the results show that specific coastal areas in Norway appear to be affected by PAHs. From the data available here it is however not possible to separate inputs from air (long-range transport) and local sources (exhaust, small oil spills, etc.).

The results confirmed that red blood cell ALA-D is inhibited by lead and can be expected to be effected in fish from coastal areas near led inputs , such as urban and/or industrial centers. Some results indicate that there may be a threshold concentration of lead above which ALA-D is affected and also that there may be adaptation (although at a depressed level) following chronic exposure. ALA-D does not appear to be strongly affected by other endogenous (or exogenous) factors. It is therefore possible to set reference values for this biomarker. Such reference values can be set for Atlantic cod and plaice using the data from the Norwegian JAMP-programme. Interpretation of the response, however, was made more difficult by the lack of a complementary dataset for tissue lead. More specific, the ALA-D results show clear evidence for effect in the two most contaminated areas, Sørfjord and the inner Oslofjord. Results for more diffusely affected areas are more uncertain and fish in remote areas do not appear to be affected by lead. The interpretation of the results are hampered by the lack of data for the same flatfish species along the entire coast.

Despite the large variability both within and between species, the results also show that hepatic EROD activity is affected by organic contaminants and that fish collected in areas with local inputs respond in a reproducible manner. A novel result is the indication that size may affect the EROD response in some species. This effect does not appear to reflect maturation or sex-related differences. There were surprisingly small differences between sexes, indicating that the time of year (September-October) is appropriate for sampling to reduce such differences. More specific, the EROD-results show that fish in the two most contaminated areas, Sørfjord and the inner Oslofjord, are affected by organic contaminants (as is also shown through approximately 20 years of JAMP-monitoring). There were clear relationships with accumulation of contaminants. There was also a reproducible increase in hepatic EROD in fish from these two areas. The range of responses in less contaminated areas also indicate that individual fish are affected by organic contaminants.

Hepatic metallothionein generally reflected metal concentrations in the liver of the fish studied. For cod and dab, differences appeared to reflect natural endogenous processes involving the two essential metals zinc and copper. For flounder and plaice, there was some indication that cadmium (and for plaice, mercury) may affect the response, but this relationship was weak. As for EROD, there was a surprising relationship between metallothionein and size, but only minor differences due to sex. In

the species investigated here, metallothionein does not appear to provide easily interpretable information about the metal exposure.

Of the four methods investigated during the Norwegian JAMP in the period 1997 to 2001, OH-pyrene, ALA-D and EROD provide useful information about how and whether contaminants affect fish. The results for the fourth method, hepatic metallothionein, could not clearly be related to metal effects in the areas investigated.

It is recommended to continue the biological effects programme for Atlantic cod at the same stations for three methods: OH-pyrene, ALA-D and EROD. The results for metallothionein did not indicate clear effects and the use of this method should be discontinued. The same three methods should also be continued for flounder, but there is a need for a reference site for this species. Flounder is found in the most contaminated coastal areas and estuaries both in Norway and other European countries. It is therefore important to enhance the database for biological effects in this species.

Sammendrag

Biologiske effekt-metoder, BEM (eller biomarkører), ble introdusert i norske JAMP i 1997. Hensikten med disse markørene er, ved å gå inn på molekyl/ celle/organisme-nivå, å gi varselsignaler om økosystemer er påvirket av giftige stoffer (miljøgifter), samt å bidra til å øke forståelsen rundt de spesifikke mekanismene som er involvert i de eventuelle forstyrrelsene. Biomarkørene kan med andre ord bidra med informasjon om effekter av fremmedstoffer og ikke bare deres konsentrasjoner i miljøet. Denne rapporten vurderer bruken av biologiske effekt-metoder innenfor norske JAMP 1997-2001, som fører til konklusjoner og anbefalinger for fremtidig bruk av slike metoder.

De biologiske effekt-metodene som er målt er OH-pyren (pyren-metabolitt; spesifisitet for PAH), δ-aminolevulinic acid dehydrase (ALA-D; spesifisitet for bly), cytokrom P4501A aktivitet (EROD; spesifisitet for plane hydrokarboner) og metallotionein (MT; spesifisitet for Cd, Cu, Zn). I løpet av 5 år med overvåking har disse metodene vært brukt på torsk fra 8 stasjoner og flyndre-arter fra 7 stasjoner langs kysten, fra Oslofjorden til grensen mot Russland. Seks av flatfiskstasjonene lå i nærheten av torskestasjonene.

Resultatene fra denne undersøkelsen indikerer at målinger av PAH-metabolitter (eksemplifisert av 1-OH-pyren) er en pålitelig metode for å kvantifisere utstrektningen av PAH-forurensning i kyst-områder. Resultatene fra dette programmet gir også et antatt bakgrunnsnivå for 1-OH-pyren for torsk og rødspette. Resultatene viser også at spesifikke kystområder i Norge ser ut til å være påvirket av PAH. Fra de data som er tilgjengelig er det imidlertid ikke mulig å skille tilførsel fra luft (lang-transportert) og lokale kilder.

Resultatene bekreftet at ALA-D i røde blodlegemer hemmes av bly, og kan forventes å være påvirket i fisk fra kystområder nær blytilførsel, slik som urbane og/eller industrialiserte områder. Noen resultater indikerer at det kan være en terskelverdi for konsentrasjoner av bly, hvilket ALA-D påvirkes ved overskridelse. Det kan også være en adapsjon (dog lavt) ved kronisk eksponering. ALA-D ser ikke ut til å bli særlig påvirket av andre endogene (eller eksogene) faktorer. Det er derfor mulig å sette referanseverdier for denne biomarkøren. Slike referanseverdier kan bli satt for torsk og rødspette vha. data fra det norske JAMP-programmet. Tolkning av responsen var imidlertid vanskelig på grunn av ufullstendige data på vevskonsentrasjoner av bly. Mer spesifikt viste ALA-D-resultatene effekter av miljøgifter i de mest forurensede områdene Sørfjord og indre Oslofjord. Resultater fra mer diffust påvirkede områder er mer usikre og fisk i de mest avsidesliggende områdene ser ikke ut til å være påvirket av bly. Tolkningen av resultatene er hemmet av mangel på data fra flatfiskartene langs resten av kysten.

Til tross for stor variablitet både innen og mellom arter, viser resultatene også at EROD-aktivitet påvirkes av organiske miljøgifter. Det er også indikasjoner på at fiskestørrelse påvirker EROD-responsen i enkelte arter. Denne effekten ser ikke ut til å gjenspeile modningsgrad eller kjønnsrelaterte forskjeller. Det var overaskende små forskjeller mellom kjønnene, noe som indikerer at årstiden (september-oktober) er hensiktsmessig for innsamling, for å redusere slike forskjeller. Mer spesifikt viste EROD-resultatene at fisk i de mest forurensede områdene, Sørfjorden og indre Oslofjord, er påvirket av organiske miljøgifter (som man også vet av 20 år med overvåking gjennom JAMP). Det var klare sammenhenger med akkumulering av miljøgifter. Det var også reproduserbare økninger i EROD-aktivitet i fisk fra disse to områdene. Spennvidden av responser i mindre forurensede områder indikerer også at individuelle fisk er påvirket av organiske miljøgifter.

Metallotionein i lever gjenspeilet generelt metall-konsentrasjoner i leveren til fiskene som er undersøkt. For torsk og sandflyndre ser forskjellene ut til å gjenspeile endogene prosesser, som involverer de essensielle metallene sink og kobber. For skrubbe og rødspette var det noe indikasjon på at kadmium (og for rødspette, kvikksølv) kan påvirke responsen, men denne sammenhengen er svak. Slik som for EROD, var det en overaskende sammenheng mellom metallotionein og størrelse, men bare små forskjeller på grunn av kjønn. I artene som er undersøkt ser det ut til at metallotionein ikke bidrar med tolkbar informasjon om metall-påvirkning.

Av de fire metodene som er undersøkt i norske JAMP i perioden 1997 til 2001, så bidrar OH-pyren, ALA-D, og EROD med nyttig informasjon om hvordan (og om) miljøgifter påvirker fisk. Resultatene fra den fjerde metoden (metallotionein) kunne ikke, uten videre, relateres til metall-påvirkning i områdene som er undersøkt.

Det anbefales at biologisk effekt-programmet fortsettes for torsk på de samme stasjonene for tre metoder: OH-pyren, ALA-D og EROD. Resultatene for metallotionein indikerte ingen klare effekter og bruken av denne metoden bør avsluttes. De samme tre metodene bør også fortsette for skrubbe, men det er behov for en referanse-stasjon for denne arten. Skrubbe finnes i de mest forurensede kystområdene og i estuarier i Norge, så vel som i andre europeiske land. Det er derfor viktig å forbedre databasen for biologiske effekter i denne arten.

2. Introduction

The Norwegian contribution to the “Joint Assessment and Monitoring Programme (JAMP) was initiated by the Norwegian Pollution Control Authority (SFT) and is integrated with SFT’s State Pollution Monitoring Programme. The procedures and practice of JAMP has also provided a basis for other investigations of interest to SFT but not necessarily requested by JAMP (e.g. SFT’s Index Programme (Pollution and Reference Indices).

Data are submitted to ICES under three categories: for Purpose A (health assessment) on a voluntary basis, Purpose C (spatial distribution) on a voluntary basis and Purpose D (temporal trend assessment) on a mandatory basis. Where practical, data collection was in accordance to agreed procedures (OSPAR 1990, 1997). Data were screened and submitted to ICES in accordance with procedures outlined by ICES (1996).

2.1 The purpose of this report

This report focuses on one JAMP issue (no.1.17): "Where do pollutants cause deleterious biological effects?" (ASMO 1997, Annex 30) and assesses the use of biological effects methods within the Norwegian JAMP 1997-2001, leading to conclusions and recommendations for future use of such methods.

2.2 Data source and availability

An overview of JAMP stations in Norway where biological effects methods are employed is shown in Appendix B and in maps in Appendix C. The stations and sample counts relevant to the 2001 investigations are noted in the tables in Appendix B. A brief summary of the use of these methods during the period 1997-2001 has been recently reported in the Norwegian National Comments for JAMP 2001 (Green *et al.*, 2002).

2.3 Biological effects methods

Biological effects markers, BEM or biomarkers were introduced in the Norwegian JAMP in 1997. The purpose of these markers is, by investigations on molecular/cell/individual level, to give warning signals if ecosystems are affected by toxic compounds, i.e. contaminants, and to assist in establishing an understanding of the specific mechanisms involved. Biomarkers can, in other words, provide information regarding *the effects* of xenobiotics, and not simply their concentrations in environmental matrices.

Exposure of environmental contaminants to biological systems will first affect molecular and cellular processes. If the adaptation- and repair-mechanisms are overloaded, the effect will be transferred to another level (f. i. tissue, organ, individual, population, or community/ecosystem). Effects at higher hierarchical levels are always preceded by changes in “lower” processes, allowing the development of the mentioned biomarker signals of effects at “higher” response levels (Bayne *et al.* 1985) (Figure 1).

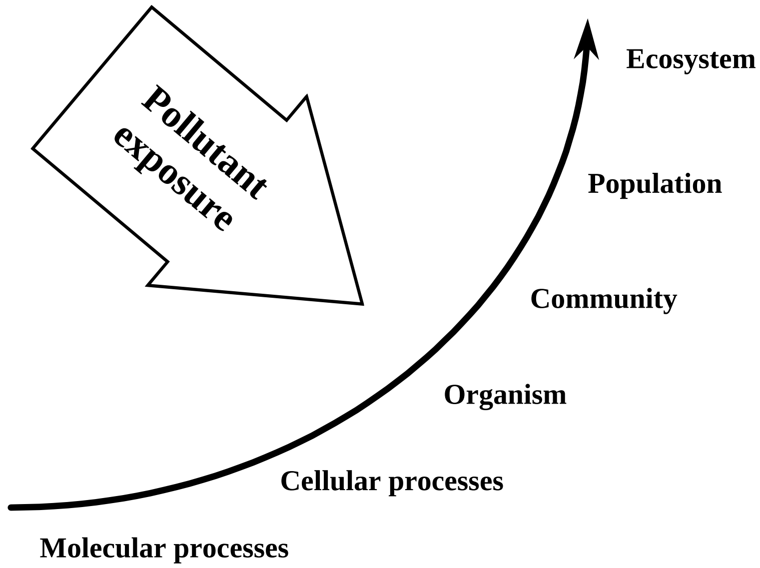

Figure 1. Sequential order of responses to pollutant exposure within a biological system.

There are several definitions for a "biomarker". According to Peakall (1994) biomarkers are "*biological responses that can be related to an exposure to, or toxic effect of, an environmental chemical or chemicals*". This is a very wide definition, since "biological responses" can refer to responses at any hierarchical level, from molecular processes to the ecosystem. Other definitions are more specific, such as that of Mayer (1992) which states that biomarkers are "*quantifiable biochemical, physiological, or histological measures that relate in a dose- or time-dependent manner to the degree of dysfunction that contaminants have produced*". This narrows a biomarker down to the lower hierarchical levels illustrated in Figure 1. These measures are quickly evident, but not readily interpreted at the population level. Measures at higher hierarchical levels will, on the other hand, become evident too late to have a diagnostic or preventive value, and thus not function as the wanted "early warning signal".

The definition of Mayer (1992) includes a number of parameters that may serve as a biological effects marker/biomarker. Examples are (Fox, 1993):

- induction of the stress response
- induction of detoxification systems
- inhibition of specific enzymes
- metabolic impairments that detrimentally alter synthetic or degradative processes or that deplete energy, vitamin, or substrate stores
- impaired growth or failure to thrive, mass loss
- genetic damage, or impaired repair
- impairment of immune system function
- impaired or altered reproductive function
- impaired organ or tissue function based on functional tests or histopathological alterations.

For any biological response, there are criteria for it to serve as a biomarker, according to Stegemann *et al.* (1992):

1 The assay to quantify the biomarker should be sensitive, reliable, and relatively simple;
2 baseline data for the concentration/activity of the biomarker should be known in order to be able to distinguish between natural variability (noise) and contaminant induced stress (signal);

3 the basic biology/physiology of the test organism should be known so that sources of uncontrolled variation (growth and development, reproduction, food sources) can be minimized;
4 all the factors, intrinsic as well as extrinsic, that affect the biomarker should be known;
5 it should be established whether changes in biomarker concentration are due to physiological acclimation or to genetic adaption; and finally,
6 changed levels of the biomarker should be correlated with the “health” or “fitness” of the organism.

2.4 Biological effects methods in the Norwegian JAMP

The JAMP-programme for 1997-2001 included five biological effects methods (BEM): OH-pyrene, ALA-D, EROD, MT and TBT (Table 1). The first four are discussed in this report. All have been briefly reviewed in the JAMP national comments for 2001 (Green *et al.* 2002).

Table 1. Summary of biological effects methods employed by the Norwegian JAMP in the period 1997-2001.

Code	Name	tissue sampled	Specificity
OH-pyrene	pyrene metabolites	fish bile	PAH
ALA-D	δ-amino levulinic acid dehydrase inhibition	fish red blood cells	Pb
EROD	cytochrome P4501A-activity (CYP1A/P4501A1, EROD)	fish liver	planar PCB/PCNs, PAHs, dioxins
MT	metallothionein	fish liver	Cd Cu Zn (Hg)
TBT	imposex/Intersex	snail soft tissue	organotin

The reason to use biological effects methods within monitoring programmes is to evaluate whether marine organisms are affected by contaminant inputs. Such knowledge can not be derived from tissue levels of contaminants only. In addition to enable conclusions on the health of marine organisms, some biomarkers assist in the interpretation of contaminant bioaccumulation. The biological effects component of the Norwegian JAMP is possibly the most extensive of its type in Europe and includes imposex in gastropods as well as biomarkers in fish. The four chosen methods for fish were selected for specificity, for robustness and because they are among a limited set of methods proposed by international organisations, including OSPAR and ICES.

The measures derived from OH-pyrene, EROD and MT (cf. Table 1) increase with increased exposure to their respective inducing contaminants. The activity of ALA-D on the other hand is inhibited by contamination (mainly lead), thus lower activity means higher exposure.

Each year, 25 individual cod were sampled for biological effects measurements at each of the eight stations. Similarly, 25 flatfish were collected in each of the other areas indicated above. All fish were collected by local fishermen and kept alive until arrival of NIVA staff within 5 days. Live fish were sampled except in a few cases where OH-pyrene was measured in bile taken from gallbladder that had been frozen. There is an ongoing process to train and inform the fishermen that collect fish for JAMP to ensure the quality of the material. The results are presented in Appendix D.

3. Materials and methods

3.1 Compliance with guidelines/procedures

Samples were collected and analysed, where possible, according to OSPAR guidelines for OH-pyrene and EROD (OSPAR 1998).

The data is stored at NIVA in MS ACCESS 1997. The tables have been generated using MS ACCESS 97 and MS EXCEL 97.

3.2 Locations and species

OH-pyrene, ALA-D, EROD and MT were measured in Atlantic cod along the coast from the Oslofjord to the Russian border, including the Sørfjord and Hardangerfjord area (23B, 30B, 36B, 53B, 67B, 98B, 10B). The same parameters were also measured in flounder at three locations, Sørfjord and Hardangerfjord area and the nearby reference area in the Åkrafjord (21F, 53F, 67F), dab at one location in outer Oslofjord (st.36F) and in the Lista area (15F) and plaice from Lofoten (st.98F) and Varangerfjord (10F). No data from station 15B/F was obtained in 2000. There is also a limited number of samples from 21F and only from the last three years. Samples from the inner Oslofjord (st.30B), Sørfjord (53B/F) and to some extent Hardangerfjord (67B/F) are considered to be more highly contaminated with metals and organochlorines than the other stations. An overview of the samples collected can be found in Table 2 and Appendix B. Table 2 also indicate which stations are considered as reference locations or areas presumed only diffusely contaminanted.

Atlantic cod (*Gadus morhua* L.) is present and can be collected along the entire Norwegian coast, from south to north and from the inner end of fjords to the open sea. In contrast, Norwegian flatfish species have more limited spatial distribution. The main OSPAR target species, dab (*Limanda limanda* L.) and European flounder (*Platichthys flesus* L.) are present along the entire coast, but their availability in different coastal habitats vary. Generally, flounder is most abundant in shallow parts of fjords and inshore areas, whereas dab is mainly found on the open coast. Plaice (*Pleuronectes platessa* L.) is similarly found along the entire Norwegian coast from south to north, but only in some habitats.

Table 2. Sampling years for biological effects analyses. A complete overview can be found at Appendix A. The stations are shown from north to south along the coast. The suffix "B" after the station-number indicates cod and the suffix "F" indicates flatfish * indicate reference locations, i.e. those that are presumed to be only diffusely contaminated (with respect to this investigation/report on BEM).

Area	Station code	Atlantic cod	Flounder	Dab	Plaice
Varangerfjord *	10B/F	2000-2001			2000-2001
Svolvær *	98B/F	2000-2001			2000-2001
Bømlo *	23B	1997-2001			
Åkrafjord *	21F		1999-2000		
Hardangerfjord	67B/F	1997-2001	1999-2001		
Inner Sørfjord	53B/F	1997-2001	1999-2001		
Lista	15B/F	1997-2001		1999-2001	
Færder	36B/F	1997-2001		1999-2001	
Inner Oslofjord	30B	1997-2001			

3.3 Analytical methods

Detailed descriptions of the analytical methods can be found at 6.Appendix A.

3.3.1 OH-pyrene metabolites

When fish are exposed to, and take up PAHs, the compounds are biotransformed into polar metabolites, to enable their excretion. One such biotransformation is the coupling of a hydroxyl-group to the molecule (Figure 7 in Appendix A) .The bile is thought to be the dominant excretion route of metabolites of especially larger PAH molecules in fish (Meador *et al.* 1995). Since PAH metabolites are stored for some time and thereby concentrated in the gall bladder, the bile is shown to be a good matrix for the quantification of PAH metabolites (Creaven *et al.* 1965; Lech *et al.* 1973; Statham *et al.* 1976; Aas *et al.* 2000a,b). OH-pyrene metabolites were analysed with HPLC and fluorescence detection.The concentration of pyrene metabolites was normalised to the absorbance at 380nm (bile diluted in ethanol), quantified using a spectrophotometer.

3.3.2 ALA-D

One of the most important toxic mechanisms of non-essential metals is the interaction with and inhibition of enzymes, especially enzymes with metal co-factors. One such enzyme is δ-aminolevulinic acid dehydratase (ALA-D) which has Zn as a co-factor (Granick *et al.*, 1972). This enzyme is one step in the synthesis pathway for heme. Heme is incorporated in macromolecules such as hemoglobin and cytochromes. In mammals and birds, inhibition of ALA-D may lead to anemia since it is one of the rate-limiting enzymes in heme (and hence hemoglobin) synthesis. This does not appear to be the case for fish (Larsson *et al.*, 1985). The reason for ecotoxicological interest in ALA-D is its inhibition by Pb, even at very low exposure levels (Hodson *et al.*, 1984; Haux and Förlin, 1989). The ALA-D activity was determined in red blood cells, basically as described by Hodson *et al.*, (1984).

3.3.3 EROD

EROD (7-Ethoxyresorufin-*O*-deethylase) is a specific cytochrome P450 reaction where ethoxyresorufin is used as substrate (Burke & Mayer, 1974). Cytochrome P450 1A catalyse the deethylation of 7-ethoxyresorufin to resorufin. Cytochrome P4501A activity in microsome fractions can be quantified from the amount of resorufin produced (Andersson & Förlin, 1985). The resorufin can be quantified by spectrophotometric or fluorimetric methods (Klotz *et al.*, 1984). In addition to being substrates for biotransformation, different planar hydrocarbons can also interact with cytochrome P450 1A as inducers (Boon *et al.*, 1992; Goksøyr and Förlin, 1992). The induction is initiated by the binding of the inducer to the cytosolic Ah (Aryl hydrocarbon)-receptor (Rowlands and Gustafsson, 1997; Van den Berg *et al.*, 1998). Several studies have indicated that P450 induction is the first step in a series of toxic symptoms, such as immunosuppression, vitamin and hormonal imbalance, and reproductive failure (reviewed by Safe, 1994). EROD is a tool used to measure this induction. The induction of cytochrome P450 enzymes in fish liver was first suggested as an indicator of environmental contamination in the 1970s by Payne (1976), and the EROD measurement has now gained widespread use in biomonitoring studies with fish (Goksøyr and Förlin, 1992; Sandvik *et al.*, 1997; Ruus *et al.* 2002). Ethoxyresorufin-*O*-deetylase (EROD) activity was assayed fluorimetrically (Burke and Mayer, 1974) using an internal NIVA-method adapted for plate-reader.

3.3.4 Metallothionein

The low-molecular-weight protein metallothionein (MT) is present in most vertebrate tissues. A major role of this protein is regulation of the intracellular availability of zinc (Zn) and/or copper (Cu). Other functions, such as metal detoxification and free radical scavenging, have also been suggested (Kägi and Schäffer, 1988). In addition to Cu and Zn, MT binds non-essential metals such as cadmium (Cd), mercury (Hg) and silver (Ag). The synthesis of the protein is induced by elevated intracellular concentrations of the above mentioned metals. Metallothionein induction is a response to elevated intracellular metal concentrations and the protein has been applied as a biomarker for environmental metal contamination (Hogstrand & Haux, 1989; Hylland *et al.*, 1991). Metallothionein was assayed by the use of differential pulse polarography (DPP) as described by Olsson, (1987).

3.3.5 Protein

ALA-D and EROD activity, as well as metallothionein concentration, were normalised to protein content in the respective preparations, determined according to the Lowry protein assay (Lowry *et al.*, 1951) adapted to measurement by plate reader. Protein standard was bovine gamma globulin.

3.3.6 Statistical analyses

Statistical analysis was performed with the use of Statistica® software (version 6.1; StatSoft). Each of the four biological effect methods (OH-pyrene, ALA-D, EROD, metallothionein) were treated as response (dependent) variables in separate analyses (separate also for each species), and their variability explained by a range of explanatory variables (predictors) (Table 3) in multiple regressions, performed in the GLM (General Linear Models)-module in Statistica®. Due to measurements below detection limits and, in some cases, expected colinearity, specific compounds/congeners were selected to represent specific groups of contaminants (Table 3). Second degree interactions were tested for the categorical factors. Non-significant predictors (with low explanatory value) were manually taken out of the models in a backwards stepwise fashion until the best models were obtained. All continuos predictors were log_2-transformed prior to the analysis to reduce skewness of distributions.

Table 3. Explanatory variables (predictors) in the full GLM model, before stepwise (manual) elimination.

Variable	Abbreviation	Type of variable	Measured in (matrix)	Notes/Explanations
Year	year	Categorical		1997-2001
Station	station	Categorical		
Sex	sex	Categorical		
Maturation	maturation	Categorical		Determined from length [1]
Length	length	Continuous		
Condition	cond	Continuous		Only for cod
Liver Somatic Index	log2LSI	Continuous		
OH-pyrene [2]	oh-pyr	Continuous [2]	Bile	Represents PAH-metabolites
PCB-153	livcb153	Continuous	Liver	Represents congeners with ≥ 2 Cl in *ortho*-position
PCB-105 + -118	l105_118	Continuous	Liver	Represents congeners with 1 Cl in *ortho*-position
p,p'-DDE	livddepp	Continuous	Liver	Represents DDT-compounds/metabolites
Cd	livcd	Continuous	Liver	
Cu	livcu	Continuous	Liver	
Hg	muhg	Continuous	Muscle	
Pb	livpb	Continuous	Liver	
Zn	livzn	Continuous	Liver	

1 *Gadus morhua*: Individuals > 400 mm = mature (others = juvenile).
Limanda limanda: Individuals > 130 mm = mature (others = juvenile).
Platichthys flesus: Individuals > 204 mm = mature (others = juvenile).
Pleuronectes platessa: Individuals > 265 mm = mature (others = juvenile).

2 Not when OH-pyrene was the response (dependent) variable.

4. Results and discussion

4.1 General assumptions and precautions

The JAMP sampling programme has some consequences for the assessment of the biological effects sub-programme. Cod is the only species found at all locations, making it difficult to compare species responses. Of the flatfish species, flounder was sampled at both contaminated and less polluted locations, providing different exposure levels against which to test responses. Dab was sampled in two areas (15 and 36) expected to represent the diffuse contamination levels in the Skagerrak. As will be evident from results presented below, the biological effects programme showed that this was not the case. Dab were in fact exposed to PAH at one of the two locations (15F). Plaice was only sampled in areas with no known point sources and low-level exposure to long-range transported contaminants. In conclusion, only cod and flounder were exposed to different levels of environmental contaminants, the two other species (dab, plaice) were each sampled from two areas with similar contamination loads.

In the present assessment, biological effects responses have been compared with tissue-levels of contaminants and general physiological characteristics. Biological responses and physiological endpoints have been determined for each individual fish as was contaminant levels in cod. Contaminants in flatfish were however determined in pools of five fish. For the purpose of the analyses presented below, each of the five fish were allocated the value of the analyses of the pooled sample.

Biological effects reflect endogenous processes in organisms and will therefore to varying degrees be affected by sex, nutritional status, maturation, general health and the levels of accumulated contaminants. For the analyses presented below it would obviously be desirable to have homogenously distributed samples with regard to size, sex, condition, etc. This is not always possible. Problems associated with skewed distributions have been assessed and will be commented upon in this report. Furthermore, the relative importance of external factors, e.g. contaminant exposure, as compared to internal processes, e.g. maturation or growth, will vary between methods. At one extreme is the concentration of OH-pyrene metabolites in bile, which would not be expected to be strongly affected by endogenous processes (and results actually shows it is not). Metallothionein would be at the other end of the scale – a “householding” protein for the essential metals zinc and copper for which effects of external factors will have to be extracted from factors relating to normal trace metal metabolism (zinc and copper).

To assess any influence of maturation on the chosen methods, fish within each species were divided between juvenile and mature. As it turned out, this parameter did not explain much variability in most of analyses. It will be apparent below whenever maturation status is relevant for the interpretation of results.

The dataset has been running for too short period to conclude on changes between years. There is an ongoing process to develop and improve the methods themselves and the quality assurance aspect of the methods (through the international programme BEQUALM). "Year" has been included as a factor in the analyses, but is interpreted with caution. With the determination of pyrene metabolites, year has a more definite interpretation. Due to an improvement in methodology between 1999 and 2000 (from single wavelength to HPLC separation), values in 1998-1999 and 2000-2001 are not directly comparable. The pattern between stations is however convincingly similar for the two sets. For other methods, between-year variability could derive from environmental factors not controlled for (e.g. temperature) or year-to-year variability in the analyses themselves. Generally, a set of samples from the previous year was run with every year's samples to identify and minimise such effects.

For each of the methods, a “normal” range has been indicated. The range given is simply the quartiles of responses at stations removed from any point source of contaminants. From discussions below it will be evident that it is difficult to provide such absolute limits of what is ”normal” for each response (as they will all be affected by other factors). The values may however be used as a guide to the range that must bee seen as normal for each of the species. It must also be remembered that sampling for this programme has adhered to the general OSPAR guidelines. Hence, the fish has primarily been sampled during September and October, a period in which gender-related differences are at their least. Every effort has also been made to sample 25 fish at each station each year, although this has not been possible for all years, stations and species.

4.2 OH-pyrene metabolites in bile

4.2.1 Specific assumptions and background levels

Detection methods for OH-pyrene have been improved two times since the initiation of these analyses in the JAMP programme. In 1998 the support/normalisation parameter biliverdin was changed to measurement of light absorbance at 380 nm. Furthermore, in 2000, the use of single-wavelength fluorescence for quantification of OH-pyrene was discontinued and the use of HPLC separation with fluorescence detection was implemented. Although there is a good correlation between results from the two methods they can not be compared directly. The single wavelength fluorescence method is naturally more unspecific and will include fluorescence from more components than the HPLC method, which has extremely high specificity towards individual metabolites. The interpretation of OH-pyrene data is therefore primarily focused towards stations within each year.

Bile metabolites of PAH can be detected within a short period (hours) following exposure, and holding conditions prior to sampling may affect results. However, measures were taken in 1998 and 1999 to minimise or remove such exposure. Given the precautions taken, it is unlikely that the observed levels have been caused by exposure during the storage of fish prior to sampling. The higher levels of pyrene metabolites at stations 53B and 30B compared to the other areas (1998 - 2000) presumably reflect the general contamination of the two areas (inner Sørfjord and inner Oslofjord).

There is no reason to expect different fish species to metabolise pyrene with very different rates. The large difference in range observed at reference locations presumably reflects the fact that only Atlantic cod and plaice were collected in areas with low PAH inputs (Table 4). The results indicate that open coastal areas in southern Norway (Færder) and the presumably diffusely contaminated Åkrefjord are to some extent affected by PAHs.

Table 4. Biliary concentration of OH-pyrene (μg/kg bile standardised to absorbance at 380 nm) from fish collected at reference locations; the range represents the quartiles of the observations.

Species	Stations	Count	Range OH-pyrene (μg/kg)
Atlantic cod	10, 23, 98	117	0.6-4.4
flounder	21	11	26.4-88.5
dab	36*	37	3.1-34.1
plaice	10, 98	67	0.4-2.5

*) station 15 not included

Atlantic cod (*Gadus morhua* L.)
The available data explained nearly 90% of the variability in bile concentration of OH-pyrene in Atlantic cod in the general linear model (Table 9 in Appendix E, see also Appendix A for details of the analysis). As indicated above, year-to-year differences for this parameter should not be given too much weight as there was a change in methods. The model shows that, the ability of cod to metabolise pyrene, cytochrome P4501A activity (EROD), appears to have some effect on the concentration of metabolites in bile. It has generally been thought that the activity of the cytochrome P4501A system would not be limiting to the metabolism of pyrene. The results found here indicates a more intimate relationship. The cytochrome P4501A system will be induced by PAHs, so the result may indicate a parallel increase more than direct interaction.

Furthermore, size had an influence as did maturation, indicating that smaller individuals had lower relative accumulation of metabolites in bile. In addition to the included factors, there was a significant additional component linked to station.

The results show that station/location affects this parameter. Fish at all but the most remote areas had elevated levels of OH-pyrene. It has also become clear that cod caught in the open coastal area outside Lista are more strongly affected by PAHs than cod at the other stations, despite the large water exchange in that area. Inputs from an aluminium smelter is the probable reason for the elevated concentrations. Station differences were to be expected and fits with the general pattern of contamination (except the Lista station).

Dab (*Limanda limanda* L.)
No biological or physiological factors appeared to have a strong effect on the levels of OH-pyrene in bile from dab (Table 10 in Appendix E). Most of the observed variability could be accounted for through differences between the two stations and difference between years (the latter due to change in methodology). Dab at both stations appear to be exposed to PAHs. Dab from the Lista area (station 15F) are probably exposed to higher environmental PAH levels than dab from the outer Oslofjord (station 36F).

Flounder (*Platichthys flesus* L.)
As for cod, much of the variability in individual concentrations of OH-pyrene in flounder could be explained by the factors available (Table 11 in Appendix E). In contrast to cod, size did not appear important, whereas males and females appeared to accumulate the pyrene metabolite differently. The model showed that the relative size of the liver, indicating fat content, also had a influence. It is possible that high fat content in the liver results in higher direct accumulation of hydrophobic contaminants, e.g. PAH, thus decreasing the availability of PAHs for the metabolising “machinery” of the liver (which will then lead to accumulation of metabolites in bile). The results found here only indicate a possible relationship and such a relationship will obviously need to be tested experimentally. Any accumulation of contaminants in liver fat is nevertheless a two-edge sword – although immediate exposure is decreased, future use of resources (e.g. prior to spawning) will lead to mobilisation of contaminants. Such a mechanism has been suggested to explain the pattern of EROD seen in dab from the southern North Sea (Cooreman, pers. comm.).

Plaice (*Pleuronectes platessa* L.)
In addition to year and station, both sex and length contributed significantly to explain variability in OH-pyrene in plaice (Table 12 in Appendix E). All plaice sampled were presumably mature, so effect of length could not be explained by a difference between juvenile and mature individuals. Dietary or habitat differences between different age groups could however, lead to the observed result. In addition, there is a change with growth in the relative size of gill area to body weight (decreases with increasing size). The results also indicate a difference between the two stations expected to be the least contaminated. Results for plaice from station 10F (Varangerfjord) was used to derive a baseline or background level of 1-OH-pyrene in bile for plaice (Table 4). Such a value (or range) may possibly be relevant also to other flatfish species, but this will need to be verified experimentally.

4.3 ALA-D in red blood cells

4.3.1 Specific assumptions and background levels

The activity of ALA-D is known to be inhibited by exposure to lead. The results indicated that fish from the Sørfjord (station 53B/F) and inner Oslofjord (station 30B) are affected by the exposure to lead (Figure 13 in Appendix E) (as is also shown through the approximately 20 years of JAMP-monitoring). During the period 1998-2001 slight overconcentrations of lead in cod liver have been found in the Sørfjord (1-1.3 times provisional "high background" concentrations, Green *et al.* 2002) and for the period 1997-2001 in cod from the inner Oslofjord (1-8.5 times, cf. Appendix F). During the period 1997-2001, no overconcentrations were found for cod from Hardangerfjord (67B) or outer Oslofjord (36B). For flounder from the Sørfjord (53F), overconcentrations of 1-1.9 were found during this period but none for flounder from the Hardangerfjord (67F). The results indicate that ALA-D in red blood cells is probably a more sensitive indicator of lead-exposure than lead concentration measurements in fish liver (Figure 2).

Although ALA-D inhibition is lead-specific, it is not possible to rule out interference by other metals or organic contaminants. Previous studies indicate that only zinc may ameliorate the effect of lead to some extent, but the effect is variable and weak. Other studies have also shown ALA-D to be a remarkably robust biomarker and factors such as sex, age or season do not appear to affect the response.

As stated above, ALA-D is specifically inhibited by exposure to lead. One problem in the assessment has been the high proportion of liver samples with lead levels below the detection limit. For three of the species, more than half the cases are excluded if lead is included in the analysis (due to lack of data). A close relationship is to be expected between concentrations of lead in liver and lead in red blood cells. It is of course the latter that will affect ALA-D activity in that tissue, but Pb in blood is rarely measured in monitoring programmes.

The background or baseline activity of ALA-D in red blood cells are within a similar range for the four fish species (Table 5). Such ranges must be used with caution, although ALA-D appears to be less affected by non-contaminant factors than other biological effects methods.

Table 5. Red blood cell ALA-D activity in the indicated species from reference locations; the range represents the quartiles of the observations.

Species	Stations	Count	Range ALA-D (ng PBG/min/mg protein)
Atlantic cod	10, 23, 98	129	15-21
flounder	21	36	13-21
dab	15, 36	99	10-20
plaice	10, 98	67	13-21

Atlantic cod (*Gadus morhua* L.)

ALA-D in Atlantic cod appears to be primarily affected by metals, presumably as substitutes for lead (in a statistical sense), but there is also residual variance being explained by both year, station and an interaction between the two (Table 13 in Appendix E). This general linear model explained about 40% of the variability in the dataset.

In a reduced model with lead included (would skew the selection of fish towards the two contaminated areas 53 and 30), the metal came out as significant. More surprisingly, maturation also contributed significantly in this second model in addition to station and year (Table 13). Even including lead as an explanatory factor, station came out as significant. This could mean that there are other factors at stations (e.g. other contaminants) that affect the response, but it is more probable that there is either an adaptation (decreasing the response over time) or that the effect of environmental lead levels on ALA-D has one or more threshold levels. One should also be aware that the statistical model used not necessarily will reflect the true relationship between variables. Non-linearity will e.g. not be included.

As expected, sex or size did not appear to have any relevance to ALA-D activity in cod blood. Similarly, the fat-content of the liver, LSI or condition of the cod did not appear to have any consequences for ALA-D activity. Tissue residues of organic contaminants also did not appear to affect ALA-D activity.

Dab (*Limanda limanda* L.)
Dab was collected in two areas on the open coast with a presumably diffuse contaminant load. Differences in ALA-D activity between years and the two stations contributed in the model (Table 14 in Appendix E). For both years where both station were sampled the results for Lista were slightly higher (Figure 12). Hepatic lead concentrations were above the detection limit in more than two thirds of the material, but liver lead did not enter significantly in the general linear model. Lead concentrations in the liver of dab were lower than that found in cod and flounder, but at the same level as for plaice. There is some variability in ALA-D in dab between years and stations, but it does not appear to be strongly associated with accumulated lead. It may simply be that the lead levels are too low to affect ALA-D or that exchange between liver and blood is slow. Lead is known to accumulate in insoluble forms in some tissues, although it is not known if such is the case for fish (dab) liver.

Flounder (*Platichthys flesus* L.)
In contrast to cod, there was no evidence that hepatic metal accumulation has affected ALA-D in flounder. In comparing ALA-D directly with hepatic lead, it was clear that flounder from Sørfjord all had similar ALA-D activity even with varying lead levels (Figure 2). The activity of ALA-D was lower in flounder from the inner Sørfjord (station 53F) than in flounder from cleaner areas (Hardangerfjord 67F and Åkrefjord 21F). Flounder from Sørfjord may have reached a threshold of depressed ALA-D that is not further decreased with increasing hepatic lead accumulation. Approximately 80% of Sørfjord flounder have blood ALA-D levels below the lower baseline level indicated (Table 5; Figure 2).

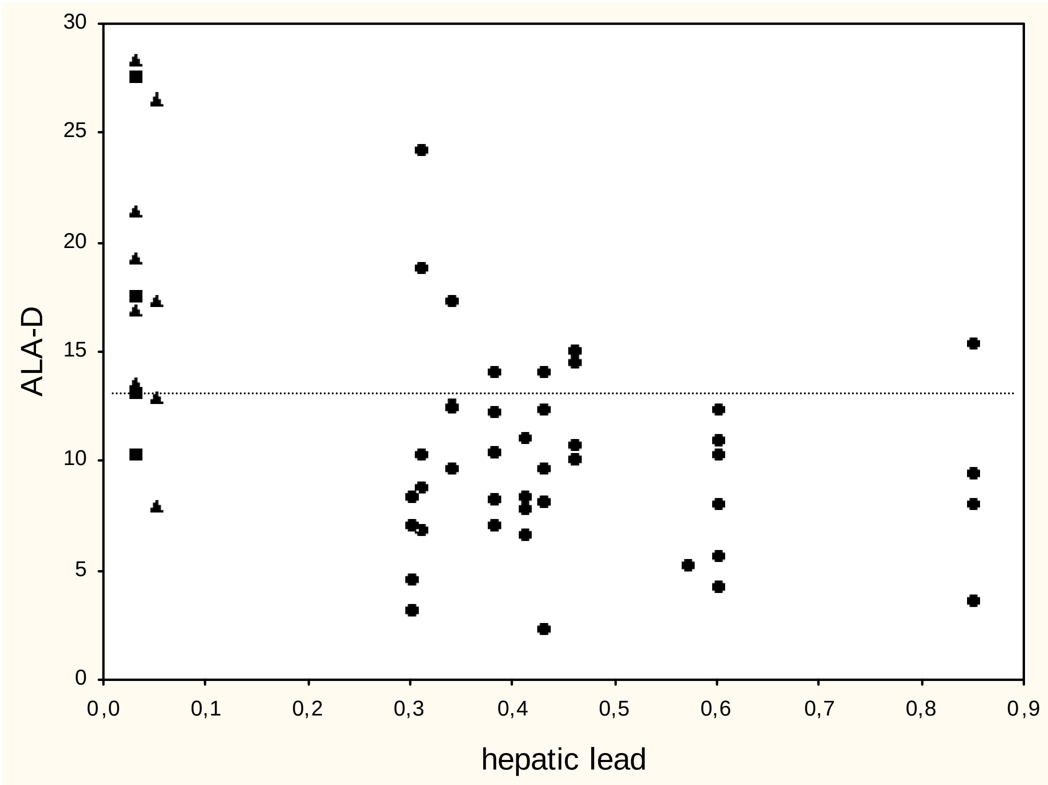

Figure 2. Relationship between hepatic lead (µg/g w.w.) and red blood cell ALA-D (ng PBG/min/mg protein) in flounder from Sørfjord (circles), Hardangerfjord (squares), Åkrafjord (triangles).

As for cod, there were no indications that other factors such as sex, size, condition or accumulation of organic contaminants affected the response of ALA-D in flounder (Table 15 in Appendix E).

Plaice (*Pleuronectes platessa* L.)
In contrast to the other species, there were no obvious relationships between any of the factors and ALA-D in red blood cells from plaice (Table 16 in Appendix E). As mentioned above, plaice was collected from two areas with low contaminant exposure. Hepatic lead levels in the plaice collected during JAMP are presumably too low to cause inhibition of ALA-D in this species.

4.4 Hepatic EROD

4.4.1 Specific assumptions and background levels

High activity of hepatic cytochrome P4501A activity (EROD) indicates a response to planar organic contaminants. It was expected that higher activity would be found at the stations that were presumed to be most perturbed by planar PCBs, PCNs, PAHs or dioxins, which were station 30B (inner Oslofjord) and 53B/F (inner Sørfjord). EROD activity at these stations were not consistently higher than activity at other stations when other factors were not included in the analysis.

The median EROD activity in cod from Lofoten (98B) for both 2000 and 2001 was between 2-3 pmol/min/mg-protein (Figure 15) and the lowest recorded in this investigation and may represent "background". As shown in Table 6 the upper quartile at the reference locations was higher.

Table 6. Hepatic EROD in fish collected at reference locations; the range represents upper and lower quartiles of the observations.

Species	Stations	Count	Range EROD (pmol/min/mg protein)
Atlantic cod	10, 23, 98	139	9-95
flounder	21*	16	10-43
dab	36	98	123-529
plaice	10, 98	81	33-146

*) supplemented with values from other reference locations not included in JAMP

Fish are sampled at the same time of year (September-November) when differences between the sexes should be at a minimum. Statistical analyses indicated no clear difference in activity between the sexes (Appendix E). Generally, higher activity was found at more contaminated stations, but the response was inconsistent (Appendix G). This inconsistency might indicate that populations with variable exposure history are sampled. Besides, there is evidence from other fish species that continuous exposure to e.g. PCBs may cause adaptation, i.e. decreased EROD response.

Atlantic cod (*Gadus morhua* L.)

The general linear model (explaining about 40% of the variability in the data) shows that EROD in *Gadus morhua* change between years and stations, but there is also a significant interaction between these two categorical factors (Table 17 in Appendix E). This indicated that the differences between stations do not follow the same pattern all years. This can also be seen in Figure 3, which shows that in 1997, the EROD activities at the various stations are not as different as the other years (which seem to display approximately the same pattern between stations). Furthermore, both muscle concentrations of Hg, and especially liver concentrations of HCB are shown to be significant contributors to the model. The median concentration of HCB in cod liver was the lowest at station 98 for the years 2000 and 2001 (Green *et al.* 2002). Likewise, EROD was also the lowest at station 98 for these two years (Appendix G). Figure 4 shows the relationship between HCB and EROD in cod (when all stations and years are included). It is possible that HCB induces EROD through interaction with the cytosolic Ah-receptor, although this is not known. Another possibility is that HCB co-vary with other known inducers of CYP1A, that are not measured through the JAMP-programme, such as dioxins or non-*ortho*-PCBs.

The Liver-Somatic Index (LSI) reflects the size and lipid content of the liver. These may be important factors for the induction of hepatic biotransformation enzymes such as CYP1A (and thus EROD) since lipophilic contaminants may be “trapped” in these lipids and kept from interacting with receptors in the hepatocytes (Ruus *et al.* 2001). It is known that lipids of aquatic organisms can serve (among other functions) as a protective storage site against toxic effects of contaminants that accumulate in body lipids (Geyer *et al.* 1993). In organisms with higher lipid content, a smaller fraction of a lipophilic chemical will reach target organs to cause adverse effects.

It is known that EROD activity can be influenced by sex (at least at certain times of the year). However, no clear differences was seen between sexes in cod for any years at any stations (Table 17 in Appendix E).

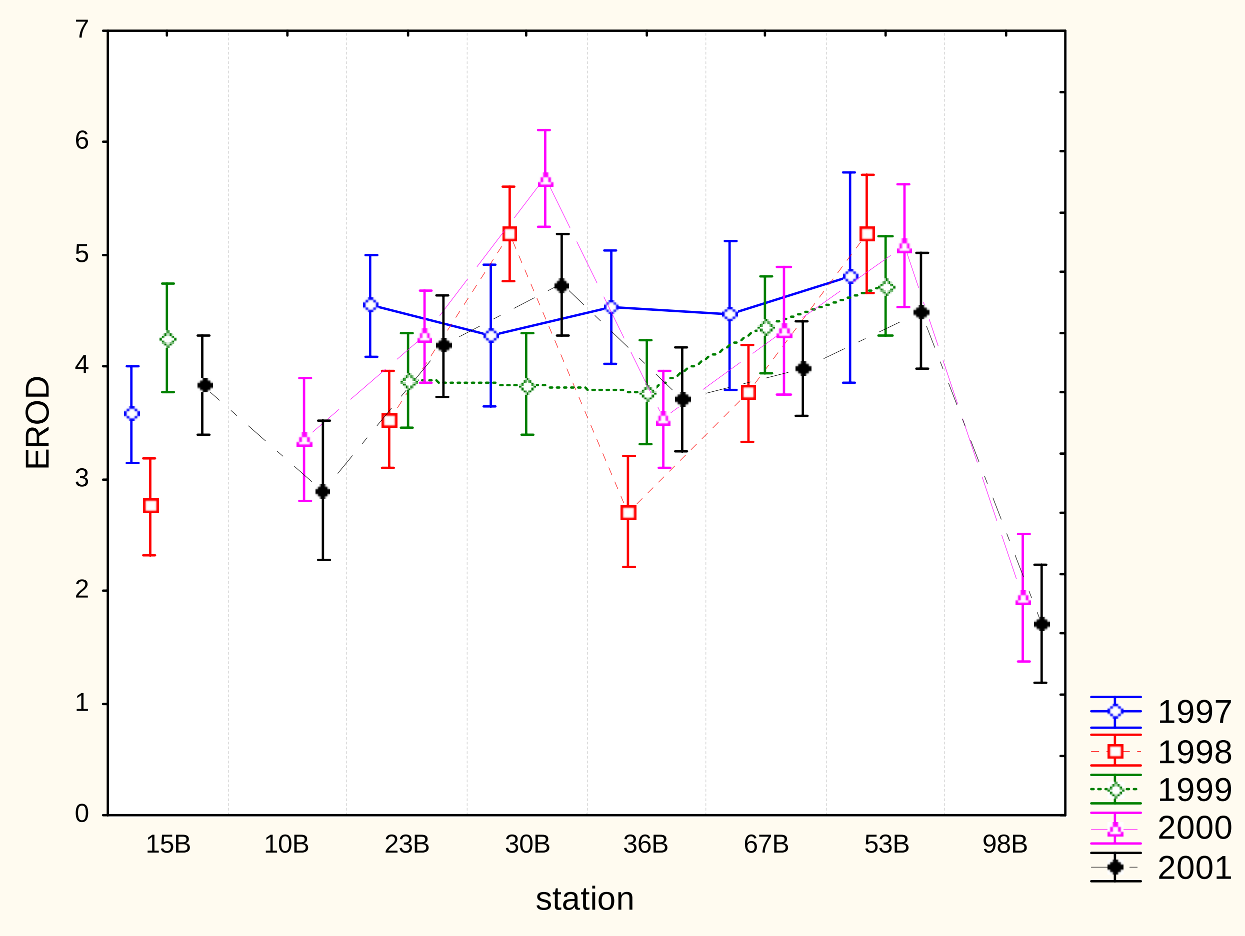

Figure 3. EROD activity (log_2-transformed; Least Squares Means) in cod at the various stations, the different years. (See Table 17 in Appendix E for model effects).

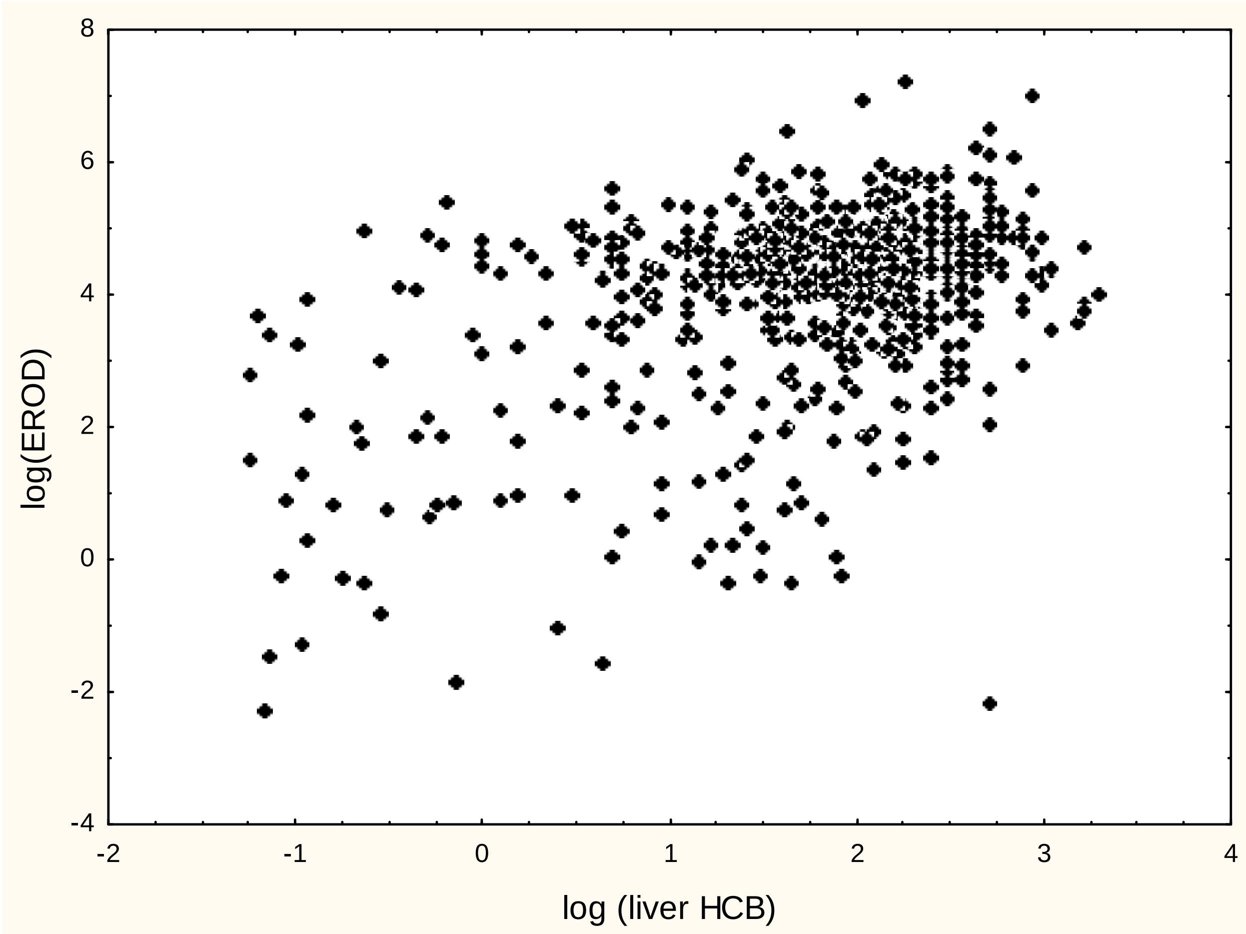

Figure 4. Relationship between concentrations of hepatic HCB concentration and EROD activity in *Gadus morhua* (all stations and years included). Both variables were log-2 transformed.

Dab (*Limanda limanda* L.)
The general linear model (explaining about 35% of the variability in the data) shows (as for cod) that EROD in *Limanda limanda* change between years (Table 18 in Appendix E), but a significant interaction between year and station also exists, indicating that the differences between stations do not follow the same pattern all years. There are, however only three years (1999-2001) and two stations (15 and 36) where this species has been caught within the JAMP-programme. Furthermore, liver concentrations of both PCB-153 and PCB-105/-118 are shown to be significant contributors to the model (Table 18). This indicates that diffuse perturbation by PCBs affects EROD activity. This was also noted in JAMP National comments regarding the Norwegian data for 2000 (Green *et al.* 2002), where induction of EROD was indicated in both cod and plaice from the diffusely contaminated area Varangerfjord (10B/F). PCB-data from 1995 have shown great variations in liver concentrations in cod, indicating variable exposure, or a point source near the 10B/F station. Planar hydrocarbons, such as certain PCBs (these are primarily non-*ortho*) are known to be inducers of CYP1A/EROD. Mono-*ortho* substituted PCBs (such as PCB-105 and –118) are partly coplanar, but congeners with two or more Cl-atoms in *ortho*-positions are sterically prevented from having this conformation.

The liver-somatic index (LSI) was (as for cod) a significant contributor to the model. The LSI reflects the size and lipid content of the liver. These may be important factors for the induction of hepatic biotransformation enzymes such as CYP1A (and thus EROD) since lipophilic contaminants may be “trapped” in these lipids and kept from interacting with receptors in the hepatocytes (Ruus *et al.* 2001). It is known that lipids of aquatic organisms can serve (among other functions) as a protective storage site against toxic effects of contaminants that accumulate in body lipids (Geyer *et al.* 1993).

In organisms with higher lipid content, a smaller fraction of a lipophilic chemical will reach target organs to cause adverse effects.

Flounder (*Platichthys flesus* L.)
Despite the large range of EROD responses in flounder from the three locations, only about a third of the total variability could be explained from the factors available (Table 19 in Appendix E). Both length and relative liver size (LSI) had significant influence. It was not possible to single out maturation as the main size-associated process affecting EROD, mainly due to the lack of juveniles. Hepatic p,p-DDE was the organic contaminant that provided the best fit in the model, but it may well be a substitute for other contaminants. Including tissue contaminants had to be done with some care as there are only results for pools of five individuals (as indicated above). OH-pyrene also contributed to the model, but weakly.

Plaice (*Pleuronectes platessa* L.)
The general linear model (explaining about 50% of the variability in the data) shows that EROD in *Pleuronectes platessa* change between years (see Table 20 in Appendix E). Note that there are only two years (2000 and 2001) and two stations (10 and 98) where this species has been caught within the JAMP-programme. Liver concentration of PCB-153 is shown to be a significant contributor to the model, as for *Limanda limanda*, which again indicates that diffuse perturbation by PCBs affects EROD activity (see above). Both EROD activity (Appendix G) and liver concentrations of PCB-153 (cf. Green *et al.* 2002) in *P. platessa* are also shown to be higher in 2000 than 2001. PCB-data since 1995 have indicated large variations in PCB exposure at station 10 (see above; Green *et al.* 2002).

Length was also shown to be a significant predictor for EROD activity in *P. platessa* (Table 20). Figure 5 shows the relationship between fish length and EROD activity (when both years and both stations are included), and may indicate that the EROD activity decreases with length. According to the estimate used for mature individuals (those of > 265 mm of length), only mature individuals were found. This criterion may, however, not apply to plaice in northern, cold areas such as stations 10 and 98. Maturity may, in other words, be an important factor, and indicates that gonado-somatic index (GSI) should be included in future studies/monitoring.

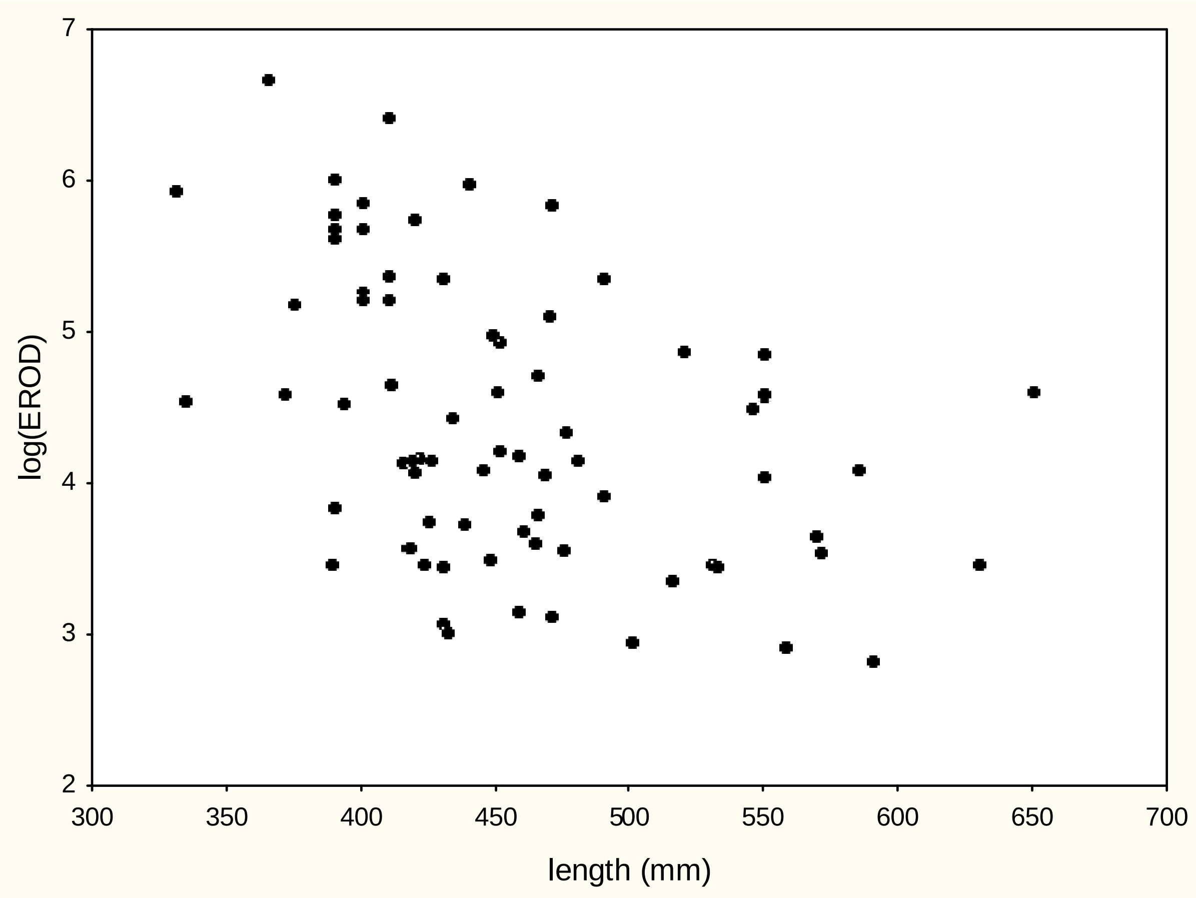

Figure 5. Relationship between length and EROD activity (pmol/min/mg protein) for *Pleuronectes platessa* (both years, 2000 and 2001, and both stations, 10 and 98, included). EROD has been log-2 transformed.

The Liver-Somatic Index (LSI) was again a significant predictor for EROD activity (Table 20). As already mentioned, the LSI reflects the size and lipid content of the liver. These may be important factors for the induction of hepatic biotransformation enzymes such as CYP1A (and thus EROD) since lipophilic contaminants may be “trapped” in these lipids and kept from interacting with receptors in the hepatocytes (Ruus *et al.* 2001). Figure 6 indicates that EROD activity decrease with increasing LSI. It is known that lipids of aquatic organisms can serve (among other functions) as a protective storage site against toxic effects of contaminants that accumulate in body lipids (Geyer *et al.* 1993). In organisms with higher lipid content, a smaller fraction of a lipophilic chemical will reach target organs to cause adverse effects.

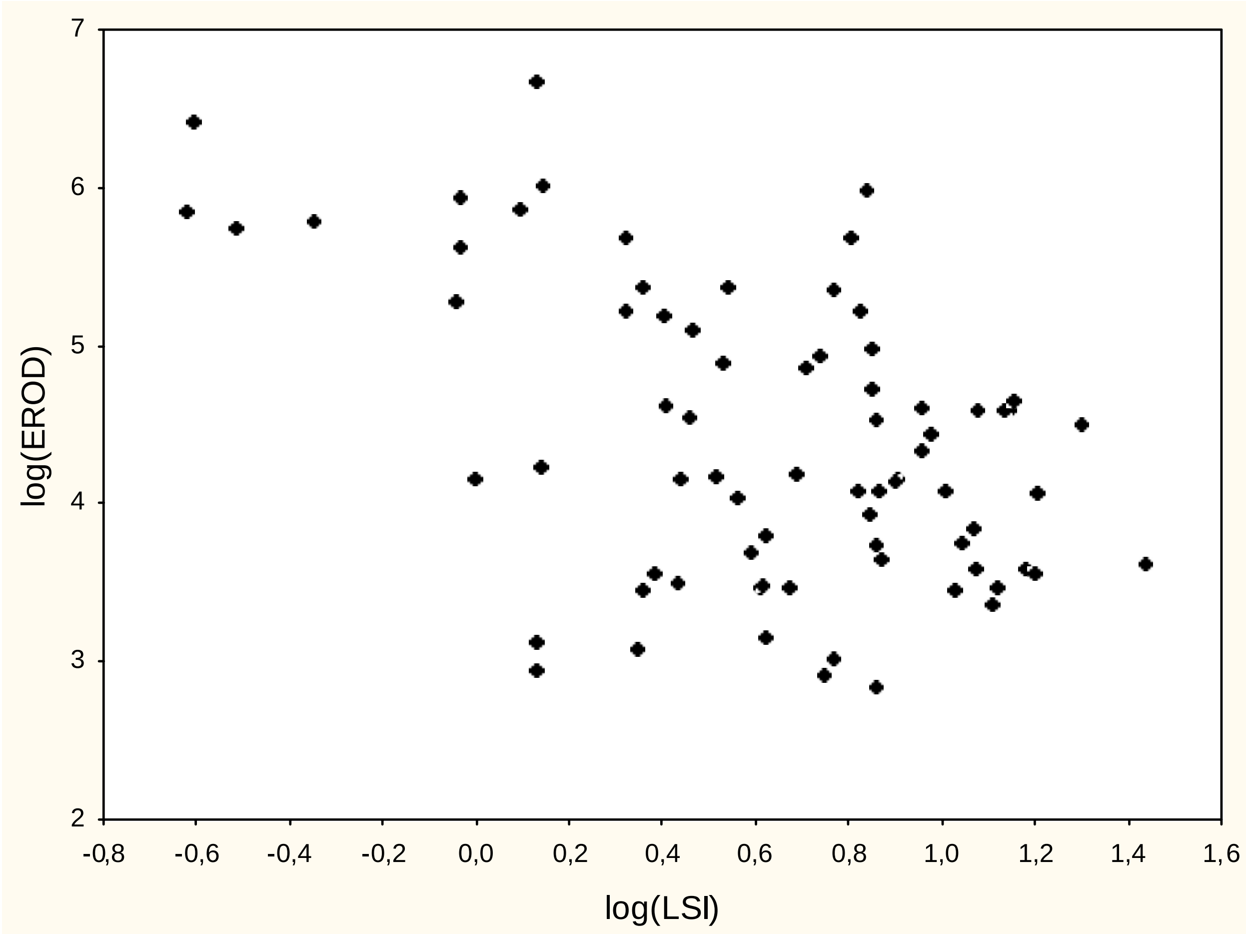

Figure 6. Relationship between liver-somatic index (LSI) and hepatic EROD activity (pmol/min/mg protein) in *Pleuronectes platessa* (both years, 2000 and 2001, and both stations, 10 and 98, included). Both variables were log-2 transformed.

4.5 Hepatic metallothionein

4.5.1 Specific assumptions and background levels

As indicated earlier (Green *et al.* 2002e), 1997-1999 samples have been reanalysed for metallothionein using differential pulse polarography (DPP). Thus, the same method has been used for all samples from all years and temporal comparisons can be made. There were no clear trends in the hepatic concentrations of the metal-binding protein metallothionein (MT) in cod from the eight stations for the period 1997-2001 and in flounder from three stations 1999-2001.

Metallothionein is a protein that is induced by and binds the metals cadmium, zinc, copper and mercury, and differences in median metal concentration should indicate differences in exposure. However, presumed gradients in metal exposures, such as that decreasing from the inner Oslofjord to the outer Oslofjord and likewise from the Sørfjord to the Hardangerfjord (cf. Appendix G), did not correspond directly with metallothionein levels. More often than not the opposite was observed in cod and flounder for the period 1999 to 2001. The response in metallothionein largely appear to reflect hepatic metal levels (see more detailed analyses below). There are surprisingly small differences in the putative baseline levels of hepatic metallothionein in the four main species used in the Norwegian JAMP (Table 7). In all four species, baseline values (as used herein) lie between 6.5 and 15-16 µg/mg protein. For metallothionein there is however a need to investigate other factors to clarify whether a fish population is under metal stress or not.

Table 7. Hepatic metallothionein (MT) activity in the indicated species from reference locations; the range represents the quartiles of the observations.

Species	Stations	Count	Range MT (μg/mg protein)
Atlantic cod	10, 23, 98	131	6.5-15.8
flounder	21*	6	8.4-15.3
dab	15, 36	95	7.2-13.3
plaice	10, 98	76	6.5-14.3

*) Supplemented with values from other reference locations not included in JAMP

Atlantic cod (*Gadus morhua* L.)
The results for hepatic metallotionein in Atlantic cod suggests several previously unknown relationships in a general linear model that explained three-quarters of the total variability (Table 21 in Appendix E). As expected, hepatic copper and zinc explain a large part of the variability observed in hepatic metallothionein. In addition, there are differences between years and stations. More surprising is the relationship between length and metallothionein. This has not been observed earlier. An apparent relationship between metallothionein and relative liver size is presumably only an inverse correlation between metallothionein (associated with water-soluble components) with fatty tissue in the liver (which increases with increasing relative liver size). In addition to copper and zinc, there were unknown differences between stations (showing up as highly significant), presumably due to other factors that modulate metallothionein.

Dab (*Limanda limanda* L.)
In contrast to the other three species, the best model for hepatic metallothionein in dab did not explain much variability (only about 25%, Table 22 in Appendix E). Copper and zinc in the liver were significant components, as expected (in this analysis summed to give one parameter). In dab there also appear to be an effect of size on hepatic metallothionein levels.

Flounder (*Platichthys flesus* L.)
The model for flounder explained about 60% of the total variability in metallothionein (Table 23 in Appendix E). In addition to including year and station, sex and hepatic cadmium concentration explained variability in this biomarker. Flounder differ from the above species in that a non-essential metal, cadmium, appear to explain variability in the statistical model. Surprisingly, neither of the essential metals copper or zinc contributed in this model.

Plaice (*Pleuronectes platessa* L.)
Hepatic metallothionein in plaice related to tissue levels of several metals, both essential (zinc) and non-essential (mercury). In addition, there were gender-related differences, although not found as extensively as expected (Table 24 in Appendix E).

5. Conclusions and recommendations

5.1 General conclusions and recommendations

The results from the Norwegian JAMP indicate that the measurement of PAH metabolites in bile (exemplified by 1-OH-pyrene) is a reliable method to quantify the extent of PAH contamination in marine coastal systems. The results also provide a putative background level for 1-OH-pyrene for Atlantic cod and plaice. Other species probably have similar baseline levels, but this cannot be verified from the results from this programme.

The Norwegian JAMP confirms that red blood cell ALA-D is inhibited by lead and can be expected to be effected in fish from coastal areas near lead inputs, such as urban and/or industrial centers. Some results indicate that there may be a threshold concentration of lead above which ALA-D is affected and also that there may be adaptation (although at a depressed level) following chronic exposure. ALA-D does not appear to be strongly affected by other endogenous (or exogenous) factors. It is therefore possible to set reference values for this biomarker. Such reference values can be set for Atlantic cod and plaice (found at stations 10 and 98) using the data from this programme. Interpretation of the response was made more difficult by the lack of a complementary dataset for tissue lead.

Despite the large variability both within and between species, the results from five years of Norwegian JAMP shows that EROD is affected by organic contaminants and that fish collected in areas with local inputs respond in a reproducible manner. A novel result is the indication that size may affect the EROD response in some species. This effect does not appear to reflect maturation or sex-related differences. There were surprisingly small differences between sexes, indicating that the time of year (September-October) is appropriate for sampling to reduce such differences.

Hepatic metallothionein generally reflected metal concentrations in the liver of the fish studied. For cod and dab, differences appeared to reflect natural endogenous processes involving the two essential metals zinc and copper. For flounder and plaice, there was some indication that cadmium (and for plaice, mercury) may affect the response, but this relationship was weak. As for EROD, there was a surprising relationship between metallothionein and size, but only minor differences due to sex. In the species investigated here, metallothionein does not appear to provide easily interpretable information about the metal exposure.

Of the four methods investigated during the Norwegian JAMP in the period 1997 to 2001, OH-pyrene, ALA-D and EROD, provide useful information about how and whether contaminants affect fish. The results for the fourth method, hepatic metallothionein, could not be related to metal contamination in the areas investigated.

5.2 Conclusions and recommendations for the Norwegian JAMP

The results for pyrene metabolites in bile indicate that specific stations in coastal areas in Norway (not the most remote) are affected by PAHs. From the data available here it is not possible to distinguish between inputs from air (long-range transport) and local sources (exhaust, small oil spills, etc.).

The results for ALA-D inhibition shows that there is clear evidence for effects in the two most contaminated areas, Sørfjord and the inner Oslofjord. Results for more diffusely affected areas are more uncertain and fish in remote areas do not appear to be affected by lead. The interpretation of the results were hampered by the lack of data for the same flatfish species along the entire coast.

EROD results show that fish in the two most contaminated areas, Sørfjord and the inner Oslofjord, are indeed affected by organic contaminants (as is also shown through the approximately 20 years of

JAMP-monitoring). There were clear relationships with accumulation of contaminants. There was also a reproducible increase in hepatic EROD in fish from these two areas. The range of responses in less contaminated areas also indicate that individual fish are affected by organic contaminants.

Results for hepatic metallothionein indicate that fish are not strongly exposed by zinc, copper, cadmium or mercury in the areas investigated during this 5-year programme.

It is recommended to continue the biological effects programme for Atlantic cod at the same stations for three methods: OH-pyrene, ALA-D and EROD. The results for metallothionein did not indicate clear effects and the use of this method should be discontinued. The same three methods should also be continued for flounder, but there is a need for a reference site for this species. Flounder is found in the most contaminated coastal areas and estuaries both in Norway and other European countries. It is therefore important to enhance the database for biological effects in this species.

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Appendix A. Analytical methods

ANALYTICAL METHODS

OH-pyrene metabolites

When fish are exposed to, and take up PAHs, the compounds are biotransformed into polar metabolites, which enhances the efficiency of excretion. One such biotransformation is the coupling of a hydroxyl-group to the molecule (Figure 7) .The bile is thought to be the dominant excretion route of metabolites of especially larger PAH molecules in fish (Meador *et al.* 1995). Since PAH metabolites are stored for some time and thereby concentrated in the gall bladder, the bile is shown to be a suited matrix for measures of PAH metabolites (Creaven *et al.* 1965; Lech *et al.* 1973; Aas *et al.* 2000a,b).

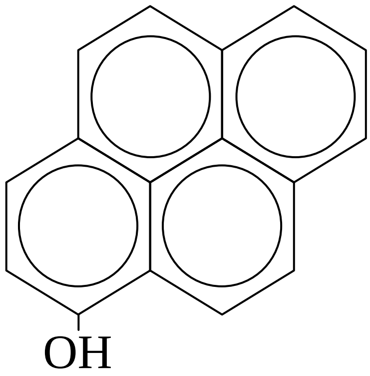


Figure 7. 1-OH-pyrene. Example of a PAH-metabolite. A hydroxyl-group has been added to the molecule, through biotransformation, to increase the polarity of the molecule, and thus the efficiency of excretion.

All PAH compounds fluoresce (FAC: Fluorescent Aromatic Compounds). PAH molecules absorb ultraviolet light followed by emission of light of a longer wavelength. These compounds can therefore be detected by using their fluorescence.

The use of high performance liquid chromatography (HPLC) provides a compound specific characterisation of the PAH composition in the bile (Krahn *et al.* 1986). By this method, the PAH metabolites are separated in a chromatographic column prior to detection. The detection can be performed by either as fluorescence (as mentioned above; HPLC/F) or with mass spectrometer (HPLC/MS).

A factor influencing the absolute levels of PAH metabolites in bile is differences in bile density between individuals. Filling and emptying of the gall bladder is dependent on the feeding status of the fish, and this is influencing the bile density and therby also the concentration of eventual PAH metabolites in the bile (Collier and Varnasi 1991). One can normalise for this bile density by measuring the absorbance in the bile at 380 nm. It is the bile pigment biliverdin that has one of its two major peaks at this wavelength, thus the relative concentration of biliverdin can be deduced from the measured absorbance.

Twenty microlitres of the bile sampled from the fishes were added triphenylamine (internal standard), diluted with demineralised water (50µl) and hydrolysed with β-glucuronidase/arylsulfatase (20µl; 1 hour at 37°C). Methanol (200µl) was added and each sample was centrifuged to precipitate any dissoluted proteins. The superanatant was subsequently analysed with HPLC and fluorescence detection with the following conditions:

Column:	Vydac C_{18} 3 µm particles, 4,6 mm*15cm
Temperature:	40°C
Mobile phase:	Gradient from 40%:60% acetonitrile:water to 100 % acetonitrile
Flow:	1ml/min

Dector: The fluorescence was measured at the optimum for each analyte

The bile-concentrations of the PAH metabolites were normalised (see above) according to the bile-absorbance at 380nm (bile diluted in ethanol), detected in a spectrophotometer.

ALA-D

Many metals are essential to all organisms, e.g. copper (Cu), zinc (Zn), iron (Fe), manganese (Mn) and molybdenum (Mo), but there are also metals for which no biological function is known, such as mercury (Hg), cadmium (Cd), gold (Au), silver (Ag) and lead (Pb). Such non-essential metals generally have much higher toxicity than the essential metals. Uptake, storage and excretion are also less well controlled for the non-essential than for essential metals.

One of the most important toxic mechanisms of non-essential metals is the interaction with and inhibition of enzymes, especially enzymes with metal co-factors. One such enzyme is δ-aminolevulinic acid dehydratase (ALA-D) which has Zn as a co-factor (Granick *et al.*, 1972). This enzyme is one step in the synthesis pathway for heme and is found in bacteria, plants and invertebrates as well as in vertebrates. Heme is incorporated in macromolecules such as hemoglobin and cytochromes. In mammals and birds, inhibition of ALA-D may lead to anemia since it is one of the rate-limiting enzymes in heme (and hence hemoglobin) synthesis. This does not appear to be the case for fish (Larsson *et al.*, 1985). The reason for ecotoxicological interest in ALA-D is its inhibition by Pb, even at very low exposure levels (Hodson *et al.*, 1984; Haux and Förlin, 1989). ALA-D has been used to investigate Pb effects in several species (e.g. Hodson, 1976; Hodson *et al.*, 1977; 1978; Addison *et al.*, 1990; Burden *et al.*,. 1998; Bogovski *et al.*, 1998). The sensitivity, timing and specificity of ALA-D inhibition in response to lead exposure has been reviewed by Hodson *et al.* (1984).

The ALA-D activity was determined in red blood cells (Hodson *et al.*, 1984) as follows: Red blood cells were separated from plasma by centrifugation at 5000 g for 5 min (4°C). The blood cell-samples were homogenised in 3 volumes (v/v) of dillution buffer (0.1 M potassium phosphate buffer with 0.2% Triton X-100, pH optimised for the fish species in question at 7.0) using a Potter-Elvehjem glass-teflon homogeniser before centrifugation for 30 min at 10 000 g (4°C). The resulting supernatant was then used for measurement of ALA-D activity and blood-protein.

The analysis of ALA-D activity was performed in three steps (i) sample dilution and initiation of reaction, (ii) stopping the reaction and separation of product from reagents, (iii) quantifying the product:

Step (i): The supernatant was diluted in dilution buffer (see above). 50 µL of this solution were added to six eppendorf tubes. 200 µL of dilution buffer (see above) were then added to three tubes, and 200 µL ALA-reagent (33.5 mg δ-aminolevulinic acid dilluted in 50 mL dilution buffer [see above]) to the remaining three. The solutions were mixed well and incubated for 2 h at room temperature.

Step (ii): Standards were prepared (from the standard solution; porphobilinogen dissolved in dilution buffer to a final concentration of 40µL/mL) in dilution buffer to a total volume of 400 µL; 20, 40, 80, 160 µL of the standard solution are generally appropriate. Then 300 µL precipitation reagent (4.0 g trichloroacetic acid and 2.7 g mercury chloride dissolved in distilled water to a volume of 100 mL) were added to all tubes (samples and standards); mixed immediately and left for 5 min, before centrifugation at 2500 g for 5 min (room temperature). The supernatants were transferred to clean, labelled tubes.

Step (iii): 150 µL of each supernatant were transferred to wells in a 96-wells plate (in triplicate), before 150 µL modified Erlich reagent (0.35 g mercury chloride dissolved in 6 mL of distilled water and 20 mL of 70% perchloric acid. Acetic acid added to a total volume of 110 mL and 2.0 g p-amino benzoic acid dissolved in the final volume) were added to all the wells and mixed well. The solutions were incubated for 15 min (room temperature), and the absorbance at 553 nm was read, using a plate reader. The assay is linear for values exceeding those found in the temperate fish species studied.

The ALA-D activity was normalised to blood protein content, determined according to the Lowry protein assay (Lowry *et al.*, 1951) adapted to measurement by plate reader. Protein standard was bovine gamma globulin.

EROD

EROD (7-Ethoxyresorufin-*O*-deethylase) is a specific cytochrome P450 reaction where ethoxyresorufin is used as substrate (Burke & Mayer, 1974). Cytochrome P450 1A (see below) catalyse the deethylation of 7-ethoxyresorufin to resorufin (Figure 8). P-450 activity in microsome fractions can be quantified from the amount of resorufin produced (Andersson & Förlin, 1985). The resorufin can be quantified by spectrophotometric or fluorimetric methods (Klotz *et al.*, 1984).

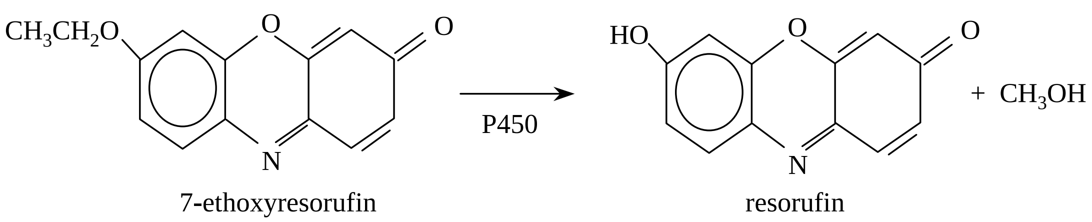


Figure 8. The deethylation of 2-ethoxyresorufin to resorufin, catalysed by cytochrome P450.

The cytochrome P450 system is a large superfamily of enzymes with several hundred forms comprising 265 different families (of which animals have 69), further divided into subfamilies (see Nelson *et al.* [1996] and http://drnelson.utmem.edu/ CytochromeP450.html for overview). The system is a highly diversified set of proteins and is found in bacteria, plants and lower eukaryotes, as well as in animals. Members of the P450 subfamily CYP1A are particularly important in the metabolism of many pollutants. In the case of planar molecules, such as certain PCBs, PCNs, dioxins and PAHs iso-enzymes of CYP1A are responsible for the insertion of oxygen into the molecular structure of the compound (Matthews and Dedrick, 1984; Letcher *et al.*, 2000). This first oxidative step in the biotransformation process is called 'phase I' (Williams, 1974). The introduced oxygen creates a functional group for attachment of larger polar molecules of endogenous origin in a 'phase II' reaction (e.g. glucoronidation and sulphate- or glutathione conjugation) (Williams, 1974; Goksøyr, 1995). In this way, a lipophilic xenobiotic is transformed into a polar and water-soluble end product that can be excreted through bile or urine. These metabolites can also serve as a biomarker for contaminant exposure, as described above (quantification of OH-pyrene metabolites in fish bile).

In addition to being substrates for biotransformation, the above mentioned planar compounds can also interact with cytochrome P450 1A as inducers (Boon *et al.*, 1992; Goksøyr and Förlin, 1992). The induction is initiated by the binding of the inducer to the cytosolic Ah (Aryl hydrocarbon)-receptor (Rowlands and Gustafsson, 1997; Van den Berg *et al.*, 1998). Several studies have indicated that P450 induction is the first step in a series of toxic symptoms, such as immunosuppression, vitamin and hormonal imbalance, and reproductive failure (Reviewed by Safe, 1994). EROD is a tool used to measure this induction. The induction of cytochrome P450 enzymes in fish liver was first suggested as an indicator of environmental contamination in the 1970s by Payne (1976), and the EROD measurement has now gained widespread use in biomonitoring studies with fish (Goksøyr and Förlin, 1992; Sandvik *et al.*, 1997; Ruus *et al.* 2002).

Ethoxyresorufin-*O*-deetylase (EROD) activity was assayed fluorimetrically (Burke and Mayer, 1974) in 8 steps, as follows:

i. The reaction mixture was prepared from 50 mL buffer (0.1 M potassium-phosphate; pH 8.0) and 0.75 mL 7-ethoxyresorufin (0.2 mM in dimethylsulfoxide [DMSO]).

ii. Samples of microsomes, prepared from the fish livers, were then diluted to 2 mg/mL in buffer (see above).

iii. resorufin-standards (duplicates) were pipetted onto a (plate-reader) plate: 0, 0.01, 0.02, 0.04, 0.08, 0.16, 0.32 µM in buffer (300 µL; see above).

iv. 200 µL reaction mixture (see pt. i) were pipetted into subsequent wells (see pt. iii) on the plate.

v. 50 µL buffer were pipetted into the same wells as in pt. iv, above.

vi. 10 µL 0.32 µM resorufin-standard (see pt. iii) were added to subsequent wells on the plate.

vii. 25 µL NADPH-solution (2.4 mM in buffer [see above]) were added to the same wells as in pts. iv and v above.

viii. transformation of 7-ethoxyresorufin to resorufin was read in 8 steps on the plate reader. Excitation was at 530 nm and flourescence emmission was measured at 590 nm.

The EROD activity was normalised to protein content in the microsome fraction, determined according to the Lowry protein assay (Lowry *et al.*, 1951) adapted to measurement by plate reader. Protein standard was bovine gamma globulin.

Metallothionein

The low-molecular-weight protein metallothionein (MT) is present in most vertebrate tissues. A major role of this protein is regulation of the intracellular availability of zinc (Zn) and/or copper (Cu). Other functions, such as metal detoxification and free radical scavenging, have also been suggested (Kägi and Schäffer, 1988). In addition to Cu and Zn, MT binds non-essential metals such as cadmium (Cd), mercury (Hg) and silver (Ag). The synthesis of the protein is induced by elevated intracellular concentrations of the above mentioned metals. Metallothionein induction is a response to elevated intracellular metal concentrations and the protein has been applied as a biomarker for environmental metal contamination (Hogstrand & Haux, 1989; Hylland *et al.*, 1991).

A widely used method to quantify MT is the quantification of sulfhydryl groups, which in most cases is done with an electrochemical quantification of MT by differential pulse polarography, DPP. This method involves an initial removal of high-molecular-weight proteins, either by heat denaturation or organic precipitation, followed by quantificaton of sulfhydryl groups. Sulfhydryl groups are quantified by either DPP or spectrophotometrically, using DTNB (5,5'-dithiobis 2-nitrobenzoic acid) as a chromophore.

Metallothionein was assayed by the use of differential pulse polarography (DPP) as follows.

Sample preparation:

i. Samples of cytosol, prepared from the fish livers, were diluted approximately 1:10 in 0.9% NaCl.

ii. The diluted samples (pt. i) were heat-denatured at 95°C (5 min) before they were cooled on ice.

iii. The samples were sentrifuged at 10 000 g (10-15 min), and the supernatant was removed.

Analysis:

i. 100 µL triton X-100 solution (125 µL triton X-100 to 1 L ddH_2O [0.0125%]) was added to 10 mL electrolyte (0.6 mM hexamine cobalt chloride [0.321 g], 1.0 M NH_4Cl [53.4 g], 1.0 M NH_4OH (NH_3) [75 mL], ddH_2O to 1L).

ii. Sample or standard is added to the electrolyte.

iii. After deoxygenation for 2 min the scan is initiated.

The amount of metallothionein is proportional to peak height (and area) (in the scan) and can be calculated from a prepared standard curve. An exaple of a scan is presented in Figure 9.

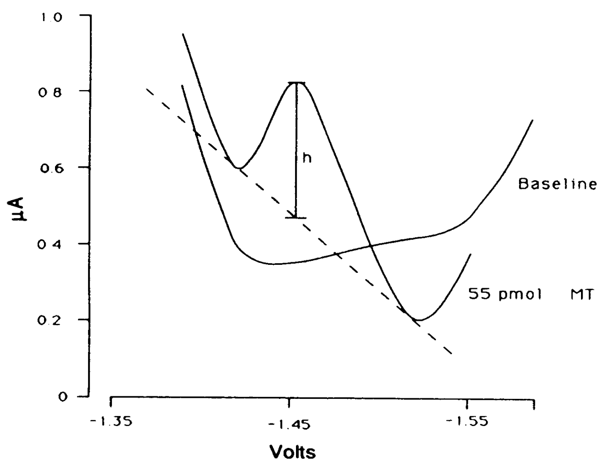


Figure 9. A typical scan. One baseline and one with 55 pmol rainbow trout (*Onchorynchus mykiss*) MT (from Olsson, 1987).

Data preparation and statistical analyses

Statistical analysis was performed with the use of Statistica® software (version 6.1; StatSoft, Tulsa, OK, USA). Each of the four Biological Effect Markers (above) were treated as response (dependent) variables in separate analyses (separate also for each species), and tried explained by a battery of explanatory variables (predictors) (Table 8) in multiple regressions, performed in the GLM (General Linear Models)-module in Statistica®. All contaminants that are analysed in the fish through the JAMP-programme can be found in Green *et al.* 2002. Due to measurements below detection limits and, in some cases, expected colinearity, specific compounds/congeners were selected to represent specific groups of contaminants (Table 3). Second degree interactions were tested for the categorical factors. Non-significant predictors (with low explanatory value) were stepwise taken out of the models (manually) until the best models were obtained. All continuos predictors were $\log_e$-transformed prior to the analysis to reduce skewness of distributions.

Table 8. Explanatory variables (predictors) in full GLM model, before stepwise (manual) elimination.

Variable	Abbreviation	Type of variable	Measured in (matrix)	Notes/Explanations
Year	year	Categorical		1997-2001
Station	station	Categorical		
Sex	sex	Categorical		
Maturation	maturation	Categorical		Determined from length [1]
Length	length	Continuous		
Condition	cond	Continuous		Only for cod
Liver Somatic Index	log2LSI	Continuous		
OH-pyrene [2]	oh-pyr	Continuous [2]	Bile	Represents PAH-metabolites
PCB-153	livcb153	Continuous	Liver	Represents congeners with ≥ 2 Cl in *ortho*-position
PCB-105 + -118	l105_118	Continuous	Liver	Represents congeners with 1 Cl in *ortho*-position
p,p'-DDE	livddepp	Continuous	Liver	Represents DDT-compounds/metabolites
Cd	livcd	Continuous	Liver	
Cu	livcu	Continuous	Liver	
Hg	muhg	Continuous	Muscle	
Pb	livpb	Continuous	Liver	
Zn	livzn	Continuous	Liver	

1 *Gadus morhua*: Individuals > 400 mm = mature (others = juvenile).
Limanda limanda: Individuals > 130 mm = mature (others = juvenile).
Platichthys flesus: Individuals > 204 mm = mature (others = juvenile).
Pleuronectes platessa: Individuals > 265 mm = mature (others = juvenile).

2 Not when OH-pyrene is the response (dependent) variable.

Trend analyses

The same simple 3-model approach used to study time trends for contaminants in biota based on *median* concentrations (ASMO 1994) was also applied to results from all four biological effects methods: OH-pyrene, ALA-D, EROD and metallothionein. The method was first used on a large-scale basis by the Ad Hoc Working Group on Monitoring that met in Copenhagen 8-12. November 1993 (MON 1993).

The method of calculating the smoother is in accordance to the methods employed at Ad Hoc Working Group on Monitoring that met in Copenhagen 23-27. February 1998 (MON 1998). A Loess smoother is based on a running seven-year interval, a non-parametric curve fitted to median log-values (Nicholson *et al.*1997). For statistical tests based on a fitted smoother to be valid the contaminants indices should be independent to a constant level of variance and the residuals for the fitted model should be lognormally distributed (cf. Nicholson *et al.* 1998).

The National Comments since 1994 have included two additional analyses. The first is that the smoothed median for the last three sampling years is linearly projected for the next three years. This deviates from previous reports where the upper 95 confidence interval was used to assess the likelihood of overconcentrations (Nicholson, *et al.* 1994). The projected estimate is based on the results for the temporal trend analyses of at least 6 years of data.

The second is an estimate of the power of the temporal trend series expressed as the number of years to detect a 10% change per year with a 90% power (cf. Nicholson *et al.* 1997). The fewer the years the easier it is to detect a trend. The power is based on the percentage relative standard deviation (RLSD) estimated using the robust method described by ASMO (1994) and Nicholson *et al.* (1998).

The estimate was made for series with at least 3 years of data and covers the *entire* period monitored. This fixed means of treating all the datasets may give misleading results especially where non-linear temporal changes are known to occur.

Appendix B
Stations and sample count for fish used for biological effects methods 1997-2001

Station positions are shown on maps in Appendix C

jmpco: JAMP area code (J99 = unclassified)
jmpst: station code
stnam: station code
Lon: Longitude
Lat: Latitude
icear: ICES area
speci: species code (English, Norwegian (Latin))
- GADU MOR - Atlantic cod, torsk (*Gadus morhua*)
- LIMA LIM - dab, sandflyndre (*Limanda limanda*)
- PLAT FLE - flounder, skrubbe (*Platichthys flesus*)
- PLEU PLA - plaice, rødspette (*Pleuronectes platessa*)

tissu: tissue:
- BI - bile
- BL - blood
- LI - liver
- MU - muscle

param: parameter

- PYR1O - **OH-pyrene**
- ALAD - **ALA-D** (δ-amino levulinic acid dehydrase inhibition)
- EROD - **EROD** (Cytochrome P4501A-activity)
- MT - **Metallothionein**
- OC - **Organochlorines**
- HS - **Hazardous substances,** including cadmium, lead, mercury, copper, zinc and PCBs (see Green *et al.* 2002).

STATIONS AND SAMPLE COUNT FOR FISH USED FOR BIOLOGICAL EFFECTS METHODS

jmpco	jmpst	stnam	lat	lon	icear	speci	tissu	param	97	98	99	00	01
J26	30B	Oslo City area	59° 49.0	10° 33.0	48G05	GADU MOR	BI	PYR1O		27	23	21	25
J26	30B	Oslo City area	59° 49.0	10° 33.0	48G05	GADU MOR	BL	ALAD	20	27	25	25	25
J26	30B	Oslo City area	59° 49.0	10° 33.0	48G05	GADU MOR	LI	EROD	11	30	25	25	25
J26	30B	Oslo City area	59° 49.0	10° 33.0	48G05	GADU MOR	LI	MT	16	22	25	25	25
J26	36B	Færder	59° 2.0	10° 32.0	47G06	GADU MOR	BI	PYR1O		25	25	23	25
J26	36B	Færder	59° 2.0	10° 32.0	47G06	GADU MOR	BL	ALAD	20	25	25	23	25
J26	36B	Færder	59° 2.0	10° 32.0	47G06	GADU MOR	LI	EROD	18	23	25	23	24
J26	36B	Færder	59° 2.0	10° 32.0	47G06	GADU MOR	LI	MT	20	22	25	23	24
J26	36F	Færder area	59° 4.0	10° 23.0	47G06	LIMA LIM	BI	PYR1O			11	8	18
J26	36F	Færder area	59° 4.0	10° 23.0	47G06	LIMA LIM	BL	ALAD			20	9	20
J26	36F	Færder area	59° 4.0	10° 23.0	47G06	LIMA LIM	LI	EROD			20	10	19
J26	36F	Færder area	59° 4.0	10° 23.0	47G06	LIMA LIM	LI	MT			19	9	19
J99	15B	Ullerø area	58° 3.0	6° 43.0	45F69	GADU MOR	BI	PYR1O		25	25		24
J99	15B	Ullerø area	58° 3.0	6° 43.0	45F69	GADU MOR	BL	ALAD	24	22	25		23
J99	15B	Ullerø area	58° 3.0	6° 43.0	45F69	GADU MOR	LI	EROD	23	25	24		24
J99	15B	Ullerø area	58° 3.0	6° 43.0	45F69	GADU MOR	LI	MT	24	19	24		24
J99	15F	Ullerø area	58° 3.0	6° 43.0	45F69	LIMA LIM	BI	PYR1O			20		20
J99	15F	Ullerø area	58° 3.0	6° 43.0	45F69	LIMA LIM	BL	ALAD			25		25
J99	15F	Ullerø area	58° 3.0	6° 43.0	45F69	LIMA LIM	LI	EROD			25		25
J99	15F	Ullerø area	58° 3.0	6° 43.0	45F69	LIMA LIM	LI	MT			23		25
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	GADU MOR	BI	PYR1O		28	24	25	25
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	GADU MOR	BL	ALAD	15	29	25	25	25
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	GADU MOR	LI	EROD	10	30	25	25	25
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	GADU MOR	LI	MT	14	24	25	25	25
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	PLAT FLE	BI	PYR1O			25	11	11
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	PLAT FLE	BL	ALAD			23	11	12
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	PLAT FLE	LI	EROD			25	11	12
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	PLAT FLE	LI	MT			24	11	12
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	GADU MOR	BI	PYR1O		24	25	14	25
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	GADU MOR	BL	ALAD	25	25	25	13	24
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	GADU MOR	LI	EROD	25	25	25	14	25
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	GADU MOR	LI	MT	25	23	25	15	25
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	PLAT FLE	BI	PYR1O			25	22	24
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	PLAT FLE	BL	ALAD			25	23	23
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	PLAT FLE	LI	EROD			25	24	25
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	PLAT FLE	LI	MT			23	23	25
J99	21F	Åkrefjord	59° 45.0	6° 7.0	48F62	PLAT FLE	BI	PYR1O			11		
J99	21F	Åkrefjord	59° 45.0	6° 7.0	48F62	PLAT FLE	BL	ALAD			11	25	
J99	21F	Åkrefjord	59° 45.0	6° 7.0	48F62	PLAT FLE	LI	EROD			11	6	
J99	21F	Åkrefjord	59° 45.0	6° 7.0	48F62	PLAT FLE	LI	MT				6	
J99	23B	Karihavet area	59° 54.0	5° 8.0	48F51	GADU MOR	BI	PYR1O		23	24	23	25
J99	23B	Karihavet area	59° 54.0	5° 8.0	48F51	GADU MOR	BL	ALAD	25	24	25	24	25
J99	23B	Karihavet area	59° 54.0	5° 8.0	48F51	GADU MOR	LI	EROD	21	25	25	25	25
J99	23B	Karihavet area	59° 54.0	5° 8.0	48F51	GADU MOR	LI	MT	22	18	25	25	25
J99	98B	Lille Molla	68° 12.0	14° 48.0	65G48	GADU MOR	BI	PYR1O				14	21
J99	98B	Lille Molla	68° 12.0	14° 48.0	65G48	GADU MOR	BL	ALAD				5	25
J99	98B	Lille Molla	68° 12.0	14° 48.0	65G48	GADU MOR	LI	EROD				15	25
J99	98B	Lille Molla	68° 12.0	14° 48.0	65G48	GADU MOR	LI	MT				15	25
J99	98F	Lille Molla	68° 12.0	14° 48.0	65G48	PLEU PLA	BI	PYR1O				18	22
J99	98F	Lille Molla	68° 12.0	14° 48.0	65G48	PLEU PLA	BL	ALAD				13	19
J99	98F	Lille Molla	68° 12.0	14° 48.0	65G48	PLEU PLA	LI	EROD				18	25
J99	98F	Lille Molla	68° 12.0	14° 48.0	65G48	PLEU PLA	LI	MT				18	25
J99	10B	Varangerfjorden	69° 56.0	29° 40.0	68H97	GADU MOR	BI	PYR1O				19	18
J99	10B	Varangerfjorden	69° 56.0	29° 40.0	68H97	GADU MOR	BL	ALAD				25	25
J99	10B	Varangerfjorden	69° 56.0	29° 40.0	68H97	GADU MOR	LI	EROD				25	24

jmpco	jmpst	stnam	lat	lon	icear	speci	tissu	param	97	98	99	00	01
J99	10B	Varangerfjorden	69° 56.0	29° 40.0	68H97	GADU MOR	LI	MT				25	25
J99	10F	Skogerøy	69° 55.0	29° 51.0	68H97	PLEU PLA	BI	PYR1O				11	25
J99	10F	Skogerøy	69° 55.0	29° 51.0	68H97	PLEU PLA	BL	ALAD				11	24
J99	10F	Skogerøy	69° 55.0	29° 51.0	68H97	PLEU PLA	LI	EROD				16	23
J99	10F	Skogerøy	69° 55.0	29° 51.0	68H97	PLEU PLA	LI	MT				15	25
J26	30B	Oslo City area	59° 49.0	10° 33.0	48G05	GADU MOR	LI	HS	50	50	25	25	25
J26	30B	Oslo City area	59° 49.0	10° 33.0	48G05	GADU MOR	MU	HS	60	60	30	30	30
J26	36B	Færder	59° 2.0	10° 32.0	47G06	GADU MOR	LI	HS	25	25	25	23	25
J26	36B	Færder	59° 2.0	10° 32.0	47G06	GADU MOR	MU	HS	30	30	30	27	30
J26	36F	Færder area	59° 4.0	10° 23.0	47G06	LIMA LIM	LI	HS	5	5	5	5	30
J26	36F	Færder area	59° 4.0	10° 23.0	47G06	LIMA LIM	MU	HS	5	5	5	5	30
J99	15B	Ullerø area	58° 3.0	6° 43.0	45F69	GADU MOR	LI	HS	25	25	25	25	25
J99	15B	Ullerø area	58° 3.0	6° 43.0	45F69	GADU MOR	MU	HS	30	30	30	30	30
J99	15F	Ullerø area	58° 3.0	6° 43.0	45F69	LIMA LIM	LI	HS	5	5	5	5	30
J99	15F	Ullerø area	58° 3.0	6° 43.0	45F69	LIMA LIM	MU	HS	5	5	5	5	30
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	GADU MOR	LI	HS	30	30	25	25	25
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	GADU MOR	MU	HS	36	36	30	30	30
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	PLAT FLE	LI	HS	15	11	5	2	30
J63	53B	Inner Sørfjord	60° 10.0	6° 34.0	49F65	PLAT FLE	MU	HS	15	11	5	2	30
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	GADU MOR	LI	HS	25	25	25	25	25
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	GADU MOR	MU	HS	30	30	30	30	30
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	PLAT FLE	LI	HS		4	5	5	30
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	PLAT FLE	MU	HS		4	5	5	30
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	LIMA LIM	LI	HS		5			
J62	67B	Strandebarm	60° 16.0	6° 2.0	49F62	LIMA LIM	MU	HS		5			
J99	21F	Åkrefjord	59° 45.0	6° 7.0	48F62	PLAT FLE	LI	HS			3	5	30
J99	21F	Åkrefjord	59° 45.0	6° 7.0	48F62	PLAT FLE	MU	HS			3	5	30
J99	21F	Åkrefjord	59° 45.0	6° 7.0	48F62	LEPI WHI	LI	HS			5		
J99	21F	Åkrefjord	59° 45.0	6° 7.0	48F62	LEPI WHI	MU	HS			5		
J99	23B	Karihavet area	59° 55.0	5° 7.0	48F51	GADU MOR	LI	HS	25	25	25	25	25
J99	23B	Karihavet area	59° 55.0	5° 7.0	48F51	GADU MOR	MU	HS	30	30	30	30	30
J99	98B	Lille Molla	68° 12.0	14° 48.0	65G48	GADU MOR	LI	HS	25	25	25	25	25
J99	98B	Lille Molla	68° 12.0	14° 48.0	65G48	GADU MOR	MU	HS	30	30	30	30	30
J99	98F	Lille Molla	68° 12.0	14° 48.0	65G48	PLEU PLA	LI	HS	4	5	1	4	30
J99	98F	Lille Molla	68° 12.0	14° 48.0	65G48	PLEU PLA	MU	HS	4	5	1	4	30
J99	10B	Varangerfjorden	69° 56.0	29° 40.0	68H97	GADU MOR	LI	HS	23	25	25	25	25
J99	10B	Varangerfjorden	69° 56.0	29° 40.0	68H97	GADU MOR	MU	HS	27	30	30	30	30
J99	10B	Varangerfjorden	69° 56.0	29° 40.0	68H97	BROS BRO	LI	HS					
J99	10B	Varangerfjorden	69° 56.0	29° 40.0	68H97	BROS BRO	MU	HS					
J99	10F	Skogerøy	69° 55.0	29° 51.0	68H97	PLEU PLA	LI	HS	5		4	3	30
J99	10F	Skogerøy	69° 55.0	29° 51.0	68H97	PLEU PLA	MU	HS	5		4	3	30

Appendix C
Map of stations

Station positions 1981-2001
(cf. Appendix B)

Appendix C (cont.) Map of stations

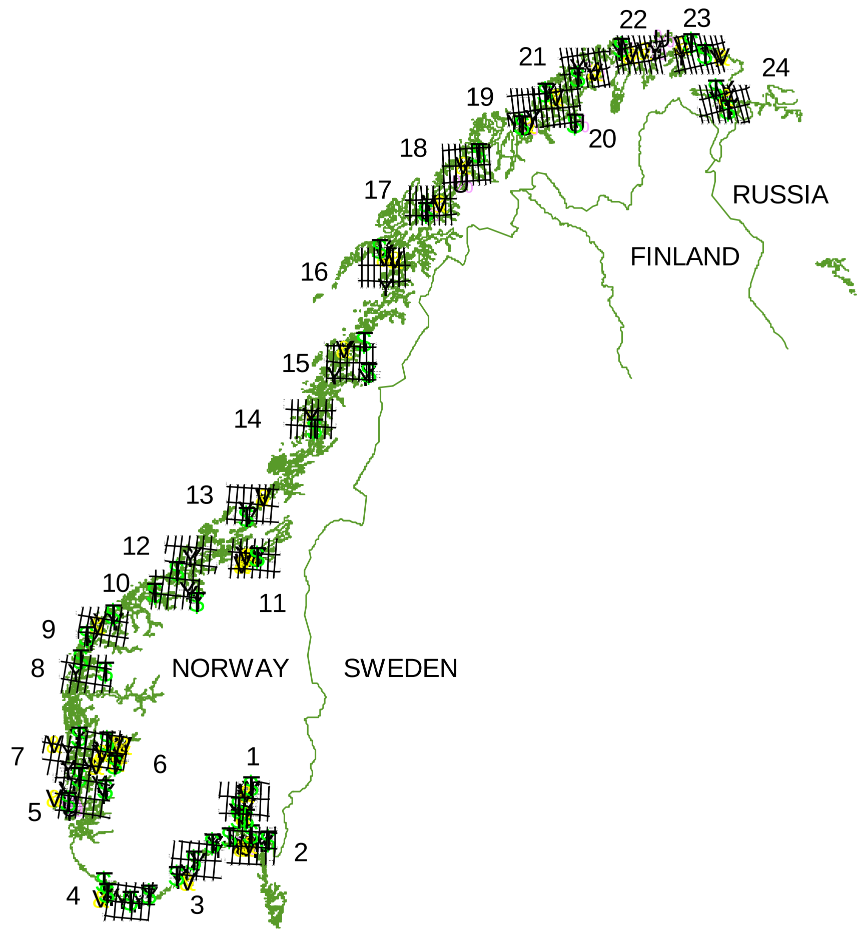
NOTES

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.

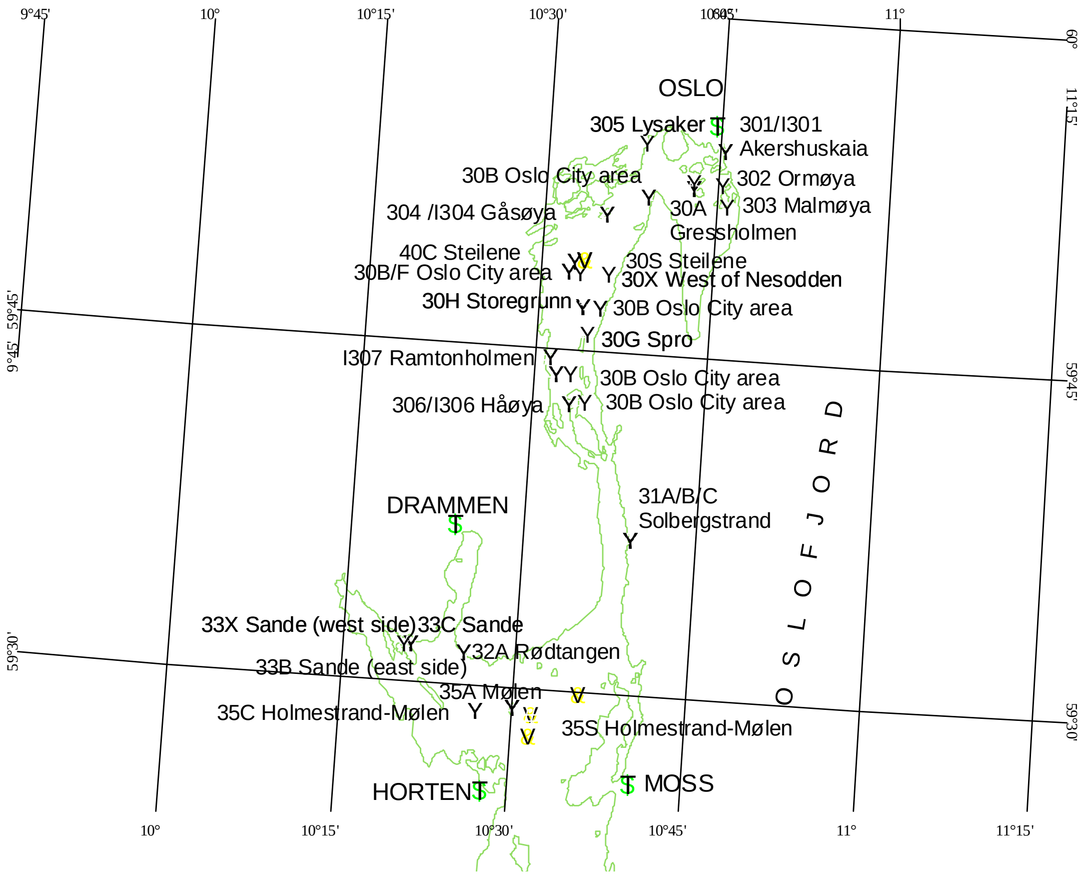
The letter A following the station identification number indicates that blue mussels were sampled. The letter B indicates sampling for cod and the letter F indicates sampling for flatfish (selected stations, marked B and/or F are used in this BEM-investigation, see Table 2). This system for fish is not 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. An encircled dot indicates the position for sampling mussels, shrimp or fish. A square and pentagon symbol indicates the position for sampling dog whelks or sediment, respectively. A triangle indicates the position of a town or city.

The letter "I" preceding 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.* 2001).

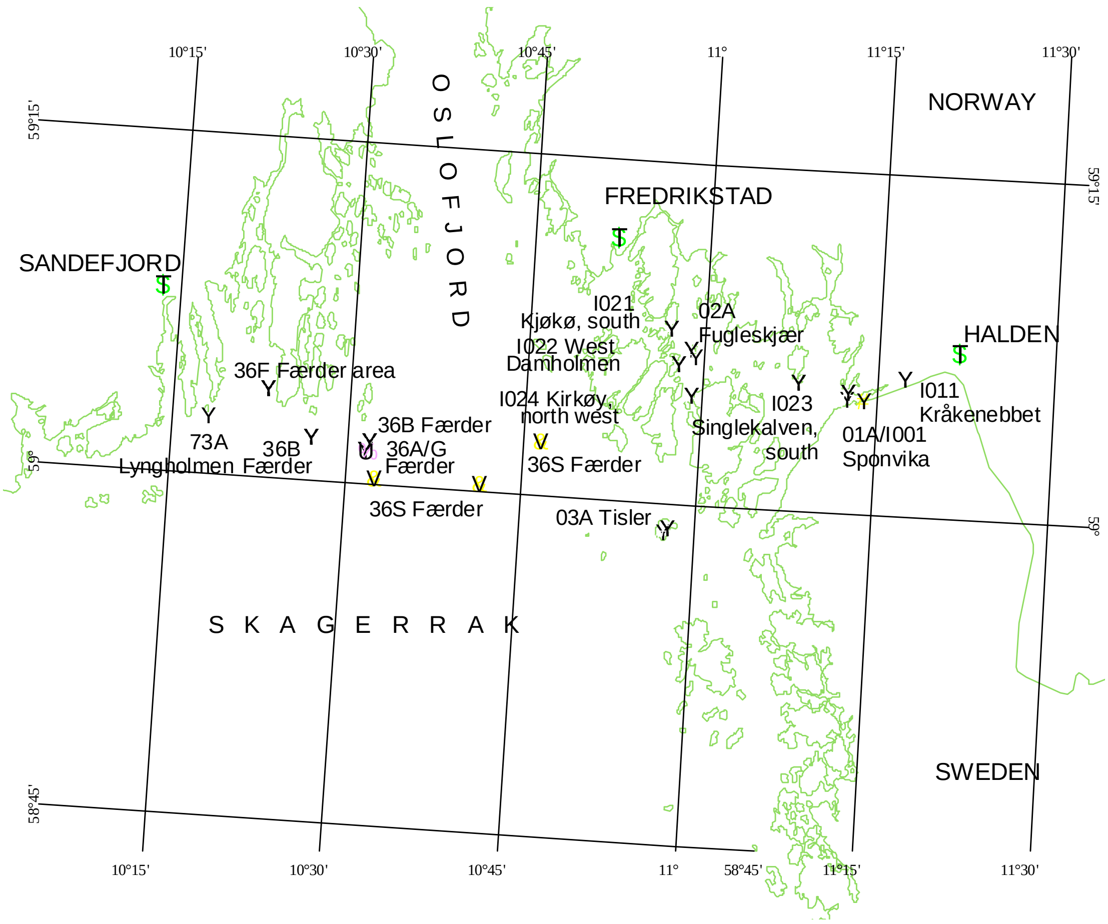
The maps are generated using ArcView GIS version 3.3.



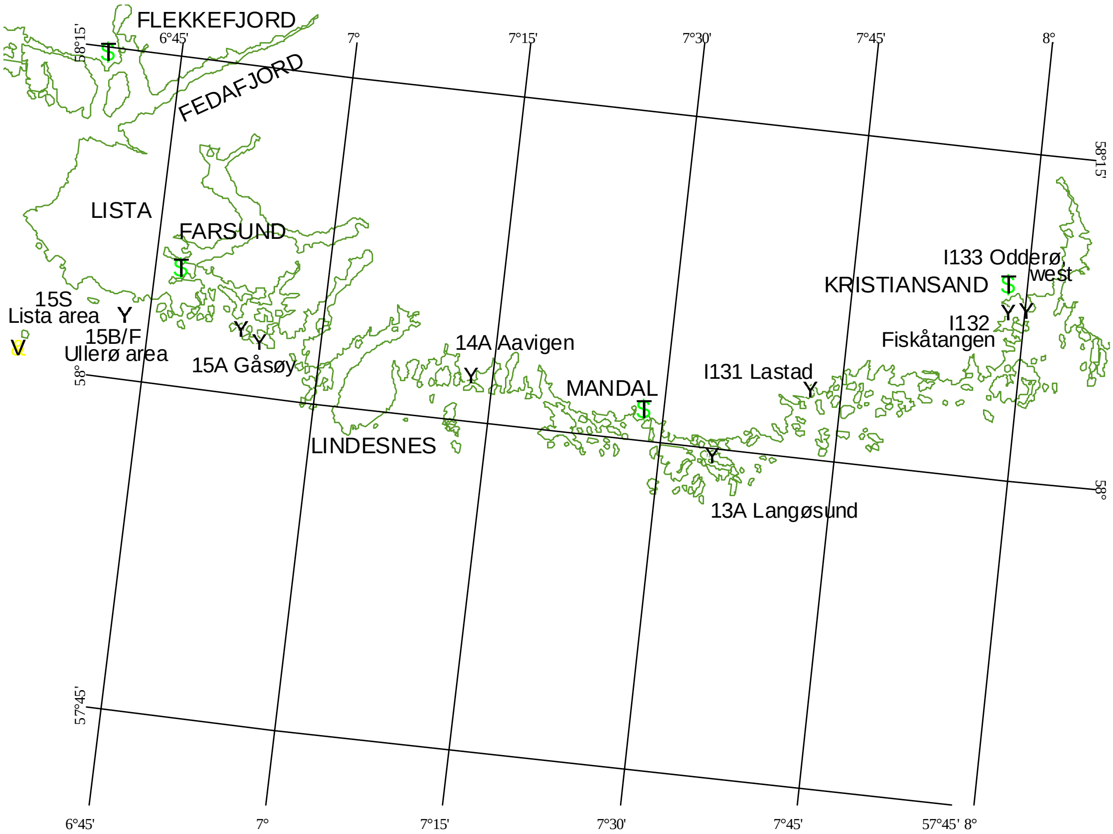
JAMP stations Norway. Numbers indicate map reference


OSLO
305 Lysaker
301/I301 Akershuskaia
30B Oslo City area
302 Ormøya
303 Malmøya
304 /I304 Gåsøya
30A 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
DRAMMEN
31A/B/C Solbergstrand
O S L O F J O R D
33X Sande (west side)
33C Sande
32A Rødtangen
33B Sande (east side)
35A Mølen
35C Holmestrand-Mølen
35S Holmestrand-Mølen
HORTEN
MOSS

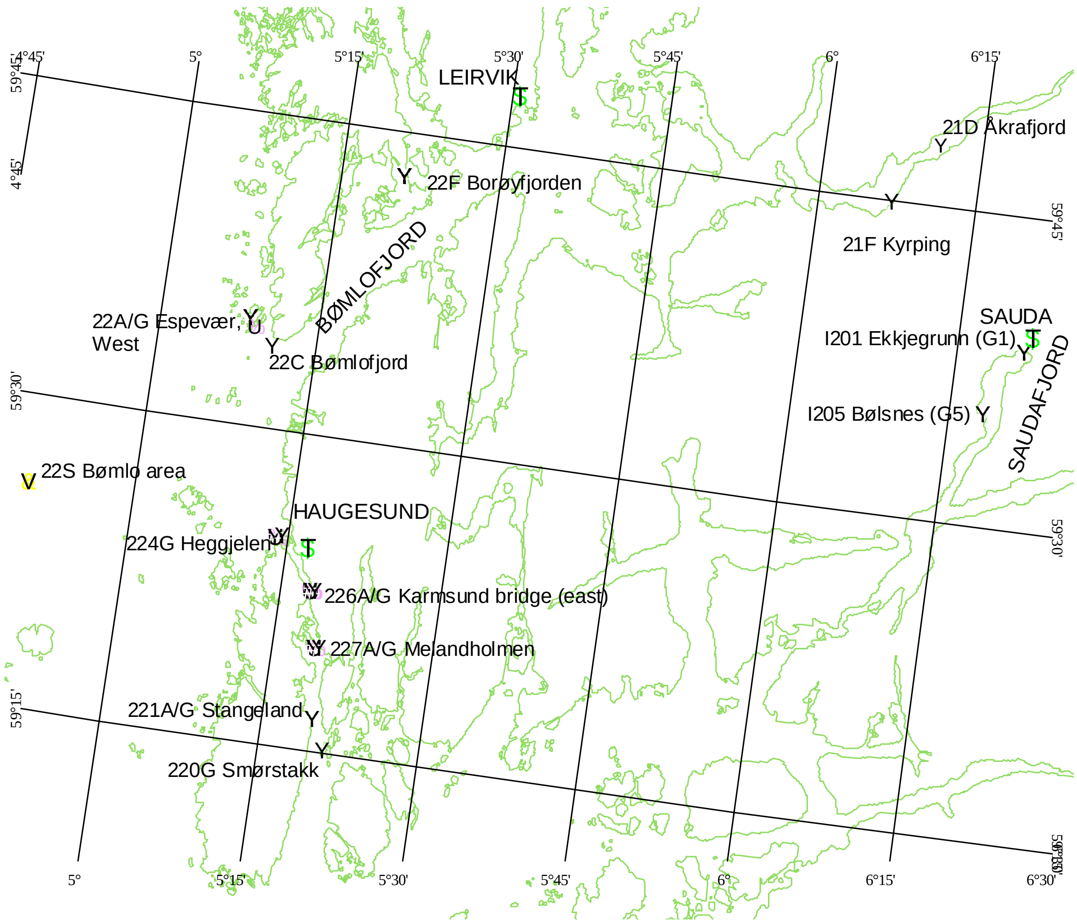
MAP 1


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

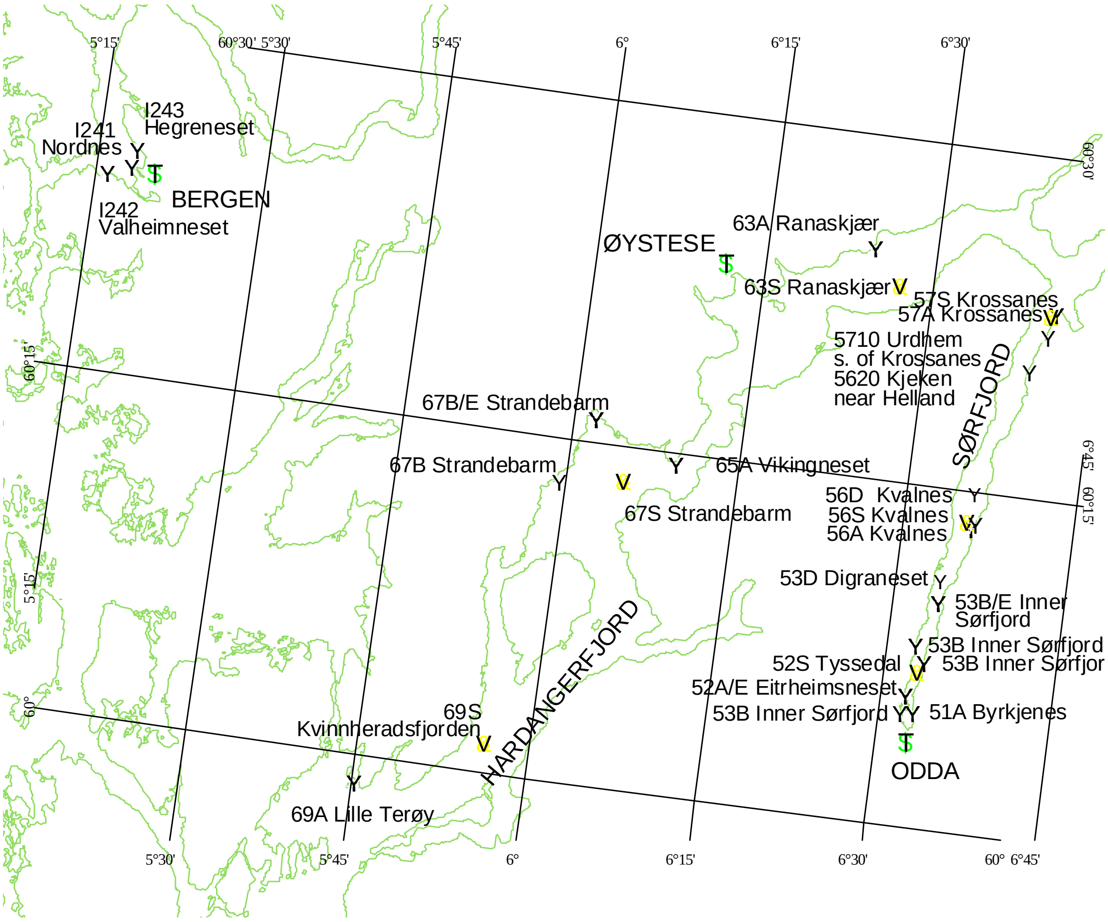
MAP 2


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

MAP 4

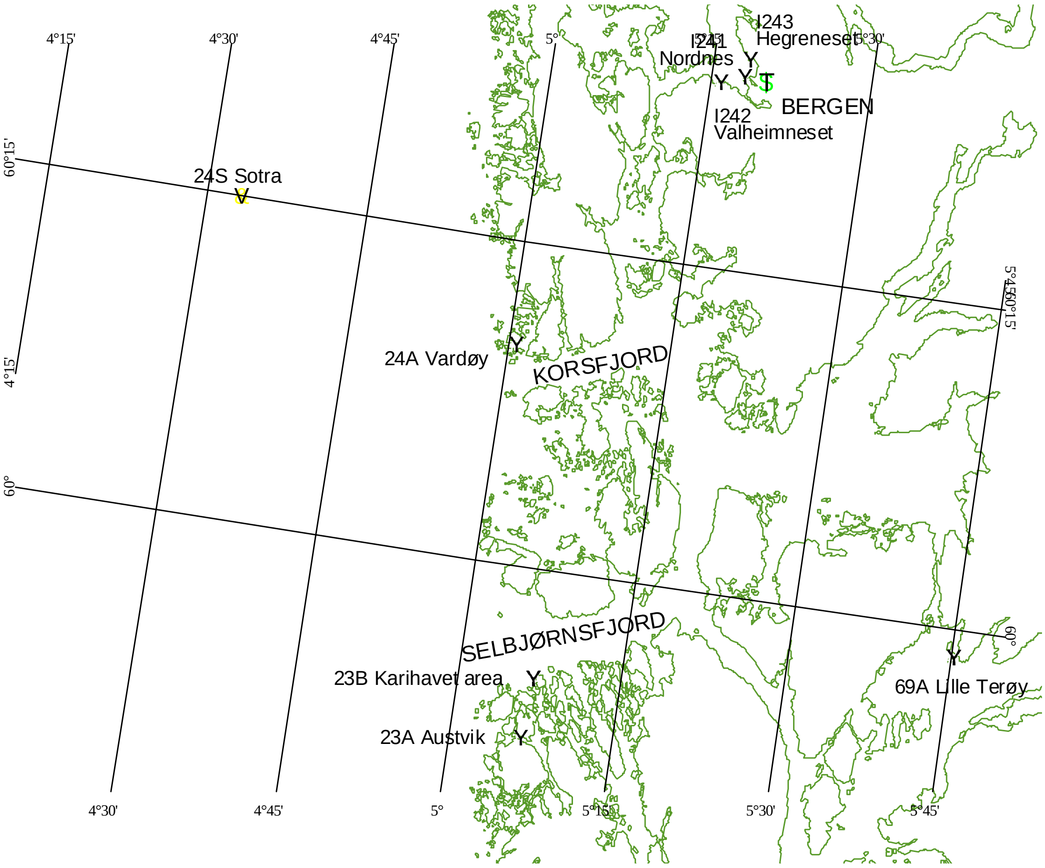

LEIRVIK
21D Åkrafjord
22F Borøyfjorden
21F Kyrping
BØMLOFJORD
22A/G Espevær, West
22C Bømlofjord
SAUDA
I201 Ekkjegrunn (G1)
I205 Bølsnes (G5)
SAUDAFJORD
22S Bømlo area
HAUGESUND
224G Heggjelen
226A/G Karmsund bridge (east)
227A/G Melandholmen
221A/G Stangeland
220G Smørstakk
4°45'
5°
5°15'
5°30'
5°45'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

MAP 5



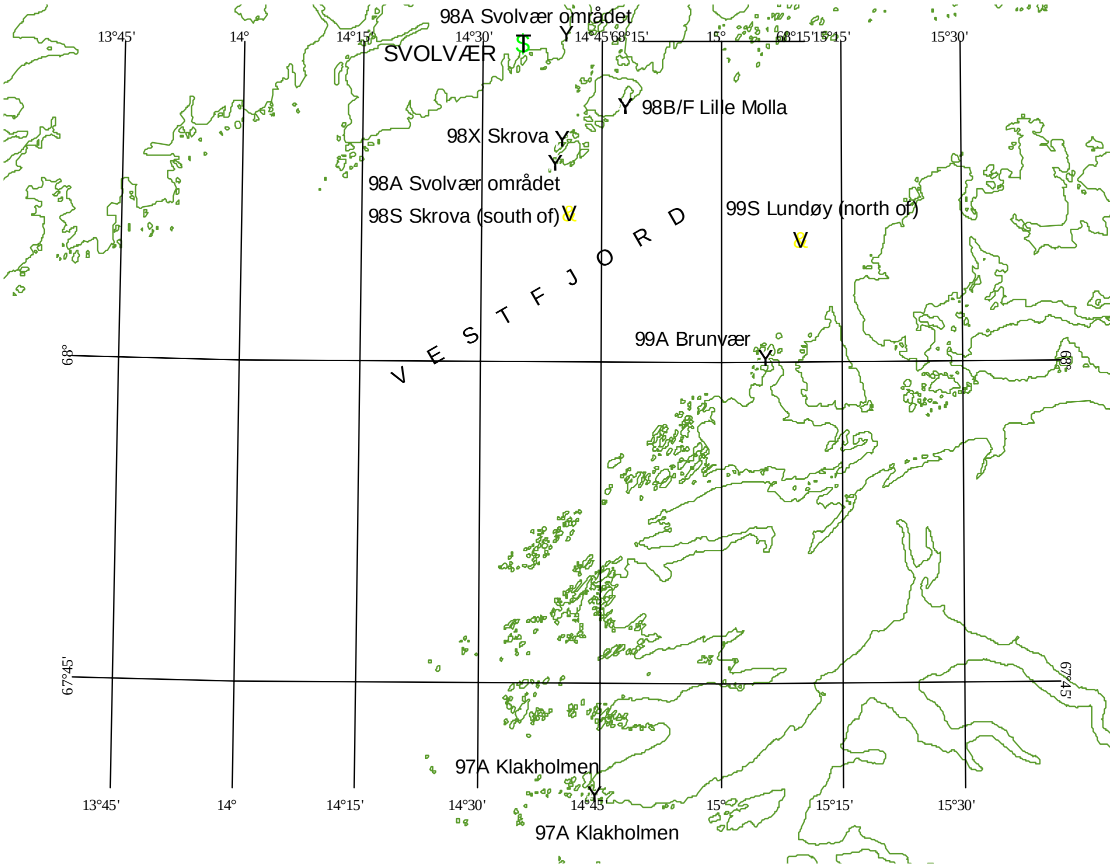
I243
Hegreneset
I241
Nordnes
I242
Valheimneset
BERGEN
ØYSTESE
63A Ranaskjær
63S Ranaskjær
57S Krossanes
57A Krossanes
5710 Urdhem
s. of Krossanes
5620 Kjeken
near Helland
SØRFJORD
67B/E Strandebarm
67B Strandebarm
65A Vikingneset
67S Strandebarm
56D Kvalnes
56S Kvalnes
56A Kvalnes
53D Digraneset
53B/E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

MAP 6

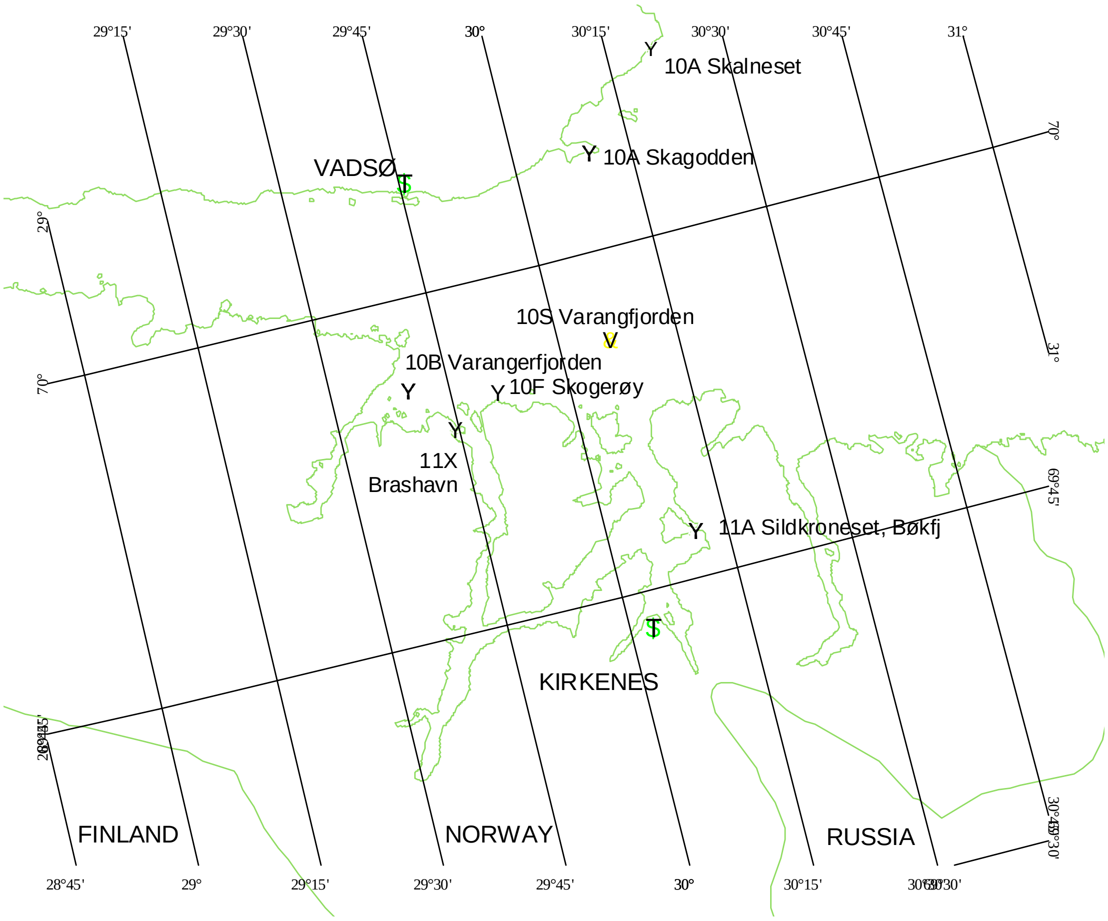


I243
Hegreneset
I241
Nordnes
I242
Valheimneset
BERGEN
24S Sotra
24A Vardøy
KORSFJORD
SELBJØRNSFJORD
23B Karihavet area
23A Austvik
69A Lille Terøy

MAP 7


98A Svolvær området
SVOLVÆR
98B/F Lille Molla
98X Skrova
98A Svolvær området
98S Skrova (south of)
99S Lundøy (north of)
V E S T F J O R D
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


10A Skalneset
10A Skagodden
VADSØ
10S Varangfjorden
10B Varangerfjorden
10F Skogerøy
11X
Brashavn
11A Sildkroneset, Bøkfj
KIRKENES
FINLAND
NORWAY
RUSSIA
29°15'
29°30'
29°45'
30°
30°15'
30°30'
30°45'
31°
70°
69°45'
28°45'
29°

MAP 24

Appendix D

Biomarkers in fish 1997-2001
Raw data

NOTES

This appendix presents results from biological effects methods applied to fish. All data are on a original basis; that is, the basis on which the sample was analysed.Three units of measure are used: **ppm** (parts per million, mg/kg), **ppb** (parts per billion, μg/kg) and **ppp** (parts per trillion, ng/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 data is sorted in the order of::

Species	Alphabetically by ICES code; Latin, English and Norwegian name follow.
Tissue	Softbody, tail muscle
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).

Limit check file: **No limit check**
Weight basis **"ORGINAL"**
Table sorted by **Specie, Tissue, Locality (Predefined sequence), Catchment date, Sample type (Individual, Bulked, Homegenate)**

NOTES:

- The detection limit given here are approximations based on 3 times the standard deviation og the "blank" or near zero concentration of a solutior
  Day to day variations in the analytical instrument may lead to different detection limits
- Method codes are explained in: Green, N.W., 2001. Joint Assessment and Monitoring Programme (JAMP).
  Overview of Analythical Methods 1981-2000. NIVA report 4353-2001, project 80106.
- NB! The numeric values showv have been printed with a FIXED number of digit, and do not necessarily indicate analytical precision
- If a numeric value is suspect (ie. prefixed with "s"), the value is ignored in parameter statistics unless all observations are suspect.
  If a value can not be converted to basis for the table, the value is printed in the orginal basis but not included in any parameter statistic
  unless all values are in the orginal basis.
- If replicates are analyzed, the mean value of the replicates is counted in parameter statistics
- A value prefixed with "<<" indicates that the number of "<" values is greater or equal to 25% of computed observations.
  The corresponding standard deviation is prefixed with the character "~" if any "<" value is included

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **30B Oslo City area** Latitude: 59°48.50N Longitude: 10°32.50E
Catch,date : **19980115** Count: 10 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>													
Detection limit =>					mean								
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)
repl.	F/M	year	g	mm	g	%	%	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	6	1124	500	46,3	64,7	57,1	48.28	3.936	4.01	4.35	79.16	26.96
2/1	F	7	2548	640	100,3	76,5	69,8	47.28	12.87	2.502	5.813	18.75	11.12
3/1	M	6	1542	525	34,5	64,5	56,7	46.04	17.89	3.701	6.817	49.64	15.38
4/1	M	4	488	375				41.96			14.84		
5/1	F	7	1295	525	53,5	72,0	68,2	50.44	6.966		9.199		
6/1	M	9	2991	655	47,6	56,0	43,7	48	16.7		11.05		4.276
7/1	F	5	603	405	108,5	57,8	47,8	39.96	15.12	3.841	0.8271	78.37	12.74
8/1	F	6	662	420	36,6	62,1	51,1	42.48	2.89	3.448	15.54	25.18	30.28
9/1	F	8	2564	655	9,3	46,1	26,2	40.52	10.71	6.23	6.075	134.5	26.71
10/1	M	7	1585	555	19,3	52,9	37,2	29.64		8.363	0.1234	129.6	
Mean		7	1540	526	50,7	61,4	50,9	43,460	10,885	4,585	7,463	73,600	18,209
Minimum		4	488	375	9,3	46,1	26,2	29,640	2,890	2,502	0,123	18,750	4,276
Maximum		9	2991	655	108,5	76,5	69,8	50,440	17,890	8,363	15,540	134,500	30,280
St.Dev		1	892	104	33,5	9,4	14,1	6,045	5,761	2,011	5,251	46,234	9,805
Count		10	10	10	9	9	9	10	8	7	10	7	7

Comments Station: Oslo City area Slemmestad-Måsene, 100m, trawl

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **30B Oslo City area** Latitude: 59°47.0N Longitude: 10°35.50E
Catch,date : **19980117** Count: 10 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>													
Detection limit =>					mean								
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)
repl.	F/M	year	g	mm	g	%	%	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	6	1144	500	35,8	71,2	64,8	45.08	3.832	1.177	10.55		14.83
2/1	M	5	1149	515	22,5	57,4	44,5	43.4	8.463	3.939	17.41		13.5
3/1	F	5	1155	520	29,0	58,9	46,0	43.72	7.896	3.973	8.208	68.83	10.92
4/1	F	6	1426	520	57,2	64,4	54,7	54.88	5.81	2.324	4.613		15.44
5/1	M	7	1450	530	34,8	61,3	50,0	34.41	5.958	2.884	27.65		12.25
6/1	F	7	1391	540	37,7	58,8	45,2	40.68	9.54	4.367	11.25	65.22	11.47
7/1	F	6	1655	565				37.7			12.18		
8/1	F	7	1682	565	53,2	56,6	44,3	36.91	5.03	2.535	12.6		12.84
9/1	M	7	2004	575	112,8	82,0	77,8	39.74	10.74	5.175	5.855	110.3	21.92
10/1	M	8	1918	575	88,6	80,2	76,1	39.67	12.03	9.5	8.764	46.04	17.49
Mean		6	1497	541	52,4	65,6	55,9	41,619	7,700	3,986	11,908	72,598	14,518
Minimum		5	1144	500	22,5	56,6	44,3	34,410	3,832	1,177	4,613	46,040	10,920
Maximum		8	2004	575	112,8	82,0	77,8	54,880	12,030	9,500	27,650	110,300	21,920
St.Dev		1	312	28	30,1	9,8	13,6	5,707	2,754	2,396	6,619	27,052	3,461
Count		10	10	10	9	9	9	10	9	9	10	4	9

Comments Station: Oslo City area Svestad, 60-90r Correct sampling date 980116. Changed due to IT problem; collision with same date at another "30B" site (ng-990209).

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **30B Oslo City area** Latitude: 59°48.50N Longitude: 10°32.50E
Catch,date : **19990114** Count: 10 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>															
Detection limit =>					Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	min/min/mg prot	µg/mg prot	g/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	6	900	450	13,8	50,6	37,8	12.98	37.42	9.423	2.553	10.88	249.3	14.28	141.5
2/1	F	5	814	460	10,7	40,4	22,3	11.72	27.32	11.74	3.632	15.57	210.6	9.091	219.6
3/1	F	6	1386	510	20,9	57,0	32,5	9.954	25.29	10.16	3.158	28.41	192.4	13.71	112
4/1	M	7	1425	510	22,6	53,0	42,0	11.21	20.49	9.012	3.969	22.49	160.7	17.78	126.6
5/1	M	7	1450	525	36,0	60,3	50,8	32.51	29.86	7.533	3.058	14.4	99.09	19.33	86.85
6/1	F	6	1539	550	23,4	36,9	20,0		33.08	10.68	3.669	4.412	97.84		
7/1	F	7	1600	575	13,7	30,2	13,9	18.77	35.55	11.41	4.069	11.58	74.03	23.2	88.35
8/1	F	8	1628	575	19,5	33,9	18,4	12.1	25.65	12.28	5.774	12.88	60.87		151.3
9/1	F	7	2090	630	18,6	29,7	12,9	7.56	21.66	11.37	3.652	25.48	206.7	20.22	161.3
10/1		9	2487	665	39,0	33,9	12,0	7.182	miss	10.22	3.457		91.06	13.86	137.8
Mean		7	1532	545	21,8	42,6	26,3	13,776	28,480	10,383	3,699	16,234	144,259	16,434	136,144
Minimum		5	814	450	10,7	29,7	12,0	7,182	20,490	7,533	2,553	4,412	60,870	9,091	86,850
Maximum		9	2487	665	39,0	60,3	50,8	32,510	37,420	12,280	5,774	28,410	249,300	23,200	219,600
St.Dev		1	493	69	9,2	11,6	13,6	7,801	5,946	1,436	0,856	7,730	67,357	4,518	40,693
Count		10	10	10	10	10	10	9	9	10	10	9	10	8	9

miss(1) ! Missing value Comments Station: Oslo City area Slemmestad-Måsane, 100m, trawl

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **30B Oslo City area** Latitude: 59°48.50N Longitude: 10°32.50E
Catch,date : **19990121** Count: 10 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>															
Detection limit =>					Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	min/min/mg prot	µg/mg prot	g/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	5	503	390	6,1	29,8	10,7	9.828	27.82	12.57	4.482	20.14	156.6	9.841	76.69
2/1	F	5	574	400	7,5	41,8	23,8	15.75	26.89	9.82	3.023	10.29	272.6	11.92	112.8
3/1	M	5	789	455	11,5	44,1	26,2	9.198	29.59	11.8	6.765	21.51	98.79		165.4
4/1	F	6	970	480	23,5	46,8	32,7	12.73	37.64	9.153	3.903	19.39	70.54		143
5/1	M	6	1144	495	16,5	50,8	39,0	35.91	32.27	9.825	3.25	14.89	98.91	16.21	87.36
6/1	M	6	1386	545	20,6	48,9	35,6	22.18	34.29	9.534	3.249	22.54	335.7		115.4
7/1	M	8	1766	590	23,6	45,2	32,4	37.93	29.99	7.491	3.462	21.62	2.291	24.68	89.57
8/1	M	8	2030	590	39,9	58,4	48,7		51.99	10.95	4.172		154.2	16.66	
9/1	F	8	1660	655	58,7	65,0	51,1	22.43	35.66	6.303	2.502	25.49	65.17	20.83	122.3
10/1	M	8	3148	680	90,8	69,0	61,2	32.26	27.47	6.864	1.934	33.09	47.34	18.64	100.4
Mean		7	1397	528	29,9	50,0	36,1	22,024	33,361	9,431	3,674	20,996	130,214	16,969	112,547
Minimum		5	503	390	6,1	29,8	10,7	9,198	26,890	6,303	1,934	10,290	2,291	9,841	76,690
Maximum		8	3148	680	90,8	69,0	61,2	37,930	51,990	12,570	6,765	33,090	335,700	24,680	165,400
St.Dev		1	800	101	26,6	11,6	14,7	11,123	7,495	2,063	1,322	6,371	103,688	5,068	28,328
Count		10	10	10	10	10	10	9	10	10	10	9	10	7	9

Comments Station: Oslo City area Slemmestad-Måsane, 100m, trawl

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **30B Oslo City area** Latitude: 59°48.50N Longitude: 10°32.50E
Catch,date : **19990128** Count: 10 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᵓBG/min/mg prot	ɪin/min/mg prot	µg/mg prot	ȷ/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	5	700	420	7,8	30,8	66,8	23.81	30.2	17.58	7.068	17.69	120.1	17.55	124.7
2/1	F	6	840	445	14,9	41,7	19,2	35.28	38.59	14.89	5.325	13.8	27.27	12.97	71.12
3/1	M	5	966	450	17,0	59,6	51,4	27.47	28.84	7.299	3.085	15.12	171.5		121.8
4/1	F	6	880	450	12,3	28,1	51,0		miss	12.4	6.396		84.09		
5/1	F	6	912	450	8,9	31,1	27,4	15.25	34.04	13.45	4.043	12	190.3	14.93	145.2
6/1	F	6	1096	480	21,1	41,9	58,6	13.48	24.68	16.15	3.826	10.78	128.5		116.5
7/1	M	7	1332	535	19,1	30,3	63,7	19.91	31.18	15.4	8.612	14.72	29.78	13.18	68.34
8/1	M	8	1566	535	39,4	65,1	61,9	26.96	35.8	6.288	1.815	11.13	93.41	15.48	93.72
9/1	F	8	2117	615	44,4	66,6	57,4	11.72	37.1	7.404	2.994	16.72	203.3	16.27	107.4
10/1	F	9	3691	750	55,9	51,4	75,5	14.49	30.6	9.804	2.582	18.15	365.1	30.76	99.76
Mean		7	1410	513	24,1	44,7	53,3	20,930	32,337	12,067	4,575	14,457	141,335	17,306	105,393
Minimum		5	700	420	7,8	28,1	19,2	11,720	24,680	6,288	1,815	10,780	27,270	12,970	68,340
Maximum		9	3691	750	55,9	66,6	75,5	35,280	38,590	17,580	8,612	18,150	365,100	30,760	145,200
St.Dev		1	906	102	16,6	15,1	17,5	7,972	4,422	4,098	2,200	2,756	99,366	6,150	25,173
Count		10	10	10	10	10	10	9	9	10	10	9	10	7	9

miss(1) ! Missing value

Comments
Station: Oslo City area Slemmestad-Måsane, 100m, trawl

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **30B Oslo City area** Latitude: 59°49.0N Longitude: 10°33.0E
Catch,date : **19991106** Count: 25 Sample type: **Individual**

	Analytical lab. =>							NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code =>														
	Detection limit =>				Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot	g/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	5	1969	560	55,0	47,8	33,4		28.05	7.407	2.289	18.26	31.56	17.42	
2/1	F	4	2269	650	23,0	36,9	18,8	57.17	33.09	7.956	2.973	13.96	4.19	15.52	67.86
3/1	F	2	980	470	7,0	35,2	12,2	14.95	32.01	13.52	5.383	12.07	12.28	17.64	80.81
4/1	M	4	1601	565	24,0	54,0	41,0	26.99	35.46	9.117	3.393	20.66	125.6	24.2	135.6
5/1	F	5	1970	595	52,0	48,8	33,2	22.22	30.81	9.264	4.766	18.22	4.611	13.8	81.86
6/1	F	3	1000	410	5,0	30,2	6,5	11.21	29.91	10.64	5.231	12.41	74.65	16.1	95.62
7/1	M	4	1346	545	14,0	24,8	5,1	22.62	32.28	12.22	4.407	16.55	2.34	24.45	129.7
8/1	F	5	812	470	15,0	43,6	28,3	16.06	28.09	11.26	3.819	12.57	35.05	10.98	185.7
9/1	F	5	2657	650	55,0	63,7	55,6	53.32	26.28	4.725	2.477	15.46	71.88	23.59	139.3
10/1	F	5	1155	510	18,0	40,3	21,8	12.42	28.86	8.589	5.685	14.62	23.9	29.32	134.8
11/1	F	4	1009	475	17,0	40,6	24,0	8.484	27.64	8.067	2.772	15.32	99.18	18.33	144.7
12/1	M	3	577	385	6,0	25,3	9,3		28.73	11.7	6.123	15.31	10.87	15.07	
13/1	F	3	1003	465	29,0	57,7	44,5	36.76	29.36	6.963	4.148	11.71	11.46	30.98	114.9
14/1	M	3	486	375	8,0	54,7	41,8	14.54	27.91	8.472	2.854	14.34	86.2	21.93	101.9
15/1	M	6	373	380	13,0	44,1	26,8	33.33	30.81	10.4	4.676	12.99	4.32	29.23	52.91
16/1	M	2	602	415	7,0	48,0	30,5	9.393	26	9.084	3.306	13.12	107.3	17.33	240.8
17/1	M	2	584	405	8,0	31,0	11,7	7.272	24.73	10.32	3.81	10.82	140.7	19.28	160.9
18/1	F	2	450	370	4,0	31,4	9,0	28.48	25.55	13.09	5.744	12.98	69.99	12.43	105.8
19/1	F	2	931	475	12,0	28,2	8,5	11.31	28.73	11.29	2.627	11.48	82.7	24.39	151.2
20/1	F	4	1297	525	29,0	45,9	24,2	49.46	34.08	9.252	3.783	12.29	15.44	16.9	93.69
21/1	F	6	668	415	11,0	42,7	21,8	10.61	26	9.612	3.225	10.97	71.48	10.11	118.6
22/1	M	2	463	370	6,0	43,0	28,4	12.63	27.73	12	5.242	12.6	104.8	7.813	152.7
23/1	M	6	1236	510	14,0	45,5	27,3	34.14	28.82	9.405	4.013	15.29	77.92	21.6	77.36
24/1	F	4	849	455	8,0	22,5	2,8	21.51	26.73	8.904	3.557	12.64	141.4	24.99	149.1
25/1	F	6	893	465	8,0	37,4	15,5	23.94	31.44	11.56	5.874	9.887	17.64	22.19	208.5
Mean		4	1087	476	17,9	40,9	23,3	23,427	29,164	9,793	4,087	13,861	57,098	19,424	127,144
Minimum		2	373	370	4,0	22,5	2,8	7,272	24,730	4,725	2,289	9,887	2,340	7,813	52,910
Maximum		6	2657	650	55,0	63,7	55,6	57,170	35,460	13,520	6,123	20,660	141,400	30,980	240,800
St.Dev		1	600	83	15,3	10,7	13,7	14,662	2,770	2,036	1,167	2,580	46,229	6,141	45,498
Count		25	25	25	25	25	25	23	25	25	25	25	25	25	23

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **30B Oslo City area** Latitude: 59°49.0N Longitude: 10°33.0E
Catch,date : **20001106** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>														
	Detection limit			=>	Mean													
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	NAP2O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᴾBG/min/mg prot	min/min/mg prot	µg/mg prot	ȷ/kg/ABS 380 nm	ȷ/kg/ABS 380 nm	µg/kg/ABS 38	µg/kg/ABS 38
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	X	4	765	450	17,0	50,5	36,0	8.989	34.97	6.654	3.587	9.789	268.1	8.686	<nd	<nd	<nd	41.83
2/1	X	5	845	460	32,0	72,4	62,0	36.7	32.99	6.66	2.591	10.56	239	9.29	<nd	<nd	<nd	7.521
3/1	X	4	856	470	9,0		21,0	13.03	19.56	8.566	3.539	9.113	225.3	6.954	<nd	<nd	<nd	8.903
4/1	X	3	805	440	23,0	60,5	47,0	14.04	39.56	10.24	2.99	13.74	18.49	5.845	<nd	<nd	<nd	17.24
5/1	X	3	800	430	31,0	71,0	62,0	17.37	25.62	4.744	1.978	14.77	315.3	10.04	<nd	<nd	<nd	13.35
6/1	X	6	1295	560	14,0	33,7	15,0	15.96	36.59	13.61	4.699	13.6	214.4	5.085	<nd	<nd	<nd	11.53
7/1	X	4	670	420	23,0	72,3	64,0	14.08	31.51	6.982	3.981	15.35	133.5	8.294	<nd	<nd	<nd	10.72
8/1	X	5	908	460	9,0	55,4	43,0	17.17	40.01	6.498	1.964	14.6	207.4	6.882	<nd	<nd	<nd	16.02
9/1	X	5	945	480	29,0	63,6	53,0	10.61	40.52	7.664	2.83	9.865	284	8.015	<nd	<nd	<nd	9.43
10/1	X	3	500	400	9,0	63,6	54,0	16.36	43.07	11.08	2.708	3.299	336.2	5.42	<nd	<nd	<nd	8.495
11/1	X	4	885	470	39,0	61,7	50,0	14.24	35.17	6.75	1.556	18.83	163.4	8.514	<nd	<nd	<nd	8.988
12/1	X	5	1450	540	52,0		40,0	16.16	39.56	7.716	2.511	15.72	248.2	11.62	<nd	<nd	<nd	12.25
13/1	X	3	742	430	15,0	57,4	46,0		42.3	9.364	3.14	11.7	239	7.366				
14/1	X	4	640	430	13,0	57,5	42,0	25.35	38.57	7.968	2.906	13.91	159.4	10.97	<nd	<nd	<nd	11.87
15/1	X	2	860	470	15,0	51,0	38,0	10.81	38.03	9.436	3.485	12.15	202.9	5.71	<nd	<nd	<nd	14.62
16/1	X	4	1140	505	29,0	59,4	49,0	17.17	36.68	7.752	3.027	17.35	309.9	5.338	<nd	<nd	<nd	13.98
17/1	X	5	1625	570	17,0	40,4	24,0	19.09	38.75	11.3	3.285	16.86	259.5	8.165	<nd	<nd	<nd	7.125
18/1	X	5	845	450	27,0	62,7	54,0	11.11	41.9	7.842	2.381	21.66	349.2	8.454	<nd	<nd	<nd	13.77
19/1	X	6	1235	540	29,0	54,2	43,0	10.5	38.8	9.902	3.064	15.75	394	10.85	<nd	<nd	<nd	13.14
20/1	X	5	835	490	42,0	74,2	66,0		41.45	4.644	1.425	18.44	315.2	6.723	<nd	<nd	<nd	
21/1	X	4	1160	490	37,0	58,9	49,0	17.7	31.02	7.448	2.994	13.1	231.4	8.553	<nd	<nd	<nd	15.03
22/1	X	3	900	485	33,0	64,6	55,0		38.3	6.05	1.823	18.64	331.2	6.735	<nd	<nd	<nd	
23/1	X	4	815	460	36,0	64,9	57,0	12.85	42.62	7.968	2.293	13.57	312.7	5.984	<nd	<nd	<nd	10.04
24/1	X	3	775	435	18,0	59,6	48,0		39.83	9.024	2.902	15.64	262.5	9.588				
25/1	X	2	575	390	9,0	42,1	28,0	12.04	33.94	11.26	3.098	14.86	632.1	3.854	<nd	<nd	<nd	13.79
Mean		4	915	469	24,3	58,8	45,8	15,778	36,853	8,285	2,830	14,115	266,092	7,717	<<0.000	<<0.000	<<0.000	13,316
Minimum		2	500	390	9,0	33,7	15,0	8,989	19,560	4,644	1,425	3,299	18,490	3,854	<0.000	<0.000	<0.000	7,125
Maximum		6	1625	570	52,0	74,2	66,0	36,700	43,070	13,610	4,699	21,660	632,100	11,620	0,000	0,000	0,000	41,830
St.Dev		1	266	47	11,8	10,2	13,4	6,068	5,502	2,132	0,753	3,816	110,165	2,012	~0.000	~0.000	~0.000	7,119
Count		25	25	25	25	23	25	21	25	25	25	25	25	25	23	23	23	21

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **30B Oslo City area** Latitude: 59°49.0N Longitude: 10°33.0E
Catch,date : **20011002** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) ᴾBG/min/mg prot w.wt	EROD(LI) ɪin/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	BAP3O(BI) ȷ/kg/ABS 380 nm w.wt	PA1O(BI) ȷ/kg/ABS 380 nm w.wt	PYR1O(BI) µg/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>																	
1/1	F	6	1531	540	57,7	60,4	49,0	14.99	47.49	10.42	3.115	12.42	61.52	13.3	<nd	<nd	10.6
2/1	F	6	778	456	17,9	42,8	28,0	13.74	39.46	13.27	4.366	12.75	52.3	16.07	<nd	<nd	21.4
3/1	M	5	1086	485	16,9	45,7	29,0	11.21	43.33	13.25	3.694	15.03	25.49	17.01	<nd	<nd	24.44
4/1	F	4	1452	501	36,2	58,9	48,0	14.14	46.92	9.244	3.234	11.09	49.37	15.72	<nd	<nd	17.04
5/1	M	5	1192	535	19,5	48,1	31,0	31.21	41.31	18.26	3.849	13.31	78.1	11.63	<nd	<nd	7.466
6/1	M	4	1237	430	41,5	65,7	54,0	14.34	46.67	7.2	2.104	11.53	177.8	14.41	<nd	<nd	11.99
7/1	F	3	460	375	6,5	39,7	23,0	11.62	48.28	13.45	3.487	9.744	120.8	9.546	<nd	<nd	18.77
8/1	F	3	822	460	9,4	39,5	20,0	30.18	53.44	12.6	5.01	12.72	54.14	17.72	<nd	<nd	15.01
9/1	M	3	779	428	32,4	66,5	57,0	7.575	37.1	8.462	1.94	11.24	133.7	8.718	<nd	<nd	32.21
10/1	M	5	865	445	23,7	63,7	53,0	15.96	40.67	11.26	3.107	10.3	87.02	10.73	<nd	<nd	16.1
11/1	M	4	911	432	23,4	63,5	47,0	17.88	50.33	8.712	2.459	11.74	206.8	11.81	<nd	<nd	19.97
12/1	F	4	1076	500	12,6	38,6	21,0	9.494	45.75	14.38	3.999	14.95	47.88	10.83	<nd	<nd	19.59
13/1	M	4	813	440	24,0	64,8	54,0	8.787	43.83	8.528	2.546	8.746	118	11.09	<nd	<nd	17.53
14/1	M	2	433	355	16,0	61,9	51,0	8.383	41.22	9.442	2.396	17.41	128.9	13.91	<nd	<nd	19.21
15/1	F	4	1509	545	12,2	23,8	3,7	20.1	47.91	16.52	3.463	12.49	61.95	12.96	<nd	<nd	9.951
16/1	M	4	1046	485	20,5	52,2	35,0	13.23	54.1	10.97	3.626	9.693	80.32	10.42	<nd	<nd	23.05
17/1	F	5	3233	690	72,6	58,1	46,0	21.41	44.1	10.76	2.432	16.22	73.13	18.8	<nd	<nd	4.624
18/1	M	4	709	410	10,8	43,6	27,0	11.31	43.42	15.27	4.312	10.79	117.3	8.14	<nd	<nd	12.11
19/1	F	4	2137	500	100,8	76,8	70,0	9.191	50.79	5.506	1.713	15.77	81.15	7.89	<nd	<nd	16.76
20/1	M	3	731	405	13,3	49,9	35,0	14.14	47.36	14.96	3.881	17.37	74.15	8.39	<nd	<nd	21.5
21/1	M	3	681	420	9,5	39,8	21,0	12.73	53.54	16.67	4.933	17.28	157.8	8.905	<nd	<nd	24.12
22/1	M	3	698	415	17,2	57,9	44,0	30.3	52.17	11.84	3.55	8.063	129	9.022	<nd	<nd	12.57
23/1	F	5	1197	500	11,8	28,0	9,1	18.28	50.7	15.43	4.372	13.9	37.67	13.18	<nd	<nd	12.2
24/1	F	5	888	440	25,2	57,8	45,0	8.585	47.86	9.642	2.869	16.1	92.22	15.96	<nd	<nd	15.84
25/1	F	4	956	455	17,4	46,9	31,0	15.05	59.5	12.36	3.466	12.7	130.1	8.477	<nd	<nd	27.58
Mean		4	1089	466	26,0	51,8	37,3	15,353	47,090	11,936	3,357	12,934	95,064	12,186	<<0.000	<<0.000	17,265
Minimum		2	433	355	6,5	23,8	3,7	7,575	37,100	5,506	1,713	8,063	25,490	7,890	<0.000	<0.000	4,624
Maximum		6	3233	690	100,9	76,8	70,0	31,210	59,500	18,260	5,010	17,410	206,800	18,800	<0.000	<0.000	32,210
St.Dev		1	582	68	21,9	12,9	16,2	6,786	5,273	3,227	0,896	2,744	45,566	3,302	~0.000	~0.000	6,391
Count		25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **36B Færder** Latitude: 59°2.0N Longitude: 10°32.0E
Catch,date : **19971012** Count: 25 Sample type: **Individual**

	Analytical lab. =>							NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code =>														
	Detection limit =>				Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	BILIV(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	OHBIL(BI)	ALAD(BL)	EROD(LI)	MT(LI)
repl.	F/M	year	g	mm	g	%	%	mg/L	mg/mL	mg/mL	mg/mL	µg/kg	PBG/min/mg prot	nin/min/mg prot	µg/mg prot
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	4	518	400				668.6	38.48			10.88	17.94		
2/1	F	4	676	425	9,0	42,0	25,1	369.9	27.34	14.3	11.39	60.96	11.98	186.1	12.39
4/1	M	6	1288	530	15,3	21,5	3,9	558	44.32	14.99	8.419	34.9	13.3		11.26
6/1	M	7	1333	555	11,1	21,7	3,4	1732	49.92	14.51	5.909	32.12	9.265	114.6	28.94
7/1	F	6	1325	555	15,6	22,1	4,8	1242		14.99	8.304	37.14		6.455	21.28
8/1	F	7	1518	560	13,8	21,6	4,4	3562	39.82	13.08	8.525	11.44	15.71	74.69	35.74
9/1	F	6	2172	570	102,8	57,6	44,5	661.8	42.76	24.66	7.655	18.15	16.84	111.3	11.69
10/1	F	6	997	570	10,5	19,9	4,0	966.7	43.48	16.66	3.726	41.48	15.2	1.86	16.31
12/1	F	7	1031	580	9,3	24,2	4,9	890.2	51.56	21.44	6.256	16.06	10.96		12.38
13/1	F	6	1856	580	33,4	51,0	36,9	2476	28.56	19.39	4.889	22.36	12.76	120.2	18.78
14/1	M	6	1993	595	16,8	20,8	5,0	1065	22.56	14.55	10.15	33.61	6.635	154.5	27.91
15/1	F	6	1941	600	28,4	51,4	38,3	1063	37.52	13.65	10.06	48.42	5.975	74.28	15.36
16/1	M	6	1091	600	15,1	37,5	20,2	954.8	39.11	25.66	11.72	30.19	14.86	71.02	17.03
17/1	F	7	1916	610	22,0	22,8	5,8	679.6	42.92	16.85	9.96	28.36	10.02	132.8	16.4
18/1	M	7	2091	620	40,3	56,3	45,1	2355	54.56	15.52	9.464	16.38	15.08	75.7	16.22
19/1	M	6	2301	630	49,1	46,1	28,8	725.4	52.96	26.5	10.03	22.47	9.419	108.7	11.73
21/1	F	7	2237	640	18,2	22,2	5,0	1727	30.35	11.76	8.554	24.8	13.95	114.7	30.46
22/1	M	8	2863	705	57,1	44,8	30,4	1346	50.8	22.34	4.725	6.922	12.61	83.22	25.16
23/1	M	7	3132	730	37,5	37,6	22,6	2272	48.04	24.28	11.75	16.12	13.7	41.53	26.36
24/1	M	10	3695	760	73,1	44,8	31,2	611.2	38.78	31.95	13.09	13.13	20.98	13.43	30.25
25/1	M	10	3412	760	81,0	33,5	18,5	909.3	44.68	17.95	6.034	7.067	11.29	139.1	31.46
Mean		7	1875	599	33,0	35,0	19,1	1278	41,426	18,752	8,531	25,379	12,924	90,233	20,856
Minimum		4	518	400	9,0	19,9	3,4	369,900	22,560	11,760	3,726	6,922	5,975	1,860	11,260
Maximum		10	3695	760	102,8	57,6	45,1	3562	54,560	31,950	13,090	60,960	20,980	186,100	35,740
St.Dev		1	870	91	26,9	13,4	15,1	806,069	8,946	5,515	2,611	14,115	3,685	51,232	7,923
Count		21	21	21	20	20	20	21	20	20	20	21	20	18	20

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **36B Færder** Latitude: 59°2.0N Longitude: 10°32.0E
Catch,date : **19981020** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot	g/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	X	4	462	390	9,3	44,6	26,3	20.2	14.48	3.588	1.205	56.98	83.54	11.13	37.37
2/1	M	4	587	395	10,1	45,1	30,9	13.73	35.82	4.821	1.335	30.62	14.16	13.92	51.87
3/1	F	4	835	415	57,8	65,8	54,0	60.1	32.94	2.655	0.79	7.381	19.19	14.05	43.69
4/1	F	4	623	430	14,5	18,0	9,7	40.57	23.52	6.897	2.217	24.12	<0.6	16.63	45.33
5/1	F	4	841	450	22,0	51,3	40,2	14.11	38.67	3.753	1.03	27.5	6.493	13.81	38.07
6/1	F	4	504	460	28,0	59,3	48,0	16.51	49.5	7.053	2.25	21.4	26.45	20.22	52.62
7/1	F	4	691	460	14,0	31,3	12,4	14.11	13.09	4.971	2.22	47.89	7.486	16.58	55.51
8/1	F	4	713	460	12,8	43,9	27,0	12.93	22.74	2.548	0.7238	26.21	0.7877	14.53	42.72
9/1	X	6	541	485	35,2	50,6	33,0	27.09	35.58	2.646	1.397	29.89	7.418		51.91
10/1	F	5	1206	485	46,6	70,2	63,0	16.25	34.24	3.369	0.873	22.44	22.13	26	37.91
11/1	F	5	1009	495	19,2	55,9	43,4	37.3	31.73	5.865	2.087	30.31	3.926	16.97	42.94
12/1	F	5	1249	495	38,4	63,9	52,9	11.72	27.23	3.171	1.563	22.12	80.5	15.82	48.96
13/1	F	5	1133	495	30,0	60,3	49,6	51.03	20.42	2.221	0.6475	51.46	6.867	24.55	26.87
14/1	M	5	1253	500	30,0	50,4	38,8	22.68	34.38	5.622	1.91	23.57		14.88	30
15/1	M	5	1174	500	37,0	58,3	45,0	25.7	40.75	5.808	1.899	14.85	57.49	20.61	68.22
16/1	M	5	1230	510	33,1	41,2	22,4	29.48	41.58	6.072	2.207	31.43	87.17	17.52	20.08
17/1	F	5	1053	515	46,9	58,7	45,0	20.92	52.32	1.783	0.7482	13.68	21.38	20.12	32.2
18/1	F	6	1182	515	19,4	44,0	28,9	26.08	35.55		1.277	32.86			81.77
19/1	F	5	1271	520	27,4	55,0	43,4	5.151	14.25	4.14	1.261	49.55	11.41	21.13	41.97
20/1	F	6	813	530	14,4	28,2	11,1	37.3	59.37	7.263	2.083	9.585	<0.6	20.02	9.988
21/1	M	6	1270	530	32,6	57,3	44,4	31.5	31.83	3.408	0.8435	25.7	28.74	10.24	50.9
22/1	M	7	1655	575	59,7	65,0	53,7	36.79	30.2	6.15	2.264	24.68	52.8		49.46
23/1	F	7	1221	590	15,3	45,8	29,6	34.02	17.06	9.834	3.587	44.42	10.03	15.86	20.87
24/1	F	7	1611	600	33,9	45,7	27,8	23.31	28.44	7.524	3.675	24.82	0.6971	27.66	45.62
25/1	F	7	1816	605	29,0	21,0	4,1	51.16	14.38	9.117	3.152	51.35	0.7659	22.84	22.9
Mean		5	1038	496	28,7	49,2	35,4	27,190	31,203	5,012	1,730	29,793	<23,940	17,959	41,990
Minimum		4	462	390	9,3	18,0	4,1	5,151	13,090	1,783	0,648	7,381	<0,6	10,240	9,988
Maximum		7	1816	605	59,7	70,2	63,0	60,100	59,370	9,834	3,675	56,980	87,170	27,660	81,770
St.Dev		1	368	58	14,0	13,6	15,5	13,821	12,180	2,205	0,863	13,466	~28,170	4,615	15,560
Count		25	25	25	25	25	25	25	25	24	25	25	23	22	25

Comments
Station: Færder Caught 20.10.98 , 30.11.98

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **36B Færder** Latitude: 59°2.0N Longitude: 10°32.0E
Catch,date : **19991028** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ɔBG/min/mg prot	ɲin/min/mg prot	µg/mg prot	ȷ/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	2	925	480	9,3	25,3	5,6	23.03	48.66	9.543	4.577	11.08	2.62	32.85	31.62
2/1	M	3	1028	490	22,8	65,0	53,9	65.04	56.07	6.516	2.184	7.974	73.47	27.09	12.18
3/1	F	4	1027	470	14,6	45,6	31,8	16.46	23.34	7.932	2.579	37.24	1.03	32.07	28.92
4/1	F	5	2145	630	31,1	52,5	42,3	32.32	49.35	6.723	1.748	8.09	<0.6	40.89	11
5/1	F	2	842	440	24,0	57,2	48,7	34.04	45.72	5.793	1.811	7.005	52.02	11.8	28.54
6/1	F	2	994	470	24,6	65,4	57,5	12.83	39.36	6.264	2.154	18.86	33.7	17.63	36.78
7/1	M	3	1196	540	19,2	49,8	37,1	29.9	56.67	6.273	2.68	9.341	53.27	26.78	25.56
8/1	F	1	327	330	11,8	70,2	62,0	20.2	51.72	4.932	1.845	9.131	82.46	22.13	60.13
9/1	M	1	495	360	9,8	50,4	34,0	35.25	34.02	7.701	3.189	20.05	77.86	13.07	29.69
10/1	F	1	411	360	14,1	62,9	54,4	16.06	40.83	6.378	2.36	13.46	70.71	14.05	60.92
11/1	X	1	403	340	14,8	63,0	52,7	25.96	42	4.623	1.965	7.054	285.4	14.26	46.19
12/1	F	1	332	320	13,4	68,6	63,5	66.96	38.79	4.416	1.799	9.931	44.38	13.23	19.8
13/1	F	3	1815	580	27,1	54,8	40,0	52.02	34.14	6.129	2.357	24.97	97.41	28.47	10.84
14/1	F	2	2552	630	44,9	34,8	18,1	41.01	41.31	6.513	2.529	9.421	153.5	35.44	10.46
15/1	F	2	1331	530	19,0	35,2	17,7	12.12	45.3	9.84	4.585	11.84	137.9	30.16	34.74
16/1	M	4	1388	520	29,9	39,0	24,0	10.2	34.53	8.631	2.85	2.864	2.317	22.48	58.34
17/1	F	2	1064	470	28,1	65,7	57,3	32.42	45.39	4.923	1.68	10.75	127.7	31.17	24.08
18/1	M	2	449	380	6,2	42,7	28,0	27.67	43.74	6.624	2.744	10.73	49.2	18.64	61.98
19/1	F	5	2988	690	37,5	48,1	34,1	27.67	35.79	8.328	2.704	12.89	55.15	26.33	22.04
20/1	X	1	343	320	10,8	62,1	47,1	17.57	27.33	6.273	1.922	4.33	58.99	12.45	62.94
21/1	F	3	1775	570	33,3	49,1	35,2	68.78	50.13	6.744	2.019	6.368	60.17	16.35	9.568
22/1	F	5	3423	680	48,4	53,0	39,9	30.5	47.37	7.872	2.962	2.755	72.29	34.04	19.08
23/1	F	3	2392	580	88,4	67,0	59,0	24.64	33.69	5.115	1.944	14.98	48.12	42.46	28.09
24/1	M	3	653	420	7,5	27,8	9,4	7.575	37.05	8.685	3.873	5.702	64.14	26.95	58.7
25/1	M	1	526	380	19,3	68,8	58,9	16.77	30.57	5.979	1.809	17.04	81.5	19.21	50.63
Mean		2	1233	479	24,4	53,0	40,5	29,880	41,315	6,750	2,515	11,754	<71,436	24,400	33,713
Minimum		1	327	320	6,2	25,3	5,6	7,575	23,340	4,416	1,680	2,755	<0,6	11,800	9,568
Maximum		5	3423	690	88,4	70,2	63,5	68,780	56,670	9,840	4,585	37,240	285,400	42,460	62,940
St.Dev		1	882	114	17,5	13,2	16,7	17,292	8,551	1,484	0,817	7,537	~59,523	9,143	18,491
Count		25	25	25	25	25	25	25	25	25	25	25	25	25	25

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **36B Færder** Latitude: 59°2.0N Longitude: 10°32.0E
Catch,date : **20001027** Count: 23 Sample type: **Individual**

Samp/	Sex	Age	Wght	Lngt	Mean weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	NAP2O(BI)	PA1O(BI)	PYR1O(BI)
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																		
Detection limit =>																		
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᵖBG/min/mg prot	ɪin/min/mg prot	µg/mg prot	ȷ/kg/ABS 380 nm	ȷ/kg/ABS 380 nm	µg/kg/ABS 38	µg/kg/ABS 38
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	6	2136	640	17,4	21,8	3,1	79.47	42.38	14.63	3.673		1.335	14.37	<nd	<nd	<nd	1.523
2/1	F	3	1452	560	16,2	26,1	9,5	68.74	30.93	11.07	3.471	22.98	43.86	20.52	<nd	<nd	<nd	3.346
3/1	F	3	2188	620	44,2	53,0	40,4	22.8	50.02	10.75	2.584	18.83	1.855	19.61	<nd	<nd	<nd	7.631
4/1	M	2	1062	490	26,8	55,2	43,2	37.05	53.04	9.65	6.168	20.99	2.469	12.75	<nd	<nd	<nd	6.288
5/1	M	2	882	460	21,2	56,0	45,1	64.89	44.24	10.25	2.772	17.07	71.98	5.238	<nd	<nd	<nd	6.088
6/1	F	2	694	420	14,6	54,8	37,9	51.98	52.73	12.14	3.731	17.89	96.75	8.16	<nd	<nd	<nd	5.137
7/1	F	2	624	405	5,8		10,8	34.2	50.2	13.26	4.303	22.64	17.72	13.61	<nd	<nd	<nd	7.28
8/1	M	2	664	410	12,6	49,1	32,2	7.878	47.05	10.66	4.13	21.59	98.05	10.86	<nd	<nd	<nd	9.266
9/1	F	2	1528	540	64,6	64,4	56,5	41.11	52.34	7.836	2.125	17.42	77.88	18.43	<nd	<nd	<nd	5.23
10/1	F	2	840	460	16,2	54,4	43,2	40.6	43.09	10.42	3.382	21.49	6.086	10.58	<nd	<nd	<nd	5.468
11/1	F	2	1579	570	54,8	63,2	55,7	20.6	42.79	7.38	1.952	22.03	64.93	13.11	<nd	<nd	<nd	6.795
12/1	M	2	1468	550	37,8	64,0	53,9	31.52	42.51	7.992	2.977	18.13	1354	32.95	<nd	<nd	<nd	7.995
13/1	M	2	868	450	25,4	64,1	55,9	68.58	45.16	8.282	2.356	17.74	104.6	13.67	<nd	<nd	<nd	4.214
14/1	F	2	816	455	20,8	55,8	44,5	53.15	48.18	9.6	2.751	21.93	134.1	10.85	<nd	<nd	<nd	2.333
15/1	F	2	739	430	20,6	64,7	55,3	25.32	32.07	7.48	2.61	25.03	79.82	14.75	<nd	<nd	<nd	6.399
16/1	M	2	934	450	22,2	65,7	58,5	64.72	41.73	7.564	2.064	24	14.74	11.89	<nd	<nd	<nd	4.929
17/1	M	2	901	460	15,2	50,6	37,9	77.8	51.59	7.596	2.45	22.1	43.88	11.63	<nd	<nd	<nd	2.982
18/1	F	2	702	420	20,2	61,3	47,5	23.14	37.53	8.576	2.745	22.96	66.68	9.215	<nd	<nd	<nd	8.212
19/1	M	2	843	470	9,6	30,3	14,0	22.3	48.09	11.42	3.446	23.95	1.525	9.506	<nd	<nd	<nd	4.978
20/1	F	2	591	390	14,2	57,4	43,5	42.92	43.07	8.348	2.66	25.91	49.13	10.16	<nd	<nd	<nd	4.52
21/1	M	2	627	415	11,4	44,1	26,8	59.52	43.79	10.07	2.49	23.69	1.611	7.086	<nd	<nd	<nd	3.327
22/1	F	2	1293	510	48,6	67,6	60,5	38.56	32.87	7.358	2.292	18.41	80.5	9.033	<nd	<nd	<nd	2.438
23/1	F	2	910	490	9,2	25,3	8,1	47.95	41.36	10.94	2.969	24.06	156.1	11.32	<nd	<nd	<nd	4.067
Mean		2	1058	481	23,9	52,2	38,4	44,556	44,207	9,707	3,048	21,402	111,722	13,013	<<0.000	<<0.000	<<0.000	5,237
Minimum		2	591	390	5,8	21,8	3,1	7,878	30,930	7,358	1,952	17,070	1,335	5,238	<0.000	<0.000	<0.000	1,523
Maximum		6	2188	640	64,6	67,6	60,5	79,470	53,040	14,630	6,168	25,910	1354	32,950	<0.000	<0.000	<0.000	9,266
St.Dev		1	462	69	15,6	14,1	18,0	19,985	6,406	2,007	0,938	2,704	274,533	5,735	~0.000	~0.000	~0.000	2,064
Count		23	23	23	23	22	23	23	23	23	23	22	23	23	23	23	23	23

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **36B Færder** Latitude: 59°2.0N Longitude: 10°32.0E
Catch,date : **20011025** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>																	
Units								ABS 380 nm	mg/mL	mg/mL	mg/mL	ᵖBG/min/mg prot	ɴin/min/mg prot	µg/mg prot	ȷ/kg/ABS 380 nm	ȷ/kg/ABS 380 nm	µg/kg/ABS 380 nm
								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	6	3100	650	69,3	36,1	21,0	14.44	54.19	10.2	2.458	20.05	<0.6	15.47	<nd	2.07	3.067
2/1	F	3	2003	570	65,1	62,2	55,0	172.2	52.89	8.572	2.207	16.24	80.96	17.65	<nd	0.1144	1.237
3/1	M	2	964	480	21,5	50,4	40,0	76.66	52.17	10.22	2.041	19.9	104.8	14.88	<nd	0.3744	1.852
4/1	F	2	1196	500				37.65	16.69			20.43			<nd	1.344	4.09
5/1	F	3	1790	570	44,5	36,0	26,0	29.87	53.43	10.16	1.678	21.48	149.4	12.56	<nd	1.383	0.7868
6/1	M	3	1072	510	35,4	28,4	15,0	37.73	47.88	10.41	2.333	15.67	37.03	9.907	<nd	0.896	3.817
7/1	F	1	523	380	14,0	49,3	36,0	23.47	49.04	10.9	3.36	19.78	100.5	8.865	<nd	0.8094	3.872
8/1	F	3	1937	600	25,6	46,8	33,0	32.62	49.86	13.27	3.471	16.35	<0.6	17.75	<nd	0.3494	1.269
9/1	M	3	1504	580	57,9	29,4	13,0	20.7	40.44	11.22	3.894	20.59	1.029	8.735	<nd	1.299	4.554
10/1	M	2	1094	470	37,1	51,8	43,0	28.89	53.38	9.266	3.624	18.37	79.42	8.993	<nd	0.7997	4.431
11/1	M	2	753	450	15,4	59,6	49,0	40.58	53.34	5.388	3.234	19.03	23.83	8.267	<nd	0.5816	1.9
12/1	F	2	1249	510	37,6	19,7	3,3	61.7	48.59	13.59	4.024	18.25	<0.6	10.79	<nd	0.389	1.214
13/1	F	1	402	350	12,4	69,1	56,0	44.6	52.17	4.314	1.193	17.16	59.88	7.942	<nd	0.6457	4.35
14/1	M	2	455	370	10,5	49,1	41,0	12.22	50.13	4.452	1.608	23.97	<0.6	10.29	<nd	2.643	3.019
15/1	F	2	903	460	23,8	24,6	8,2	81.15	40.35	13.02	3.736	18.96	<0.6	9.694	<nd	0.3093	2.588
16/1	M	2	879	460	13,0	31,5	16,0	43.53	54.86	8.698	1.956	17.51	12.73	7.974	<nd	0.5261	3.721
17/1	M	1	647	380	28,8	64,2	54,0	15.65	57.55	8.528	2.444	20.55	99.67	8.768	<nd	0.6835	5.41
18/1	M	4	2291	600	67,0	58,4	47,0	20.33	49.76	7.068	2.765	18.37	113.8	20.95	<nd	0.8706	3.34
19/1	M	3	1202	510	24,5	61,3	51,0	64.76	59.88	6.224	1.615	19.14	138.8	20.12	<nd	0.3166	2.826
20/1	M	2	698	440	7,6	37,6	21,0	45.68	57.01	8.326	2.614	19.35	79.53	14.99	<nd	<nd	4.094
21/1	F	1	393	355	13,2	70,7	61,0	29.11	49.14	5.778	1.757	21.45	96.38	14.9	<nd	<nd	4.02
22/1	M	1	517	380	7,5	29,4	12,0	18.18	44.56	7.58	2.807	20.42	101.9	4.806	<nd	<nd	6.491
23/1	F	3	715	420	20,5	43,9	29,0	15.05	49.49	4.528	2.012	18.61	54.42	5.992	<nd	<nd	6.406
24/1	F	1	588	410	13,1	48,4	34,0	40.24	39.36	11.35	3.503	20.96	73.06	8.428	<nd	0.6039	4.349
25/1	M	1	498	370	25,3	68,9	60,0	40.32	47.16	5.554	1.399	21.38	92.51	9.725	<nd	1.024	2.728
Mean		2	1095	471	28,8	47,0	34,4	41,893	48,933	8,692	2,572	19,359	<62,610	11,602	<<0.000	<0.721	3,417
Minimum		1	393	350	7,5	19,7	3,3	12,220	16,690	4,314	1,193	15,670	<0,6	4,806	<0.000	<0.000	0,787
Maximum		6	3100	650	69,3	70,7	61,0	172,200	59,880	13,590	4,024	23,970	149,400	20,950	<0.000	2,643	6,491
St.Dev		1	679	87	19,3	15,3	17,7	32,999	8,471	2,843	0,858	1,911	~47,949	4,431	~0.000	~0.647	1,525
Count		25	25	25	24	24	24	25	25	24	24	25	24	24	25	25	25

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined** Tissue: All
Locality : **15B Ullerø area** Latitude: 58°3.0N Longitude: 6°43.0E
Catch,date : **19971006** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	BILIV(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	OHBIL(BI)	ALAD(BL)	EROD(LI)	MT(LI)
repl.	F/M	year	g	mm	g	%	%	mg/L	mg/mL	mg/mL	mg/mL	µg/kg	PBG/min/mg prot	nin/min/mg prot	µg/mg prot
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	4	1028	479	9,7	23,9	3,3		54.88	15.32	6.608		16.99	35.55	13.09
2/1	M	5	962	488	7,3	25,7	3,7		38.32	11.58	4.628		12.38	3.114	10.9
3/1	M	4	1160	488	26,9	58,7	40,0			12.82	5.324				10.46
4/1	M	5	752	490	8,4	34,6	13,2		39.27	17.54	6.269		26.33	2.397	9.66
5/1	M	5	1267	524	33,9	61,8	52,0	631.4	46.8	12.22	3.094	265.1	18.22	111.9	10.15
6/1	M	5	1452	533	24,9	58,1	44,5		40.24	17.71	6.776		14.5	49.85	7.564
7/1	M	5	1427	541	12,9	32,2	13,3		27.62	11.71	6.039		22.09	31.8	13.91
8/1	F	5	1685	551	77,7	75,1	68,5		45.24	5.102	2.143		21.44	51.47	13.13
9/1	F	5	1623	555	59,8	72,3	64,8	1017	41.92	11.39	3.984	1150	21.7	264.8	14.87
10/1	F	5	1813	580	36,6	55,9	42,4	384.8	21.49	19.02	6.14	426.8	26.46	40.7	12.87
11/1	F	5	1922	595	36,7	53,5	41,2	510.1	47.96	18.44	8.536	3024	15.94	434.4	18.79
12/1	F	6	1176	600	26,9	63,8	50,4	478.3	46.44	22.44	13.11	200.1	17.49	122.1	11.76
13/1	F	6	2259	605	51,0	53,5	37,8		42.04	27.96	8.262		17.5	26.53	17.66
14/1	M	5	2111	610	91,7	75,8	70,8	546.1	50.36	5.162	2.94	130.7	18.1	40.25	17.53
15/1	M	5	2147	620	107,5	72,4	64,4		47.16	8.438	4.363		12.92	94.35	13.8
16/1	F	5	2762	655	136,2	66,9	63,7	628	45.44	11.61	5.365	719.3	15.45	38.16	13.56
17/1	F	6	2563	670	139,8	72,4	68,3		46.64	7.208	2.888		9.037	70.14	16.42
18/1	F	6	2817	675	167,1	73,7	66,1	435.5	41.48	7.208	1.838	2631	13.84	173.8	14.29
19/1	F	6	3096	679	150,9	73,2	64,5		47	11.91	3.035		15.05	128.5	12.18
20/1	M	7	3371	688	148,8	74,3	67,8	728.4	41.24	20.42	3.628	6.885	8.758	15.09	9.357
21/1	M	6	3180	693	65,8	58,2	45,1		23.41	18.49	5.611		28.6	84.08	16.52
22/1	M	6	3294	700	106,6	60,3	42,7	680.7	45.12	30.84	9.44	14.23	8.163	25.86	6.622
23/1	F	7	3206	700					42.96				7.29		
24/1	F	7	3790	710	177,0	72,8	66,0		24.71	13.86	4.435		23.6	48.22	21.39
25/1	M	8	3780	725	132,3	68,7	62,4		22.8	13.25	3.378		30.27	99.57	15.54
Mean		6	2186	606	76,5	59,9	48,2	604,030	40,439	14,652	5,326	856,812	17,588	86,636	13,418
Minimum		4	752	479	7,3	23,9	3,3	384,800	21,490	5,102	1,838	6,885	7,290	2,397	6,622
Maximum		8	3790	725	177,0	75,8	70,8	1017	54,880	30,840	13,110	3024	30,270	434,400	21,390
St.Dev		1	940	80	56,5	15,9	21,2	181,862	9,388	6,552	2,614	1099	6,456	97,053	3,583
Count		25	25	25	24	24	24	10	24	24	24	10	24	23	24

Comments
Station: Ullerø area Caught 6.10.97 15.11.97 2.12.97

Species   : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99**   **Undefined**   Tissue: All
Locality   : **15B** **Ullerø area** Latitude: 58°3.0N Longitude: 6°43.0E
Catch,date : **19981007** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᴾBG/min/mg prot	nin/min/mg prot	µg/mg prot	ȷ/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	3	329	330	3,4	38,3		24.24	24.75	8.396	2.954	25.17	72.96		4185
2/1	F	4	733	430	12,7	53,7	38,5	26.46	48.67	8.607	3.136	20.6	74.16	15.94	15310
3/1	F	4	902	450	25,5	70,4	62,5	20.03	37.59	2.497	0.8779	30.26	63.63	15.86	1894
4/1	F	5	845	452	9,0	26,0	5,2	19.9	31.41	11.51	6.348	20.76	93.67	11.23	12520
5/1	M	5	834	455	18,0	58,5	48,2	20.66	27.07	7.785	3.23	34.27	42.81	7.378	7363
6/1	M	4	848	464	14,0	40,0	23,2	10.33	26.8	16.42	3.807	31.02	26.22		3960
7/1	X	5	977	480	17,1	61,5	47,9	32.22	50.04	4.98	1.788	9.251	130.4	11.52	4853
8/1	M	5	1251	496	25,0	54,3	40,1	53.42	28.22	10.36	3.882	23.37	119.3	20.47	3770
9/1	F	5	1239	500	16,0	39,2	20,7	33.73	26	15.44	6.204	29.04	0.7738	17.27	823.2
10/1	F	5	1423	526	30,0	52,0	40,8	23.69	33.9	11.21	3.31	21.34	53.3	18.76	3686
11/1	M	5	1373	529	26,0	46,7	31,3	15.75	24.85	12.92	4.044	22.81	30.68	19.52	10160
12/1	F	5	1582	530	41,0	57,9	42,8	56.76	25.94	12.37	4.204	26.5	6.462	28.48	1822
13/1	F	5	1381	550	38,0	65,6	51,0	22.43	62.58	7.917	2.446	21.2	203.2	22.19	6017
14/1	M	5	1581	559	18,0	30,1	10,6	20.66	27.69	12.3	8.064	23.88	1.183		4893
15/1	M	5	1691	563	13,0	34,3	14,1	16.16	35.91	17.07	3.983	18.79	38.69		5150
16/1	F	6	1651	566	23,0	37,5	18,0	23.44	31.53	11.53	3.987	23.34	3.096	30.74	5610
17/1	M	5	1574	570	13,0	24,6	6,3	15.75	39.12	8.286	2.905		121.3	19.6	2792
18/1	M	6	1967	581	43,0	58,9	47,1	37.42	25.97	16.89	3.288		15.26	20.66	5352
19/1	M	5	1895	583	36,0	55,1	43,0	20.7	44.73	7.281	2.796		99.13		3370
20/1	M	6	1872	585	13,0	60,2	51,3	19.66	28.48	11.19	3.135	28.81	7.815	15.38	1425
21/1	F	6	2866	670	116,0	66,5	57,9	23.43	16.54	13.63	6.216	42.9	85.25	22.72	2657
22/1	M	7	3217	690	175,7	74,3	67,7	32.76	53.43	3.18	1.513	21.27	52.27	19.35	351.5
23/1	F	7	3393	725	245,0	83,2	77,5	7.308	20.87	2.411	0.74	38.28	12.93	28	2134
24/1	F	7	3921	775	328,0	66,4	60,9	27.72	41.19	5.424	1.666	21.4	<0.6	23.24	170.9
25/1	F	4	772	945	12,4	56,6	42,8	29.74	35.76	8.814	3.172	22.3	202.9		3266
Mean		5	1605	560	52,5	52,5	39,6	25,375	33,962	9,937	3,508	25,298	<62,320	19,385	4541
Minimum		3	329	330	3,4	24,6	5,2	7,308	16,540	2,411	0,740	9,251	<0,6	7,378	170,900
Maximum		7	3921	945	328,0	83,2	77,5	56,760	62,580	17,070	8,064	42,900	203,200	30,740	15310
St.Dev		1	894	126	80,4	15,4	19,8	11,391	11,060	4,284	1,740	7,155	~58,844	5,964	3626
Count		25	25	25	25	25	24	25	25	25	25	22	25	19	25

Comments
Station: Ullerø area Caught 7.10.98 14.10.98 5.12.98

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined** Tissue: All
Locality : **15B Ullerø area** Latitude: 58°3.0N Longitude: 6°43.0E
Catch,date : **19991021** Count: 25 Sample type: **Individual**

	Analytical lab. =>							NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code =>														
	Detection limit =>				Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᵖBG/min/mg prot	nin/min/mg prot	µg/mg prot	ɟ/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	2	1628	560	55,0	73,4	64,0	27.57	38.37	4.581	1.611	2.989	193.2	22.99	7724
2/1	F	2	1735	570	56,8	61,5	54,1	28.79	45.51	6.345	2.256	9.608	196.4	14.46	15630
3/1	M	2	974	470	19,7	51,7	42,0	24.54	50.04	5.997	1.813	7.194	453.5	17.76	7253
4/1	M	1	399	350	3,4		13,6	46.56	43.23	9.588	3.981	8.446	136.5	16.22	34310
5/1	F	3	2850	690	115,2	70,4	62,8	27.16	41.4	4.008	1.563	14.29	35.37		24.15
6/1	M	2	855	450	50,6	76,1	69,0	34.04	32.88	2.674	0.942	6.269	75.9	15.46	148.4
7/1	F	1	432	370	5,4		13,2	16.87	41.46	11.48	3.865	16.57	106.3	12.27	103.9
8/1	F	1	434	360	5,5		13,2	17.47	38.91	7.242	4.189	4.934	420.5	13.05	71.65
9/1	M	2	1310	500	48,6	68,7	62,0	21.61	31.8	4.71	1.757	3.072	251.6	19.53	96.44
10/1	F	2	2722	640	122,5	72,6	55,0	23.43	46.05	3.021	1.059	8.252	81.43	26.12	82.37
11/1	F	2	1187	510	27,0	61,6	49,6	29.09	36.57	6.441	3.816	23.14	102.1	27.08	47.65
12/1	F	2	1003	450	24,6	64,4	52,4	22.22	33.63	5.301	2.523	20.75	140.5	16.43	56.98
13/1	M	3	2548	600	158,1	75,3	65,3	9.494	27.63	2.427	1.193	2.676	58.79	23.53	56.46
14/1	M	2	1303	520	31,1	62,4	46,3	17.68	35.67	5.337	2.059	17.96		14.15	119.5
15/1	F	1	470	370	8,1	60,9	48,7	14.65	35.73	4.758	2.307	16.37	209.7	15.21	156.1
16/1	M	1	357	320	3,3		10,7	15.25	34.5	8.694	3.693	3.333	53.46	17.76	252.9
17/1	M	1	299	320	3,5		20,8	11.72	37.71	7.845	3.909	6.421	148.6	7.704	432.1
18/1	F	1	358	350	3,6		20,0	33.84	36.96	9.342	3.619	21.3	312.6	14.9	178.7
19/1	F	2	1500	540	34,4	65,1	49,0	33.33	41.46	5.106	2.163	27.2	156	27	1952
20/1	F	2	1102	500	35,7	66,5	55,0	27.37	39.63	4.614	1.988	8.261	332.9	26.36	21620
21/1	F	2	873	460	17,7	56,5	35,0	40.4	43.26	5.328	2.204	3.522	212.4	27.36	72320
22/1	F	2	765	450	7,6	37,9	18,0	12.32	45.72	10.81	4.221	6.048	349.2	14.58	6588
23/1	F	1	792	440	23,1	69,6	55,0	64.03	52.29	5.097	1.692	13.16	666.2	19.63	10530
24/1	M	1	712	420	16,2	62,8	48,0	10.71	41.52	5.358	2.732	20.37	174.5	19.68	11400
25/1	M	3	637	420	14,3	54,5	39,0	53.23	57.96	6.951	2.277	10.1	302.5	23.82	10920
Mean		2	1090	465	35,6	63,8	42,5	26,535	40,396	6,122	2,537	11,289	215,423	18,877	8083
Minimum		1	299	320	3,3	37,9	10,7	9,494	27,630	2,427	0,942	2,676	35,370	7,704	24,150
Maximum		3	2850	690	158,1	76,1	69,0	64,030	57,960	11,480	4,221	27,200	666,200	27,360	72320
St.Dev		1	735	99	40,5	9,3	18,9	13,575	6,797	2,393	1,054	7,289	150,324	5,507	15819
Count		25	25	25	25	19	25	25	25	25	25	25	24	24	25

Comments
Station: Ullerø area Caught 20-21okt. 1999

Species   : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined**   Tissue: All
Locality   : **15B Ullerø area** Latitude: 58°3.0N Longitude: 6°43.0E
Catch,date : **20011016** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>																	
Unit								ABS 380 nm w.wt	mg/mL w.wt	mg/mL w.wt	mg/mL w.wt	PBG/min/mg prot w.wt	nin/min/mg prot w.wt	µg/mg prot w.wt	g/kg/ABS 380 nm w.wt	g/kg/ABS 380 nm w.wt	µg/kg/ABS 380 nm w.wt
1/1	F	3	1698	569	41,2	53,4	42,0	38.78	42.39	10.58	1.851	17.97	54.58	10.44	<nd	0.7477	32.41
2/1	F	3	1846	590	37,4	35,5	24,0	30.2	50.39	11.98	2.911	18.94	31.8	18.45	<nd	0.9272	11.19
3/1	M	3	1065	489	25,4	57,0	47,0	89.86	56.68	6.194	0.9515	14.03	25.48	15.25	<nd	2.326	22.02
4/1	F	2	801	442	18,1	46,5	31,0	34.04	57.45	10.71	1.607	27.2	38.44	12.6	<nd	5.377	50.18
5/1	F	3	1193	494	41,1	63,4	56,0	26.56	54.75	8.91	1.778	21.16	89.28	16.66	<nd	2.183	25.07
6/1	M	3	1466	560	48,4	54,7	42,0	28.48	56.66	9.28	2.539	28.11	<0.6	18.74	<nd	3.793	28.94
7/1	M	3	1174	500	28,9	48,7	34,0	37.88		13.48	2.324		102.8	12.92	<nd	3.036	26.67
8/1	M	3	1333	523	29,7	46,5	33,0	39.82		13.86	1.656		10.39	14.63	<nd	3.516	26.07
9/1	F	2	1391	537	33,8	60,0	44,0	58.59	61.47	10.92	1.827	22.41	69	21.71	<nd	1.929	20.23
10/1	F	2	1021	475	11,4	37,8	20,0	28.98	46.89	13.91	2.896	17.11	137.7	15.99	<nd	2.312	18.18
11/1	F	2	1071	480	21,3	53,8	41,0	46.37	50.58	11.63	1.988	17.86	47.99	13.17	<nd	1.855	17.71
12/1	M	3	1880	590	38,7	54,7	41,0		58.47	8.63	1.87	18.39	64.44	29.05			
13/1	M	2	1208	521	27,8	53,4	39,0	99.99	59.29	13.13	2.312	15.81	57.67	13.26	<nd	2.48	24.43
14/1	F	2	1035	481	21,6	60,2	48,0	26.46	47.51	10.52	1.778	17.84	45.01	14.04	<nd	3.741	39.42
15/1	M	2	844	440	15,2	48,0	33,0	13.53	54.8	13.59	3.271	19.43	83.6	10.03	<nd	5.985	57.12
16/1	M	2	723	434	11,8	44,7	29,0	74.8	57.81	13.63	2.801	23.04	13.09	13.42	<nd	1.618	13.01
17/1	M	2	784	422				30.87	60.25			21.83			<nd	4.082	45.71
18/1	M	2	781	447	14,8	40,3	27,0	30.74	62.94	12.45	2.65	37.36	64.55	17.09	<nd	4.228	28.82
19/1	M	2	817	445	20,8	59,6	43,0	33.01	60.29	8.928	1.984	19.39	75.83	10.89	<nd	5.15	42.11
20/1	M	2	960	459	40,0	72,5	67,0	22.81	58.38	9.938	1.287	14.49	113.1	14.37	<nd	4.341	43.63
21/1	M	3	1562	558	52,6	60,6	49,0	33.52	47.74	9.466	1.851	18.9	55.25	24.31	<nd	7.071	53.56
22/1	M	2	1183	496	15,8	36,4	20,0	28.6	53.02	16.01	3.994	20.09	184.4	17.12	<nd	3.321	30.49
23/1	M	3	1129	500	40,4	62,7	52,0	57.71	49.79	9.082	1.424	19.68	12.48	14.8	<nd	3.483	36.55
24/1	M	2	810	456	18,9	38,5	20,0	28.85	51.93	13.42	3.974	17.68	84.3	17.6	<nd	4.713	54.52
25/1	M	3	1450	539	55,4	66,4	54,0	47.88	45.98	7.034	1.831	15.79	113.2	15.64	<nd	6.704	65.6
Mean		2	1169	498	29,6	52,3	39,0	41,180	54,150	11,137	2,223	20,196	<65,624	15,924	<<0.000	3,538	33,902
Minimum		2	723	422	11,4	35,5	20,0	13,530	42,390	6,194	0,952	14,030	<0,6	10,030	<0.000	0,748	11,190
Maximum		3	1880	590	55,4	72,5	67,0	99,990	62,940	16,010	3,994	37,360	184,400	29,050	0,000	7,071	65,600
St.Dev		1	338	50	13,1	10,1	12,3	21,152	5,647	2,455	0,778	5,099	~43,708	4,360	~0.000	1,711	14,883
Count		25	25	25	24	24	24	24	23	24	24	23	24	24	24	24	24

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J63 Sørfjorden** Tissue: All
Locality : **53B Inner Sørfjord** Latitude: 60°7.30N Longitude: 6°33.50E
Catch,date : **19970930** Count: 15 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	BILIV(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	OHBIL(BI)	ALAD(BL)	EROD(LI)	MT(LI)
repl.	F/M	year	g	mm	g	%	%	mg/L	mg/mL	mg/mL	mg/mL	µg/kg	ᵓBG/min/mg prot	nin/min/mg prot	µg/mg prot
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	4	391	360	2,8	49,4		727.1	36.41	21.98	7.322	113.3	1.172	22.83	11.9
2/1	F	5	418	360	1,3	26,0		320.5	35.94	18.69	6.859	152.5	2.72	109.2	9.98
3/1	M	5	517	370	19,5	71,7	57,0	449	34.84	20.16	8.179	49.83	6.854	503.3	15.84
4/1	F	5	361	370	1,1			1926	37.1	17.59	5.259	17.5	12.71		24.09
5/1	F	4	429	370	2,8	22,4		167.9	32.22	19.44	7.119	139.3	9.987	88.02	18.18
6/1	M	5	313	370	11,5	58,1	51,5	1209	25.56	18.48	9.784	73.07	12.08	83.81	
7/1	M	4	465	410	1,9	23,1		269.8	38.25	16.72	6.225	45.14	5.913		32.06
8/1	M	5	655	420	5,7	31,5	25,8	1146	37.52	21.48	8.341	43.17	8.053		16.74
9/1	M	5	472	420	6,8	30,2	22,6	679	39.63	17.87	6.612	84.35	9.283		14.99
10/1	M	5	777	420	19,2	56,2	51,2	354.4	40.36	16.72	4.883	203	6.496	146	14.55
11/1	M	4	776	425	24,2	69,4	57,1	449.7	33.75	13.7	6.443	77.71	2.13	32.56	8.422
12/1	F	5	568	440	2,2	24,7		264.8	44.68	18.13	6.49	111.9	2.768		21.63
13/1	F	6	674	465	2,6	22,5		585.3	45.16	27.3	8.47	39.96	17.8	84.91	22.53
14/1	F	5	963	480	7,2	37,7	20,9	221.5	40.68	16.75	6.979	344.1	8.042	179.4	17.39
15/1	M	6	1649	530	85,9	74,0		401.9	48.52	7.05	6.464	76.37	7.636	14.63	17.52
Mean		5	629	414	13,0	42,6	40,9	611,460	38,041	18,137	7,029	104,747	7,576	126,466	17,559
Minimum		4	313	360	1,1	22,4	20,9	167,900	25,560	7,050	4,883	17,500	1,172	14,630	8,422
Maximum		6	1649	530	85,9	74,0	57,1	1926	48,520	27,300	9,784	344,100	17,800	503,300	32,060
St.Dev		1	336	50	21,5	19,8	16,8	479,758	5,644	4,351	1,263	82,664	4,489	142,430	6,120
Count		15	15	15	15	14	7	15	15	15	15	15	15	10	14

Comments
Station: Inner Sørfjord Tyssedal, 5-10m, fish traps

Species   : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J63   Sørfjorden**   Tissue: All
Locality   : **53B Inner Sørfjord** Latitude: 60°10.0N Longitude: 6°34.0E
Catch,date : **19981024** Count: 15 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	BG/min/mg prot	nin/min/mg prot	µg/mg prot	g/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	4	482	360	8,6	54,0	39,2		4.557	7.437	2.737	245.4	143.7	19.14	
2/1	F	4	437	370	7,4	54,0	38,3	15.37	29.7	8.502	2.998	15.44	118.8	15.66	185.9
3/1	M	4	555	390	12,0	42,5	27,7	13.03	29.06	21.06	7.206	10.09	6.807	17.23	266.9
4/1	M	4	580	410	5,7	29,2	10,6	22.12	41.25	11.32	4.582	2.006	119.8	14.98	83.43
5/1	M	5	649	410	15,1	57,4	47,8	16.88	50.13	8.421	2.565	16.31	204.7	19.57	564.2
6/1	F	5	855	450	22,0	61,6	62,5	30.24	28.57	8.664	2.649	11.3	70.39		202.7
7/1	M	4	927	460	12,0	49,2	59,6	22.05	35.94	11.23	3.427	21.94	290.6	22.01	49.61
8/1	F	5	1215	500	41,3	66,7	59,5	30.24	37.01	7.077	2.788	14.18	110.9		3.058
9/1	M	5	1172	510	25,1	60,3	18,5	12.73	42.57	7.917	2.634	3.86	125	26.77	240.5
10/1	M	6	1100	520	16,3	36,8	52,4	29.49	38.7	10.59	3.266	8.133	41.84	20.87	70.93
11/1	F	6	1328	520	29,2	51,2	37,0	13.36	38.68	11.23	0.997	4.602	22.26	37.12	235.7
12/1	F	5	1436	540	40,8	64,1	55,5	19.19	42.34	6.108	1.604	13.15	164.4	33.07	57
13/1	F	6	1954	550	61,6	62,3	53,6	9.292	62.71	7.212	2.61	7.794	96.83	32.31	685.7
14/1	F	6	1115	590	42,8	66,0	46,2	18.28	15.03	6.117	2.292	9.655	153.4		40.48
15/1	M	6	1182	590	41,7	73,3	61,4	15.35	65.16	4.346	1.006	8.431	64.17	35.16	181.2
Mean		5	999	478	25,4	55,2	44,7	19,116	37,427	9,149	2,891	26,153	115,573	24,491	204,808
Minimum		4	437	360	5,7	29,2	10,6	9,292	4,557	4,346	0,997	2,006	6,807	14,980	3,058
Maximum		6	1954	590	61,6	73,3	62,5	30,240	65,160	21,060	7,206	245,400	290,600	37,120	685,700
St.Dev		1	418	77	16,8	12,0	16,0	6,873	15,654	3,896	1,498	60,876	72,866	8,014	198,788
Count		15	15	15	15	15	15	14	15	15	15	15	15	12	14

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J63 Sørfjorden** Tissue: All
Locality : **53B Inner Sørfjord** Latitude: 60°10.0N Longitude: 6°34.0E
Catch,date : **19981025** Count: 15 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	min/min/mg prot	µg/mg prot	g/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	4	313	310	2,3			30.24	25.61	4.756	2.131	11.56	4.593		45.84
2/1	F	4	427	350	7,7	57,1	43,5	13.03	39.08	9.984	2.716	17.27	230.5		53.3
3/1	M	4	406	360	3,0			24.54	44.59	9.387	3.976	19.94	188.3	14.86	46.96
4/1	M	4	442	360	6,8	50,4	32,3	16.88	32.11	10.99	3.518	19.25	133.7	16.04	47.95
5/1	F	4	459	360	7,6	48,0	30,5	3.455	34.38	8.88	6.418	11.21	105.8	13.59	249.6
6/1	M	4	476	370	5,1	36,5	17,4	11.82	42.39	11.76	3.745		371.4		112.9
7/1	M	4	821	420	12,4	36,2	20,2		25.25	8.672	2.87	10.55	75.94	15.47	
8/1	M	5	1206	510	32,2	67,2	59,6	34.54	41.31	16.25	5.031	11.62	221.4	25.9	82.58
9/1	M	5	1300	510	17,4	36,6	19,5	16.38	42.41	19.57	3.226	7.818	150.7	15.9	300.6
10/1	F	6	1414	520	41,4	57,9	44,5	9.797	29.23	15.38	3.265	7.133	60.28	21.48	489.8
11/1	F	5	1395	530	31,7	66,7	58,0	25.2	49.73	8.286	2.33	4.676	266.4	33.58	90.56
12/1	F	7	2460	600	86,4	63,3	52,1	10.61	43.08	19.73	2.292	6.79	22.36	39.96	43.35
13/1	M	7	2528	620	77,0	60,0	48,7	15.05	32.49	7.29	1.841	3.255	150.3	35.78	26.7
14/1	F	6	2337	630	29,4	33,3	17,3	18.52	43.76	9.843	4.812	6.149	95.22	21.36	45.12
15/1	M	9	2199	650	19,8	23,1	4,4	38.3	29.06	9.921	4.021	2.276	4.429	35.78	39.63
Mean		5	1212	473	25,3	49,0	34,5	19,169	36,965	11,380	3,479	9,964	138,755	24,142	119,635
Minimum		4	313	310	2,3	23,2	4,4	3,455	25,250	4,756	1,841	2,276	4,429	13,590	26,700
Maximum		9	2528	650	86,4	67,2	59,6	38,300	49,730	19,730	6,418	19,940	371,400	39,960	489,800
St.Dev		2	825	118	26,0	14,5	17,8	10,077	7,680	4,400	1,246	5,654	103,888	9,697	134,622
Count		15	15	15	15	13	13	14	15	15	15	14	15	12	14

Comments
Station: Inner Sørfjord Edna
Correct sampling date 981024. Changed due to IT problem; collision with same date at another "53B" site (ng-991202).

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J63 Sørfjorden** Tissue: All
Locality : **53B Inner Sørfjord** Latitude: 60°10.0N Longitude: 6°34.0E
Catch,date : **19991002** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot	g/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	5	1408	520	43,7	62,2	49,1	67.91	37.68	5.823	2.615	12.94	61.07	29.15	46.74
2/1	F	5	943	480	9,2	30,8	12,1	26.49	40.5	9.84	3.329	11	104	33.16	55.79
3/1	F	5	1155	520	22,6	49,6	36,0	66.56	38.16	7.197	3.105	11.51	90.11	35.21	42.13
4/1	M	4	465	380	5,0	24,1	2,2	213.4	42.69	11.5	3.65	13	16.43	26.39	11.85
5/1	F	4	405	390	8,3	55,4	43,2	33.2	37.68	7.536	2.986	4.827	120.6	16.99	83.56
6/1	M	5	744	460	6,2	30,2	5,3	161.6	40.86	8.07	2.912	8.027	110.7	19.22	20.28
7/1	F	5	1145	500	25,4	64,2	49,0	49.13	43.83	5.709	1.887	4.027	109.7	27.35	47.63
8/1	F	3	299	330	3,7	28,0	42,1	27.17	31.71	10.36	3.241	13.27	6.48	18.67	73.91
9/1	M	4	415	350	12,2	54,9	42,1	42.12	34.65	6.684	2.942	11.77	67.05	11.94	73.51
10/1	M	5	615	420	5,3	25,5	6,5	23.73	43.23	10.39	5.492	5.763	49.06	23.21	45.5
11/1	M	4	468	370	9,6	58,7	43,8	37.05		6.582	2.061		99.67	13.08	60.02
12/1	M	5	1044	480	26,7	65,5	55,8	40.74	32.1	5.661	2.01	11.15	125.2	38.64	30.48
13/1	M	4	462	370	12,9	66,7	52,3	50.97	37.8	5.643	2.529	13.3	168	20.56	68.12
14/1	M	4	378	350	4,6	42,9	26,1	27.83	30.42	8.25	3.152	12.16	35.21	19.96	65.14
15/1	M	4	739	460	4,8	25,4	3,3	28.48	45.51	8.886	3.909	9.714	59.78	29.26	55.4
16/1	F	5	682	430	7,3	37,0	16,6	72.6	39.18	7.422	3.088	2.592	34.99	18.98	65.12
17/1	M	4	411	370	4,0	30,4	7,0	32.62	36.96	7.161	3.68	11.05	98.43	21.65	46.53
18/1	M	4	342	340	4,3	29,6	10,1	18.18	36.75	8.283	3.478	5.299	81.77	12.05	80.42
19/1	M	4	415	350	6,1	41,7	27,5	43.26	35.01	9.159	2.46	14.11	204.3	12.75	87.11
20/1	M	4	432	360	10,6	50,0	33,8	34.84	34.62	6.159	2.706	1.421	46.92	18.91	75.88
21/1	M	4	461	350	16,5	64,6	50,2	53.43	36.3	6.57	2.24	15.01	10.64	15.91	45.14
22/1	M	4	636	400	5,4	35,2	17,1		41.49	9.969	3.662	15.12	32.57	20.26	
23/1	M	4	437	380	5,6	39,1	41,9	23.33	50.52	8.238	3.27	8.293	112.4	27.87	79.81
24/1	M	5	709	430	5,4	25,5	5,7	20.7	36.99	9.975	4.123	13.64	94.75	23.75	133.3
25/1	F	5	617	410	8,3	40,7	20,8	43.93	36.39	7.728	3.122	12.03	136.5	15.92	57.27
Mean		4	633	408	10,9	43,1	28,0	51,636	38,376	7,952	3,106	10,043	83,053	22,034	60,443
Minimum		3	299	330	3,7	24,1	2,2	18,180	30,420	5,643	1,887	1,421	6,480	11,940	11,850
Maximum		5	1408	520	43,7	66,7	55,8	213,400	50,520	11,500	5,492	15,120	204,300	38,640	133,300
St.Dev		1	295	59	9,5	14,8	18,2	45,071	4,634	1,697	0,772	4,044	49,105	7,297	24,925
Count		25	25	25	25	25	25	24	24	25	25	24	25	25	24

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J63 Sørfjorden** Tissue: All
Locality : **53B Inner Sørfjord** Latitude: 60°10.0N Longitude: 6°34.0E
Catch,date : **20001010** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) …BG/min/mg prot w.wt	EROD(LI) …in/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	BAP3O(BI) …g/kg/ABS 380 nm w.wt	NAP2O(BI) …g/kg/ABS 380 nm w.wt	PA1O(BI) µg/kg/ABS 38… w.wt	PYR1O(BI) µg/kg/ABS 38… w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																		
Detection limit =>																		
1/1	M	4	1375	580	12,4	22,7	5,4	15.81	30.2	12.33	3.698	9.214	10.17	17.06	<nd	<nd	<nd	4.681
2/1	F	3	1047	510	10,4	21,9	3,8	62.54	37.19	9.45	1.254	7.652	<0.6	12.13	0.3198	<nd	<nd	8.043
3/1	M	3	1107	490	22,4	58,5	48,6	62.88	38.63	9.492	2.716	9.349	43.32	18.33	0.3817	<nd	<nd	12.5
4/1	M	1	237	310	2,6			21.83	35.34	8.588	2.258	7.411	<0.6	10.22	<nd	<nd	<nd	12.19
5/1	F	2	255	320	2,4			46.86	34.41	8.072	0.9672	11.03	15.89	9.938	<nd	<nd	<nd	2.305
6/1	F	2	696	450	7,2		9,3	25.05	36.69	14.19	4.09	12.46	17.35	6.418	0.3593	<nd	<nd	14.85
7/1	M	2	554	390	6,8		17,6	11.98	31.78	12.38	2.65	16.8	171.9	8.826	0.9178	<nd	<nd	28.54
8/1	M	2	335	350	2,8			9.945	39.4	10.59	3.898	13.79	65.19	13.12	1.709	<nd	<nd	18.4
9/1	M	2	431	380	4,0			30.4	39.09	8.412	2.248	19.02	114.7	15.56	<nd	<nd	<nd	11.94
10/1	M	2	578	400	17,0	55,6	47,6	54.14	21.54	9.324	2.182	19.09	134.7	10.64	<nd	<nd	<nd	7.278
11/1	F	1	245	310	4,2			61.91	43.38	7.752	2.053	14.32	133.3	13.99	0.2261	<nd	<nd	13.87
12/1	M	2	757	430	17,2	53,5	44,1	18.48	32.4	9.662	3.27	18.41	124.9	9.277	0.9198	<nd	<nd	14.39
13/1	M	3	885	470	19,4	43,6	32,6	69.49	24.56	9.028	3.005	11.88	76.25	8.146	<nd	<nd	<nd	5.353
14/1	F	4	930	460	28,0	69,4	62,8	33.37	37.45	5.654	1.055	18.85	232.9	17.28	<nd	<nd	<nd	9.201
15/1	F	3	1286	550	22,6	42,7	28,4	56.17	24.31	9.934	1.968	5.396	142.7	17.2	<nd	<nd	<nd	7.371
16/1	M	2	865	460	37,2	63,1	53,6	88.86	29.74	5.796	0.9852	9.317	120.9	10.34	<nd	<nd	<nd	5.627
17/1	M	2	847	490	7,4		4,0	29.8	36.13	12.79	4.149	11.79	218.4	11.71	<nd	<nd	<nd	9.23
18/1	F	2	838	450	24,6	61,9	54,4	54.44	45.15	8.914	2.139	20.8	169.1	13.97	<nd	<nd	<nd	8.689
19/1	M	2	459	380	7,6		11,9	34.04	25.04	11.05	3.499	17.93	190.3	8.779	0.235	<nd	<nd	12.9
20/1	M	1	294	310	7,4			28.08	42.76	9.152	1.963	14.21	155.4	8.625	0.1781	<nd	<nd	12.07
21/1	M	4	1593	570	67,2	63,4	60,6	79.47	24.99	4.904	1.701	14.52	156	12.39	<nd	<nd	<nd	6.908
22/1	F	4	1535	550	37,6	59,7	54,0	136.3	20.64	9.208	2.912	7.284	74.27	15.57	<nd	<nd	<nd	6.047
23/1	F	2	705	440	14,2	44,2	36,4	37.17	39.06	9.61	2.861	12.94	142.5	13.31	<nd	<nd	<nd	9.874
24/1	M	2	716	440	39,2	71,6	68,5	53.13	30.16	4.776	1.185	10.7	128.1	8.595	<nd	<nd	<nd	8.527
25/1	F	3	707	420	13,4	42,0	31,0	12.42	39.41	11.02	2.966	12.72	214.2	9.132	<nd	<nd	<nd	16.26
Mean		2	771	436	17,4	51,6	35,5	45,383	33,578	9,283	2,467	13,075	<114,146	12,022	<<0.210	<<0.000	<<0.000	10,682
Minimum		1	237	310	2,4	21,9	3,8	9,945	20,640	4,776	0,967	5,396	<0,6	6,418	<0.000	<0.000	<0.000	2,305
Maximum		4	1593	580	67,2	71,6	68,5	136,300	45,150	14,190	4,149	20,800	232,900	18,330	1,709	<0.000	<0.000	28,540
St.Dev		1	392	81	15,3	15,2	21,6	29,042	7,026	2,362	0,975	4,312	~70,538	3,380	~0.409	~0.000	~0.000	5,415
Count		25	25	25	25	15	19	25	25	25	25	25	25	25	25	25	25	25

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J63 Sørfjorden** Tissue: All
Locality : **53B Inner Sørfjord** Latitude: 60°10.0N Longitude: 6°34.0E
Catch,date : **20011009** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>													
	Detection limit			=>	Mean												
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot	g/kg/ABS 380 nm	g/kg/ABS 380 nm	µg/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	11	2466	680	21,5	19,3	2,0	43.73	47.75	11.63	2.531	9.651	<0.6	23.96	<nd	0.3247	9.421
2/1	F	5	3791	790	68,4	32,9	17,0	30.81	45.29	13.38	3.453	11.07	67.11	20.18	<nd	0.1363	1.224
3/1	M	3	202	280	2,8		4,5	3.57	15.85	8.076	1.866	8.454	7.487	5.932	<nd	<nd	12.16
4/1	F	2	159	260	6,7	67,0	58,0	17.68	30.53	8.344	1.64	16.34	16.93	9.648	<nd	<nd	3.813
5/1	F	2	183	280	2,5		20,0	10.1	47.3	6.35	1.577	9.057	34.74	8.537	<nd	2.782	63.47
6/1	F	4	972	470	21,2	44,5	28,0	18.48	51.59	12.35	2.796	10.98	74.26	13.4	<nd	<nd	3.035
7/1	M	3	598	390	19,4	71,5	63,0	17.68	49.69	7.53	1.682	16.28	94.14	20.76	<nd	0.2376	2.925
8/1	F	3	1397	540	11,7	21,3	2,3	18.18	45.69	15.5	3.378	9.431	29.56	20.71	<nd	0.6711	6.106
9/1	M	3	1170	520	10,0	20,3	3,2	32.12	50.66	14.06	2.92	5.252	25.46	21.63	<nd	0.1744	4.079
10/1	F	2	439	360	9,4	49,6	37,0	25.45	45.39	12.78	2.4	11.63	63.47	11.52	<nd	0.3929	2.35
11/1	F	2	199	280	20,3		9,9	16.16	50.66	14.17	2.381	15.9	2.608	9.301	<nd	0.4146	3.298
12/1	M	3	525	400	4,5	25,9	4,2	9.696	46.64	12.9	2.607	5.36	5.753	25.94	<nd	6.663	12.38
13/1	F	1	227	290	3,2	31,5	13,0	12.73	61.56	7.494	2.191	12.07	24.84	7.091	<nd	<nd	2.672
14/1	F	1	193	280	3,0	42,3	22,0	4.386	43.78	5.786	1.192	18.28	3.601	6.576	<nd	<nd	5.039
15/1	M	3	789	450	7,0	29,7	11,0	2.346	50.11	16.78	3.994	8.239	<0.6	20.8	<nd	<nd	19.69
16/1	M	3	1812	570	44,2	60,2	51,0	25.25	53.93	9.822	2.24	22.75	63.79	16.89	<nd	0.6653	3.96
17/1	F	2	1172	490	30,6	57,8	47,0	23.23	53.89	11.51	2.844	12.3	53.01	21.44	<nd	2.609	1.248
18/1	F	3	982	520	15,1	21,3	3,1	11.31	46.03	14.29	5.291	10.86	40.29	10.27	<nd	<nd	6.763
19/1	M	3	668	410	9,5	33,3	17,0	23.53	54.11	15.99	3.753	10.02	100.3	8.879	<nd	<nd	2.435
20/1	M	2	639	390	25,2	57,8	47,0	59.29	42.12	9.44	1.823	6.478	51.99	11.15	<nd	<nd	0.8703
21/1	M	3	1539	570	16,2	29,8	13,0	18.52	54.16	14.74	4.021	5.642	58.07	20.09	<nd	<nd	5.421
22/1	M	3	820	450	21,5	62,2	53,0	44.48	55.48	8.136	1.943	9.039	21.22	18.94	<nd	0.4609	0.7532
23/1	M	5	1653	580	26,1	35,0	19,0	13.23	38.85	13.3	3.711	7.625	75.08	11.05	<nd	1.565	4.845
24/1	M	5	1811	560	62,2	55,5	41,0	24.14	44.05	8.572	2.692	19.92	112.3	15.68	<nd	<nd	2.063
25/1	M	3	963	480		34,0	16,0	19.29	49.55	13.96	3.382	7.481	13.78	17.95	<nd	<nd	3.064
Mean		3	1015	452	19,3	41,0	24,1	21,016	46,986	11,476	2,732	11,204	<41,640	15,133	<<0.000	<<0.684	7,323
Minimum		1	159	260	2,5	19,3	2,0	2,346	15,850	5,786	1,192	5,252	<0,6	5,932	<0.000	<0.000	0,753
Maximum		11	3791	790	68,4	71,5	63,0	59,290	61,560	16,780	5,291	22,750	112,300	25,940	<0.000	6,663	63,470
St.Dev		2	844	136	17,5	16,5	19,6	13,353	8,926	3,245	0,963	4,646	~33,436	6,086	~0.000	~1.463	12,481
Count		25	25	25	24	22	25	25	25	25	25	25	25	25	25	25	25

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J62 Hardangerfjorden** Tissue: All
Locality : **67B Strandebarm** Latitude: 60°16.0N Longitude: 6°2.0E
Catch,date : **19970930** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	BILIV(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	OHBIL(BI)	ALAD(BL)	EROD(LI)	MT(LI)
repl.	F/M	year	g	mm	g	%	%	mg/L	mg/mL	mg/mL	mg/mL	µg/kg	PBG/min/mg prot	min/min/mg prot	µg/mg prot
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	5	248	305	1,9	47,7		294.1	40.32	21.36	5.799	148.8	12.69	113.9	10.86
2/1	M	5	288	320	1,8	27,9		314.1	48.96	14.88	4.696	118.1	11.07	107.3	14.77
3/1	F	4	264	325	2,1	28,7		927.4	32.05	17.09	6.511	45.07	7.307	2.528	15.82
4/1	F	5	314	330	2,3	28,7		663.4	37.91	15.43	7.12	70.73	6.664	97.49	18.19
5/1	M	4	344	340	3,2	31,6		325.7	20.06	16.04	6.376	148.4	20.18	81.42	17.51
6/1	F	5	356	345	3,8	24,4		833.5	38.98	21.62	5.239	68.42	5.905	120.4	8.046
7/1	M	4	355	350	4,3	49,6		242.7	43.36	17.53	8.408	127.1	3.594	108.1	14.67
8/1	M	4	969	355	3,1	27,3		814.3	37.11	20.56	6.994	54.16	miss	90.29	11.53
9/1	F	5	331	355	2,5	33,2		524.9	42.2	15.34	4.49	77.16	10.64	264	13.56
10/1	F	4	372	360	2,8	30,4		1016	37.75	16.91	4.729	39.96	8.53	3.049	19.52
11/1	M	5	411	365	2,9	31,4		483.8	18.78	20.94	10.26	75.7	2.117	63.96	12.61
12/1	M	5	486	375	6,9	53,4	35,4	1364	35.97	16.61	5.309	43.86	3.702	129.6	22.48
13/1	F	5	345	375	2,5	18,1		311.8	38.48	17.98	6.335	141.8	15.17	38.01	20.38
14/1	F	6	404	380	6,1	55,3		421.3	16.68	32.4	8.949	84.62	8.09	108.3	20.96
15/1	M	6	385	380	3,3	27,3		511.8	43.84	18.22	6.022	86.02	5.585	103.4	16.93
16/1	M	5	772	465	5,8	43,4		702.7	38.26	16.56	6.851	70.76	5.72	31.26	11.35
17/1	F	5	901	470	20,6	59,0	47,5	678.3	31.82	33.06	9.635	68.96	7.072	110.5	16.81
18/1	M	5	823	470	13,3	54,7	8,9	1216	42.48	18.73	7.116	45.42	7.262	112.8	15.1
19/1	M	6	909	475	34,6	64,3	55,0	705.3	36.7	17.69	4.924	56.22	12.46	166	20.61
20/1	F	5	932	475	12,9	42,9	27,5	787.3	43.08	16.38	7.382	48.08	9.73	116.5	15.28
21/1	M	6	996	480	28,8	63,5	54,1	746.9	48.12	16.61	4.959	72.5	6.57	89.68	17.98
22/1	M	7	953	490	33,0	66,5	60,1	649.3	43.12	13.72	4.909	71.12	2.565	98.77	26.44
23/1	M	6	975	490	27,0	63,8	54,3	603.8	39.42	15.85	6.443	81.98	4.9	136	26.28
24/1	F	6	1022	515	23,5	60,0	48,8	341.1	29.56	29.04	8.341	91.69	12	77.52	29.61
25/1	M	7	1207	515	28,2	63,3	49,0	673.7	52.8	17.43	6.464	57.96	2.184	102.9	30.3
Mean		5	614	404	11,1	43,9	44,1	646,128	37,512	19,119	6,570	79,784	7,988	98,947	17,904
Minimum		4	248	305	1,8	18,1	8,9	242,700	16,680	13,720	4,490	39,960	2,117	2,528	8,046
Maximum		7	1207	515	34,6	66,5	60,1	1364	52,800	33,060	10,260	148,800	20,180	264,000	30,300
St.Dev		1	316	70	11,4	15,6	15,7	286,802	8,884	5,108	1,586	32,756	4,393	51,876	5,770
Count		25	25	25	25	25	10	25	25	25	25	25	24	25	25

miss(1) ! Missing value

Species   : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J62** **Hardangerfjorden** Tissue: All
Locality   : **67B** **Strandebarm** Latitude: 60°16.0N Longitude: 6°2.0E
Catch,date : **19981028** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) PBG/min/mg prot w.wt	EROD(LI) min/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	PYR1O(BI) g/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>															
Detection limit =>															
1/1	M	4	565	390	14,0	64,3	49,7	31.5	15.83	8.244	2.382	42	161.1	14.77	24.43
2/1	M	5	578	405		57,1	49,1	14.49	29.63	2.535	1.123	24.32	58.38	13.75	35.82
3/1	F	4	658	430	7,2	31,5	12,1	45.15	46.4	11.29	3.659	18.73	165.2	17.63	10.9
4/1	F	4	796	430	10,1	50,7	32,2	41.83	26.68	9.105	3.136	47.42	160	25.61	17.43
5/1	F	5	811	440	20,1	59,8	49,8	9.45	28.28	2.869	1.122	34.65	162.6	12.04	42.09
6/1	M	5	859	450	19,9	57,5	48,2	18.14	31.32	1.448	0.7048	28.18	34.24	16.49	16.91
7/1	M	4	926	470	11,3	48,6	35,6	33.14	34.11	10.88	2.501	22.75	94.28	22.99	23.32
8/1	F	5	1095	470	34,0	63,6	52,7	7.303	28.02	4.104	1.41	34.7	90.45	17.93	56.86
9/1	F	4	921	470	24,8	66,4	56,6	35.03	26.8	2.28	0.987	22.44	76.23	15.36	18.7
10/1	M	5	1076	470	66,7	79,1	71,4	30.49	17.5	0.915	0.4528	46.91	30.05	21.54	17.89
11/1	F	5	1150	490	39,5	63,6	56,1	15.37	28.37	1.168	0.5755	28.26	42.21	30.61	23.4
12/1	M	5	1161	490	30,9	61,2	49,9	5.144	27.5	1.283	0.6484	32.67	26.35	21.83	22.64
13/1	F	4	1213	500	44,5	72,2	62,6	16.16	25.16	7.508	2.199	27.56	109.7		33.87
14/1	M	5	1143	500	31,3	57,1	46,1	23.94	32.52	1.683	0.7555	22.08	30.64	15.87	17.7
15/1	F	4	1219	510	39,5	72,2	62,5	44.86	42.16	6.462	1.948	19	166.3	21.78	18.83
16/1	M	5	1231	510	40,0	65,3	53,2	12.98	34.52	2.753	1.21	21.53	99.97	20.56	26.61
17/1	F	5	1507	520	42,1	55,3	41,1		41.16	6.258	1.556	14.93	153.8	21.7	
18/1	M	5	1143	500	50,3	68,9	58,1	24.32	31.65	2.264	0.949	31.17	54.41	25.57	15.15
19/1	M	6	1249	560	12,6	28,8	10,3	33.89	27.72	3.414	1.204	20.86	2.118	13.86	13.81
20/1	F	6	1653	570	56,4	72,5	63,2	21.92	32.97	4.02	1.469	31.57	108	30.2	20.48
21/1	M	6	1707	570	63,2	77,0	60,9	13.61	37.26	1.924	0.639	32.7	57.8	27.51	43.69
22/1	M	5	1991	580	73,7	72,4	56,5	15.62	38.56	2.319	0.959	20.08	125.8	26.74	23.13
23/1	M	6	1885	590	55,3	67,2	56,3	21.8	31.83	2.405	1.003	28.51	41.22	20.71	19.16
24/1	F	7	2516	620	71,3	55,4	43,0	16.76	28.66	20.3	6.822	19.68	73.47		15.36
25/1	F	7	3446	680	169,4	63,4	52,7	10.84	29.75	5.072	1.617	39.1	34.4	27.38	15.35
Mean		5	1300	505	42,8	61,2	49,2	22,656	30,974	4,900	1,641	28,472	86,349	20,975	23,897
Minimum		4	565	390	7,2	28,8	10,3	5,144	15,830	0,915	0,453	14,930	2,118	12,040	10,900
Maximum		7	3446	680	169,4	79,1	71,4	45,150	46,400	20,300	6,822	47,420	166,300	30,610	56,860
St.Dev		1	642	69	33,6	12,2	14,4	11,795	6,858	4,437	1,351	8,837	52,470	5,491	11,046
Count		25	25	25	24	25	25	24	25	25	25	25	25	23	24

Comments
Station: Strandebarm Caught 28.10.98 5.11.98

Species   : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J62   Hardangerfjorden** Tissue: All
Locality   : **67B Strandebarm** Latitude: 60°16.0N Longitude: 6°2.0E
Catch,date : **19990927** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) BG/min/mg prot w.wt	EROD(LI) in/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	PYR1O(BI) g/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>															
Detection limit =>															
1/1	F	6	2849	660	58,4	65,2	54,9	32.38	44.4	4.851	1.333	17.2	19.06	39.34	14.78
2/1	F	4	567	400	7,9	44,9	31,8	62.92	36.42	8.502	3.485	19.12	121.4	19.38	14.81
3/1	M	4	395	340	10,4	52,7	41,2	19.7	35.55	6.516	3.896	20.09	151.4	11.94	16.48
4/1	F	4	381	360	4,8		36,3	38.48	45.39	7.686	3.069	6.039	103.8	23.32	13.79
5/1	M	4	354	350	3,3		4,4	37.37	47.19	7.248	2.271	16	135.3	12.13	20.2
6/1	M	6	1755	580	23,2	40,7	24,4	30.81	35.4	10.52	3.528	16.64	156.1	21.31	15.53
7/1	F	5	1118	500	15,5	39,7	22,2	31.71	41.94	10.26	4.56	16.89	101.2	27.51	9.633
8/1	M	4	343	330	3,1			30.4	42	8.091	3.191	19	75.99	20.88	28.86
9/1	F	4	325	330	3,1			17.27	41.34	8.52	2.463	16.19	115.4	16.38	14.29
10/1	M	4	654	420	14,3	60,9	47,6	35.35	44.19	7.251	2.586	17.09	79.13	16.84	14.87
11/1	F	4	279	320	8,4	65,9	57,0	48.08	24.37	5.01	1.47	10.86	132.2	14.82	14.7
12/1	M	4	475	370	5,7		16,1	16.56	38.82	10.12	3.915	20.68	77.96	15.85	14.11
13/1	M	4	307	330	2,5		4,5	9.696	38.55	7.944	2.781	12.31	50.8	14.05	48.76
14/1	M	7	2983	710	42,1	31,5	11,7	22.62	34.05	9.747	4.399	20.86	122.4	22.82	17.42
15/1	M	5	1440	530	25,7	54,1	42,9	25.96	49.38	5.592	2.547	15.31	51.68	32.64	11.28
16/1	F	5	1141	510	20,1	46,8	30,5	46.97	38.67	9.627	2.507	20.66	84.55	18.38	11.81
17/1	F	4	497	370	20,7	69,4	59,1	21.21	31.29	5.274	3.333	3.276	141.3	7.298	16.57
18/1	F	5	1528	560	21,3	49,4	39,0	33.33	43.53	7.233	3.096	15.71	71.29	18.08	16.76
19/1	F	4	488	370	13,7	51,6	35,1	23.63	37.62	5.469	4.718	16.4	60.58	12.01	28.73
20/1	F	4	559	390	8,6	49,0	34,0	31.31	34.71	6.918	2.301	19.99	32.68	10.24	18.09
21/1	F	4	412	350	9,6	49,0	35,5	18.68	27.4	7.2	3.033	11.81	106.2	12.5	22.99
22/1	F	4	668	410	15,5	51,5	39,3	30.68	47.85	6.093	2.184	19.62	62.43	16.58	17.65
23/1	F	4	492	370	4,8		7,0	12.73	49.05	10.16	4.54	17.23	29.54	18.39	26.38
24/1	M	4	521	370	18,6	70,2	61,4	66.56	42.69	5.73	1.818	19.46	141.9	18.06	13.95
25/1	M	4	457	360	4,7		13,2	33.13	36.09	11.52	5.42	3.251	68.33	12.31	51.2
Mean		4	840	424	14,6	52,5	32,6	31,101	39,516	7,723	3,138	15,667	91,705	18,122	19,746
Minimum		4	279	320	2,5	31,5	4,5	9,696	24,370	4,851	1,333	3,251	19,060	7,298	9,633
Maximum		7	2983	710	58,4	70,2	61,4	66,560	49,380	11,520	5,420	20,860	156,100	39,340	51,200
St.Dev		1	746	109	13,0	10,8	17,4	13,947	6,438	1,941	1,052	5,116	39,998	7,111	10,359
Count		25	25	25	25	17	23	25	25	25	25	25	25	25	25

Comments

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J62 Hardangerfjorden** Tissue: All
Locality : **67B Strandebarm** Latitude: 60°16.0N Longitude: 6°2.0E
Catch,date : **20001014** Count: 25 Sample type: **Individual**

Analytical lab.				=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code				=>														
Detection limit				=>	Mean													
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	NAP2O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot	g/kg/ABS 380 nm	g/kg/ABS 380 nm	µg/kg/ABS 38	µg/kg/ABS 38
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	6	3517	770	57,4	39,6	24,3	43.33	29.12	11.12	2.8	11.66	0.9504	8.764	<nd	<nd	<nd	0.4616
2/1	F	2	1207	510	46,0	76,4	66,5	43.13	43.95	6.082		16.88		19.89	<nd	<nd	<nd	1.484
3/1	F	2	1056	490	38,6	68,8	61,7	28.68	36.34	7.42	1.737	29.47	50.72	20.48	<nd	<nd	<nd	1.708
4/1	F	2	539	400	9,8		46,0	33.84	40.01	10.07	3.266	21.43	258.6	13.44	<nd	<nd	<nd	2.158
5/1	F	4	6400	860	183,8	57,8	51,6	40.3	43.03	6.588	1.604	22.37	95.05	16.34	<nd	<nd	<nd	1.216
6/1	F	7	4285	760	91,2	49,1	36,6	19.19	36.56	9.832	2.786	22.51	56.14	21.21	<nd	<nd	<nd	1.615
7/1	M	2	1923	580	90,4	76,6	70,2	20.3	37.17	2.394	0.7226	22.67	69.55	33.42	<nd	<nd	<nd	1.626
8/1	M	2	950	470	14,8	51,8	40,2	50.5	44.98	10.77	2.099	23.12	119.3	18.34	<nd	<nd	<nd	1.485
9/1	M	2	1813	560	66,2	67,9	59,1	18.18	47.87	8.626	1.748	21.81	104.7	11.74	<nd	<nd	<nd	1.76
10/1	F	2	1564	530	54,2	72,2	60,2		36.56	6.03	0.7782	24.09	150	17.43	<nd	<nd	<nd	
11/1	M	2	1388	520	38,0	68,6	60,2	26.56		7.508	2.414		82.74	23.06	<nd	<nd	<nd	1.92
12/1	F	2	839	460	17,4	56,0	44,3	32.52		8.322	2.634		100.4	14.16	<nd	<nd	<nd	1.445
13/1	F	2	449	370	5,6			37.98	42.59	11.74	2.93	23.6	220.2	8.474	<nd	<nd	<nd	1.58
14/1	M	2	934	470	13,0	39,9	26,3	23.94	51.97	10.53	2.953	12.14	201.5	11.95	<nd	<nd	<nd	1.713
15/1	F	2	593	390	9,8	43,2	29,9	6.363	51.89	10.34	2.87	22.39	364.7	6.382	<nd	<nd	<nd	2.515
Mean		3	1830	543	49,1	59,1	48,4	30,344	41,695	8,491	2,239	21,088	133,896	16,339	<<0.000	<<0.000	<<0.000	1,620
Minimum		2	449	370	5,6	39,6	24,3	6,363	29,120	2,394	0,723	11,660	0,950	6,382	<0.000	<0.000	<0.000	0,462
Maximum		7	6400	860	183,8	76,6	70,2	50,500	51,970	11,740	3,266	29,470	364,700	33,420	<0.000	<0.000	<0.000	2,515
St.Dev		2	1662	146	46,8	13,6	15,3	12,150	6,639	2,526	0,813	4,872	96,950	6,905	~0.000	~0.000	~0.000	0,463
Count		15	15	15	15	13	14	14	13	15	14	13	14	15	15	15	15	14

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J62 Hardangerfjorden** Tissue: All
Locality : **67B Strandebarm** Latitude: 60°16.0N Longitude: 6°2.0E
Catch,date : **20011212** Count: 25 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>					Mean												
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	min/min/mg prot	µg/mg prot	g/kg/ABS 380 nm	g/kg/ABS 380 nm	µg/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	3	1378	530	26,1	49,6	35,8	10.3	51.77	9.95	1.843	18.46	19.9	22.04	<nd	1.068	4.378
2/1	F	3	961	480	20,2	57,5	43,8	22.52	53.58	11.13	2.692	14.43	65.14	14.11	<nd	0.666	2.744
3/1	M	3	1237	500	23,1	52,4	40,7	24.75	60.56	11.65	3.064	28.24	76.79	13.75	<nd	0.5254	2.037
4/1	F	3	1516	540	63,1	60,5	53,3	32.02	42.03	8.208	2.075	18.61	79.18	35.59	<nd	0.3123	1.499
5/1	F	1	628	410	14,5	52,9	37,4	50.2	61.84	10.65	3.011	18.1	125.4	11.91	<nd	0.3785	1.371
6/1	F	3	1354	520	38,0	60,7	49,1	33.13	47.66	10.19	2.825	22.63	65.23	11.79	<nd	<nd	1.129
7/1	M	3	1556	550	33,7	48,4	34,4	7.777	51.05	10.21	3.513	17.06	75.94	10.3	<nd	<nd	2.057
8/1	F	3	1780	580	35,2	58,7	46,9	40.6	67.56	11.04	1.751	18.26	49.51	25.1	<nd	<nd	1.5
9/1	F	3	2056	620	29,6	35,9	19,0	25.75	57.79	12.3	3.083	21.83	27.47	16.89	<nd	<nd	1.363
10/1	F	2	1455	540	14,3	33,0	15,9	63.04	48.02	16.38	3.829	11.81	72.22	26.7	<nd	0.2697	1.218
11/1	F	1	612	410	10,1	54,0	36,9	68.24	53.01	13.15	2.693	25.42	1.241	10.66	<nd	0.1905	1.7
12/1	F	1	421	350	11,7	68,2	62,6	40.41		8.116	1.946		113.3	12.32	<nd	0.3465	1.75
13/1	F	1	637	400	7,5	27,3	4,0	29.34	40.21	15.3	3.684	19.32	3.595	8.904	<nd	0.7839	1.827
14/1	F	3	1302	520	32,4	55,1	42,0	59.86	56.45	10.33	2.469	18.57	37.78	19.45	<nd	<nd	0.5647
15/1	F	1	648	400	9,8	39,6	23,0	56.5	53.87	14.3	3.049	22.54	9.919	9.846	<nd	0.2832	0.8654
16/1	F	1	552	380	18,4	70,3	62,0	11.31	58.94	7.326	1.92	20.77	147.9	11.77	<nd	<nd	1.662
17/1	F	1	428	360	4,9	41,5	16,0	14.85	50.25	12.48	3.822	11.46	35.87	12.67	<nd	0.6062	1.812
18/1	F	3	1928	580	52,8	59,3	48,0	27.17	62.48	9.544	2.35	21.11	74.88	16.94	<nd	0.1104	1.465
19/1	F	3	1959	600	44,4	57,1	42,0	36.55	48.12	10.73	2.719	16.97	72.92	15.75	<nd	0.4651	1.997
20/1	M	1	583	390	15,0	51,3	36,0	12.93	40.53	9.95	2.168	20.38	44.15	7.01	<nd	1.006	3.001
21/1	M	1	682	410	18,3	57,0	47,0	54.66	53.3	8.656	2.2	17.42	128.7	7.134	<nd	0.3476	0.8288
22/1	F	1	589	380	22,6	70,3	61,0	99.9	29.63	6.528	1.702	27.84	86.37	14.95	<nd	0.1101	1.061
23/1	M	1	544	380	18,7	69,9	60,0	28	46.4	8.362	1.649	27.46	192.9	12.76	<nd	0.5357	1.825
24/1	M	1	636	400	13,4	48,6	34,0	25.49	59.41	10.24	3.229	23.58	130.3	9.634	<nd	<nd	2.154
25/1	F	3	1255	520	30,6	58,0	45,0	51.81	48.79	12.61	2.548	17.27	208.9	13.86	<nd	<nd	1.031
Mean		2	1068	470	24,3	53,5	39,8	37,084	51,802	10,773	2,633	19,981	77,820	14,874	<<0.000	<<0.320	1,714
Minimum		1	421	350	4,9	27,3	4,0	7,777	29,630	6,528	1,649	11,460	1,241	7,010	<0.000	<0.000	0,565
Maximum		3	2056	620	63,1	70,3	62,6	99,900	67,560	16,380	3,829	28,240	208,900	35,590	<0.000	1,068	4,378
St.Dev		1	534	85	14,4	11,4	15,3	21,828	8,475	2,393	0,673	4,483	54,710	6,616	~0.000	~0.322	0,792
Count		25	25	25	25	25	25	25	24	25	25	24	25	25	25	25	25

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99** **Undefined** Tissue: All
Locality : **23B** **Karihavet area** Latitude: 59°55.0N Longitude: 5°7.0E
Catch,date : **19971003** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	BILIV(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	OHBIL(BI)	ALAD(BL)	EROD(LI)	MT(LI)
repl.	F/M	year	g	mm	g	%	%	mg/L	mg/mL	mg/mL	mg/mL	µg/kg	PBG/min/mg prot	min/min/mg prot	µg/mg prot
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	3	224	290	4,7	58,3	49,0	683.3	38.22	11.16	3.996	17.98	14.6	69.53	10.7
2/1	M	3	583	380	11,8	47,3	32,6	160	33.92	10.09	3.753	53.05	11.68	55.69	9.615
3/1	M	4	566	390	6,7	48,2	28,4	867.8	35.08	15.19	7.177	15.17	17.4	91.98	5.857
4/1	F	4	602	395	9,6	58,7	3,3	601.1	39.02	12.13	4.46	13.33	22.92	102.1	12.5
5/1	F	5	651	420	4,8	24,0	3,3	721.8	40.56	17.14	6.096	16.9	14.14	125.6	16
6/1	M	4	688	425	8,2	37,8		665.4	33.61	10.01	7.24	17.64	22.9	94.11	21.42
7/1	F	5	772	440	6,9	24,0	3,9	911.8	51.56	24.22	7.75	8.171	10.46	101.9	13.33
8/1	M	6	853	440	24,1	59,3	45,2	882.3	36.44	9.962	4.954	11.46	18.73	76.8	10.34
9/1	F	5	876	450	13,4	50,2	36,4	279.6	51.52	21.06	6.056	24.19	19.96	132.1	8.921
10/1	M	4	1067	450	41,3	65,8	48,9	344.7	43.32	11.8	5.275	27.74	13.85	93.49	15.28
11/1	M	5	917	460					22.67				25.3		
12/1	M	5	909	465	15,5	43,4	24,9	379.2	49.76	21.12	8.1	37.45	6.056	152.9	16.66
13/1	M	6	1123	480					44.2				13.1		
14/1	F	5	1212	495	28,9	60,4	47,1	1154	32.77	14.32	4.44	11.82	18.75	111.1	12.11
15/1	F	6	1390	520	51,7	61,7	47,3	334.4	38.7	16.4		16.53	20.78		11.8
16/1	M	6	1523	520	64,7	58,6	42,2	126.8	40.84	12.91	10.08	34.49	15.77	61.17	8.472
17/1	M	5	1458	520	48,1	56,9	44,3	545.8	31.41	11.69	4.283	8.467	11.3	77.25	16.19
18/1	M	6	1442	525	30,0	54,6		1550	41.8	14.49	4.515	6.847	18.62	100.7	11.69
19/1	F	6	1499	530	27,3	48,5	26,1	358.4	40.8	22.02	6.78	39.76	15.27	109	13.83
20/1	F	5	1268	540					36.18				22.45		
21/1	F		1699	565	39,7	60,4	46,8	807.2	40.6	11.05	5.414	14.68	18.13	124	16.08
22/1	F	6	1645	570	32,2	63,0	52,1	1187	47.2	12.8	9.743	7.677	12.81	66.19	18.02
23/1	F	7	1931	585	28,6	41,2	17,7	598.2	51.12	29.41	10.76	12.14	11.31	71.7	11.93
24/1	F	7	2024	600	67,8	65,2	52,8	1110	38.42	15.9	5.68	7.872	18.7	88.64	18.81
25/1	M	7	3402	685	91,3	56,4	44,8	732.9	43.08	30.57	9.53	32.46	12.96	146.8	16.41
Mean		5	1213	486	29,9	52,0	34,8	681,895	40,112	16,156	6,480	19,810	16,318	97,750	13,453
Minimum		3	224	290	4,7	24,0	3,3	126,800	22,670	9,962	3,753	6,847	6,056	55,690	5,857
Maximum		7	3402	685	91,3	65,8	52,8	1550	51,560	30,570	10,760	53,050	25,300	152,900	21,420
St.Dev		1	649	84	23,4	11,9	16,7	363,041	6,905	6,097	2,157	12,541	4,682	27,410	3,794
Count		24	25	25	22	22	20	22	25	22	21	22	25	21	22

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined** Tissue: All
Locality : **23B Karihavet area** Latitude: 59°55.0N Longitude: 5°7.0E
Catch,date : **19981021** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) BG/min/mg prot w.wt	EROD(LI) nin/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	PYR1O(BI) g/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>															
Detection limit =>															
1/1	F	4	386	360	3,8	21,7	2,2	41.96	36.45	5.007	1.525	21.42	7.489	17.01	12.41
2/1	F	4	661	400	12,8	54,5	38,3	74.47	31.68	18.31	6.627	28.78	7.414	17.09	8.552
3/1	M	4	732	440	6,2	28,5	10,9	37.17	38.5	19.11	6.042	17.7	27.41	18.01	26.19
4/1	X	4	798	440	7,1	25,0	3,8	110.9	34.98	15.18	3.979	23.32	1.707	22.47	4.889
5/1	M	5	758	450	11,0	39,2	19,8	41.45	32.19	10.4	4.029	41.85	28.56		9.123
6/1	F	5	915	450	13,6	43,7	24,7		49.38	7.422	2.61	16.85	143	17.11	
7/1	M	4	856	460	18,4	58,8	46,0	33.43	55.62	6.756	2.051	17.33	9.908	23.7	23.02
8/1	M	5	1076	480	15,6	38,6	21,8		36.85	11.12	3.08	25.39	202.2	17.96	
9/1	M	5	1050	500	13,5	44,1	25,5	26.08	29.9	12.34	2.889	19.7	83.1		20.74
10/1	M	5	1028	510	12,2	37,9	17,7	23.03	51.78	11.44	3.089	25.4	60.94	15.7	27.79
11/1	M	4	1298	520	36,2	64,1	50,8	54.74	32.34	7.974	2.166	21.44	69.82	17	9.364
12/1	F	5	1284	520	27,1	56,2	41,2	28.1	38.34	9.867	3.259	25.58	85.58	28.82	13.85
13/1	F	5	1370	530	34,8	57,6	44,8	62.62	58.32	7.9	2.451	18.8	18.45	18.87	7.816
14/1	M	6	1265	540	21,9	70,4	62,1	4.064	42.27	10.13	2.712	23.95	118.2	33.18	62.25
15/1	F	5	2081	540	57,0	45,3	29,5	98.14	34.14	26.49	7.719	29.07	30.01		4.6
16/1	F	5	1422	550	27,0	63,3	50,4	68.52	41.31	5.283	2.028	24.15	81.57		12.74
17/1	F	6	1494	550	45,7	71,0	62,0	28.98	32.46	6.123	1.232	36.73	24.92	21.26	17.97
18/1	M	6	1567	570	34,3	57,7	40,4	27.97	31.71	7.815	2.778	47.67	76.77	21.8	15.78
19/1	M	5	1873	580	23,1	33,5	16,7	44.95	15.96	16.39	5.373	55.56	27.84		14.39
20/1	F	6	2378	580	168,0	78,2	72,6	39.82	42.46	3.441	0.9783	25.55	74.31		6.529
21/1	M	6	2191	590	79,8	70,3	60,8	70.53	52.17	6.996	2.368		57.66	38.98	8.686
22/1	M	6	2965	640	348,0	82,0	78,7	50.9	59.94	2.097	0.574	20.49	14.99	28.16	10.93
23/1	F	6	3664	680	331,0	83,1	77,1	60.09	15.38	5.014	1.804	54.28	6.157		130.8
24/1	M	6	3579	710	177,7	74,2	67,4	44.43	29.1	13.77	3.479	34.27	23.49	38.11	10.33
25/1	M	7	5551	770	567,0	86,4	79,8	20.29	41.63	2.446	0.6995	16.4	17.49	29.44	14.15
Mean		5	1690	534	83,7	55,4	41,8	47,506	38,594	9,953	3,022	27,987	51,959	23,593	20,561
Minimum		4	386	360	3,8	21,7	2,2	4,064	15,380	2,097	0,574	16,400	1,707	15,700	4,600
Maximum		7	5551	770	567,0	86,4	79,8	110,900	59,940	26,490	7,719	55,560	202,200	38,980	130,800
St.Dev		1	1181	96	137,9	19,0	24,0	25,196	11,410	5,787	1,805	11,420	48,972	7,477	26,850
Count		25	25	25	25	25	25	23	25	25	25	24	25	18	23

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined** Tissue: All
Locality : **23B Karihavet area** Latitude: 59°55.0N Longitude: 5°7.0E
Catch,date : **19990922** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot	g/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	5	1493	540	26,3	47,0	31,0	38.18	35.64	9.036	2.643	23.32	113.6	27.53	3.248
2/1	M	5	1208	490	48,1	68,5	61,0	42.12	48.15	4.131	0.9841	12.92	52.05	30.05	16.17
3/1	M	4	697	400	13,8	60,6	47,0	15.25	39.87	5.505	2.054	20.66	139.7	17.28	24.78
4/1	F	6	2318	600	94,5	71,7	65,0	45.15	48.81	4.191	2.224	2.581	70.05	25.14	19.09
5/1	F	5	1135	500	20,4	53,5	37,0		24.06	8.712	3.611	22.35	66.75	24.5	
6/1	M	5	1125	490	19,5	51,6	33,0	63.04	39.09	9.333	2.869	15.59	125.6	12.99	6.385
7/1	M	5	698	410	10,1	55,6	45,0	9.999	52.26	8.313	3.305	6.989	65.87	14.71	22.65
8/1	F	6	1262	490	36,9	64,0	52,0	48.68	40.83	6.249	2.046	19.71	46.74	25.79	7.672
9/1	M	6	2649	650	82,1	68,7	62,0	77.97	38.1	5.346	1.371	18.56	99.62	36.5	17.83
10/1	F	7	4938	720	61,6	37,7	22,7	29.68	39.27	10.48	3.639	21.2	<0.6	37.29	33.16
11/1	M	5	991	480	29,5	62,3	52,1	56.46	46.26	7.356	2.841	5.631	42.65	18.06	5.069
12/1	F	6	1852	590	80,4	75,8	67,7	47.87	52.38	5.844	1.461	15.98	40.84	27.04	14.74
13/1	F	5	804	450	17,0	60,2	42,4	57.37	39.48	7.176	2.535	20.93	52.78	30.26	11.04
14/1	M	4	641	410	6,5		7,6	51.81	57.87	10.52	2.906	14.4	106.3	23.81	37.83
15/1	F	6	1602	550	45,3	62,9	51,3	43.63	40.8	8.256	2.355	19.79	51.44	10.48	5.047
16/1	F	5	657	410	10,9	52,1	33,4	70.25	40.05	7.716	2.862	21.66	132.1	17.4	7.907
17/1	M	6	1463	540	21,7	52,4	36,2	40.91	35.61	9.288	3.167	20.25	0.69	18.96	11.42
18/1	M	5	994	460	18,2	51,7	35,2	67.77	48	7.296	2.586	16.57	92.1	18.31	7.887
19/1	M	5	1639	570	72,5	74,7	65,6	39.09	37.41	3.486	1.258	20.29	145.8	49.72	9.837
20/1	F	7	4408	730	255,3	78,7	72,7	55.55	53.91	4.497	1.424	8.911	26.01	22.27	10.47
21/1	F	4	679	410	11,3	52,2	28,9	35.15	40.95	8.706	3.456	18.07	71.94	20.86	6.3
22/1	M	4	1081	480	16,4	48,1	26,9	8.181	50.16	8.271	2.51	17.1	93.6	30.08	30.73
23/1	F	5	968	470	20,0	53,6	38,6	50.5	40.8	6.966	2.235	14.31	40.34	20.12	6.842
24/1	M	4	531	390	8,3		38,0	51.41	43.74	8.025	3.683	17.38	107.9	14.63	14.23
25/1	X	5	971	470	11,0	48,5	30,9	44.54	44.7	9.972	3.744	18.57	125.5	23.53	11.28
Mean		5	1472	508	41,5	58,8	43,3	45,440	43,128	7,387	2,551	16,549	<76,423	23,892	14,234
Minimum		4	531	390	6,5	37,7	7,6	8,181	24,060	3,486	0,984	2,581	<0,6	10,480	3,248
Maximum		7	4938	730	255,3	78,7	72,7	77,970	57,870	10,520	3,744	23,320	145,800	49,720	37,830
St.Dev		1	1097	94	51,6	10,6	16,1	17,452	7,262	2,027	0,815	5,443	~41,707	8,712	9,468
Count		25	25	25	25	23	25	24	25	25	25	25	25	25	24

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined** Tissue: All
Locality : **23B Karihavet area** Latitude: 59°55.0N Longitude: 5°7.0E
Catch,date : **20001020** Count: 25 Sample type: **Individual**

Analytical lab.				=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code				=>														
Detection limit				=>	Mean													
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	NAP2O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᵖBG/min/mg prot	nin/min/mg prot	µg/mg prot	ງ/kg/ABS 380 nm	ງ/kg/ABS 380 nm	µg/kg/ABS 38	µg/kg/ABS 38
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	4	3960	730	141,4	63,1	53,1	23.33	45.93	8.528	1.765	12.92	88.17	20.91	<nd	<nd	<nd	1.586
2/1	M	4	2943	670	63,6	52,0	38,9		39.34	8.502	4.1	19.85	97.55	11.58				
3/1	F	4	3749	750	150,0	72,7	65,6	45.35	45.54	4.508	0.7164	19.67	18.67	12	<nd	<nd	<nd	2.382
4/1	F	4	3276	690	75,8	53,8	40,5	10.5	48.99	9.144	2.668	20.21	68.34	17.69	<nd	<nd	<nd	3.713
5/1	F	3	4241	740	149,8	69,0	59,3	18.18	55.45	6.822	1.569	16.23	96.56	20.51	<nd	<nd	<nd	4.95
6/1	M	4	1805	570	45,8	60,7	51,6			6.962	1.576		49.21	17.94				
7/1	M	3	1483	630	61,4	68,3	60,0	23.94	48.22	6.544	1.874	20.48	67.23	11.52	<nd	<nd	<nd	3.885
8/1	F	3	2089	570	104,8	68,4	62,1	12.52	45.98	5.282	1.705	25.54	105.6	13.63	<nd	<nd	<nd	4.152
9/1	F	3	2054	550	98,6	74,1	66,3	10.91	49.33	5.05	1.337	22.16	73.47	18.44	<nd	<nd	<nd	4.492
10/1	M	3	1697	580	34,8	54,6	39,8	12.12	46.89	8.586	3.002	19.46	1023	12.74	<nd	<nd	<nd	4.95
11/1	M	4	2443	580	96,0	66,2	59,4	25.75	47.62	4.972	1.61	26.9	79.51	18.89	<nd	<nd	<nd	3.339
12/1	M	5	2596	650	98,4	66,4	59,9	36.26	39.48	4.848	0.858	18.48	122	25.71	<nd	<nd	<nd	4.661
13/1	M	3	1760	600	30,0	27,9	12,3	15.35	46.07	10.87	2.758	22.85	4.416	15.85	<nd	<nd	<nd	2.606
14/1	F	2	1897	550	104,0	73,2	66,0	13.43	55.11	5.182	1.274	16.56	71.77	16.82	<nd	<nd	<nd	6.104
15/1	F	2	1278	530	43,2	69,4	61,5	21.21	50.34	7.068	2.051	20.3	42.96	18.52	<nd	<nd	<nd	2.97
16/1	F	2	2922	590	34,0	58,8	51,5	32.12	42.69	7.974	2.83	20.07	41.69	16.86	<nd	<nd	<nd	5.978
17/1	M	4	1985	580	85,6	70,6	62,9	56.56	48.01	5.532	1.662	22.29	336.7	16.33	<nd	<nd	<nd	4.721
18/1	F	2	887	450	20,4	61,7	51,6	46.86	44.15	7.068	2.029	17.71	74.02	12.21	<nd	<nd	<nd	3.137
19/1	F	3	1199	510	17,8	55,4	44,0	31.01	46.49	8.332	2.624	15.77	1081	14.34	<nd	<nd	<nd	5.934
20/1	M	2	1196	500	29,2	54,9	41,5	7.171	52.61	7.94	2.565	16.27	87.83	14.17	<nd	<nd	<nd	11.02
21/1	M	1	838	440	13,0	45,3	25,8	16.97	43.95	10	2.732	27.44	73.25	14.15	<nd	<nd	<nd	5.599
22/1	M	1	425	350	9,4	59,3	44,9	9.999	48.69	7.014	2.61	15.11	44.92	8.283	<nd	<nd	<nd	7.801
23/1	F	2	1197	520	23,4	59,5	51,0	23.53	47.8	8.594	2.442	17.42	59.6	12.4	<nd	<nd	<nd	3.314
24/1	F	2	692	420	14,6	55,7	39,0	30.3	41.57	10.82	2.581	21.67	66.09	9.14	<nd	<nd	<nd	3.861
25/1	F	2	993	470	13,8	40,6	16,8	55.25	39.56	9.968	2.692	16.88	96.21	12.23	<nd	<nd	<nd	3.276
Mean		3	1984	569	62,4	60,1	49,0	25,157	46,659	7,444	2,145	19,677	158,791	15,315	<<0.000	<<0.000	<<0.000	4,540
Minimum		1	425	350	9,4	27,9	12,3	7,171	39,340	4,508	0,716	12,920	4,416	8,283	<0.000	<0.000	<0.000	1,586
Maximum		5	4241	750	150,0	74,1	66,3	56,560	55,450	10,870	4,100	27,440	1081	25,710	0,000	0,000	0,000	11,020
St.Dev		1	1052	102	45,2	10,9	14,8	14,580	4,345	1,912	0,762	3,663	275,449	4,007	~0.000	~0.000	~0.000	2,005
Count		25	25	25	25	25	25	23	24	25	25	24	25	25	23	23	23	23

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined** Tissue: All
Locality : **23B Karihavet area** Latitude: 59°55.0N Longitude: 5°7.0E
Catch,date : **20011015** Count: 25 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>					Mean												
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᵖBG/min/mg prot	ɪin/min/mg prot	µg/mg prot	ȷ/kg/ABS 380 nm	ȷ/kg/ABS 380 nm	µg/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	3	2261	600	137,1	72,1	63,0	34.02	59.38	5.658	1.506	34.45	49.86	15.61	<nd	<nd	2.628
2/1	M	2	1782	560	57,4	66,0	54,0	27.72	55.49	8.154	1.575	28.14	90.58	16.96	<nd	<nd	1.443
3/1	F	2	2111	600	52,3	61,1	51,0	28.6	64.48	9.384	2.849	22.54	115.5	15.09	<nd	<nd	2.601
4/1	F	4	2473	650	58,8	57,4	37,0	24.7	55.3	10.8	2.23	25.71	65.38	21.94	<nd	<nd	2.264
5/1	F	4	3136	620	199,3	74,7	68,0	16.25	48.61	5.922	1.881	26.57	62.99	12.78	<nd	<nd	3.15
6/1	M	2	1269	510	28,5	65,4	54,0	21.82	49.75	9.45	2.197	17.86	57.33	15.55	<nd	<nd	2.549
7/1	M	3	3127	670	177,7	74,1	67,0	25.55	60.48	4.094	1.351	26.84	48.15	19.85	<nd	<nd	3.037
8/1	F	3	2548	590	160,9	73,2	67,0	30.81	57.3	5.78	1.707	24.72	46.88	12.06	<nd	<nd	2.441
9/1	M	3	3189	640	327,0	82,8	76,0	27.67	61.32	2.621	0.7927	25.02	<0.6	18.81	<nd	<nd	2.732
10/1	F	3	2490	610	147,5	74,2	66,0	10.2	60.75	5.072	1.414	20.15	65.13	16.02	<nd	<nd	3.157
11/1	F	3	2442	620	73,8	57,0	43,0	22.73	44.67	10.61	2.668	24.59	78.36	20.46	<nd	<nd	2.31
12/1	F	2	1772	520	26,7	67,2	55,0	23.94	51.66	9.866	2.135	20.2	77.81	23.83	<nd	<nd	3.188
13/1	M	2	875	430	15,9	43,4	25,0	3.468	24.31	14.53	2.168	74.52	110.6	19.52	<nd	<nd	4.988
14/1	F	3	2877	640	103,9	68,7	59,0	11.41	48.33	7.568	1.656	25.4	32.03	24.78	<nd	<nd	2.155
15/1	F	2	1455	540	19,6	37,2	22,0	21.11	49.84	11.97	2.688	21.85	96.21	24.82	<nd	<nd	3.382
16/1	F	2	2682	550	51,5	66,8	59,0	62.2	49.75	6.728	1.791	24.19	50.93	19.34	<nd	<nd	1.805
17/1	F	3	1692	560	46,2	52,0	36,0	59.69	53.77	9.31	3.494	17.31	67.73	11.52	<nd	<nd	1.63
18/1	F	2	893	460	22,1	60,2	44,0	23.56	47.3	10.1	1.95	17.99	106.8	14.94	<nd	<nd	2.046
19/1	M	3	1931	570	46,9	68,0	56,0	14.85	55.21	8.968	2.405	20.12	167.2	17.16	<nd	<nd	2.472
20/1	M	2	391	350	4,7	48,9		13.53	40.97	10.65	2.499	26.1	88.73	10.04	<nd	<nd	4.677
21/1	F	2	1335	530	22,5	53,5	34,0	30.85	58.85	11.14	2.898	20.53	140.7	10.58	<nd	<nd	2.207
22/1	M	2	936	460	9,2	25,0		63.38	46.59	17.71	3.526	24.02	1.23	16.46	<nd	<nd	1.792
23/1	M	3	2444	610	28,3	31,5	11,0	3.366	49.75	13.67	4.651	16.69	76.46	19.18	<nd	<nd	2.822
24/1	M	3	3358	700	86,7	63,2	50,0	4.794	41.3	6.872	2.207	18.29	142.2	24.55	<nd	<nd	2.003
25/1	F	2	616	390	6,6	33,6		15.65	37.03	10.15	2.916	19.65	79.91	9.897	<nd	<nd	5.251
Mean		3	2003	559	76,4	59,1	49,9	24,875	50,888	9,071	2,286	24,938	<76,772	17,270	<<0.000	<<0.000	2,749
Minimum		2	391	350	4,7	25,0	11,0	3,366	24,310	2,621	0,793	16,690	<0,6	9,897	<0.000	<0.000	1,443
Maximum		4	3358	700	327,0	82,8	76,0	63,380	64,480	17,710	4,651	74,520	167,200	24,820	<0.000	<0.000	5,251
St.Dev		1	863	88	77,2	15,2	16,8	16,346	8,905	3,400	0,825	11,123	~39,972	4,625	~0.000	~0.000	0,982
Count		25	25	25	25	25	22	25	25	25	25	25	25	25	25	25	25

fished 5-10m depht

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined** Tissue: All
Locality : **98B Lille Molla** Latitude: 68°12.0N Longitude: 14°48.0E
Catch,date : **20000921** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>														
	Detection limit			=>	Mean													
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	NAP2O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	in/min/mg prot	µg/mg prot	g/kg/ABS 380 nm	g/kg/ABS 380 nm	µg/kg/ABS 38	µg/kg/ABS 38
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	6	295	330	2,5	23,3	5,0			5.978	2.235		2.153	miss				
2/1	M	4	758	445	6,7	24,1	4,0	25.05		5.254	1.94		1.923	miss	<nd	<nd	<nd	0.7585
3/1	M	3	143	310	2,3	27,5	3,7	8.08		7.804	2.74		<0.6	10.15	<nd	<nd	<nd	2.475
4/1	F	4	312	330	3,1	22,0	5,5	11.51		7.75	3.125		2.303	11.26	<nd	<nd	<nd	2.519
5/1	F	5	671	430	4,7	22,2	2,4	12.63		10.12	3.667		8.946	miss	<nd	<nd	<nd	1.505
6/1	F	5	865	460	7,8	21,6	2,4	17.57	57.25	12.67	3.664	19.39	2.278	8.959	<nd	<nd	<nd	0.9673
7/1	M	5	549	390	3,8	24,6	2,4	21.01		7.218	2.689		4.553	miss	<nd	<nd	<nd	0.952
8/1	F	5	458	370	4,4	29,3	8,2	5.559		9.748	4.335		9.151	miss	<nd	<nd	<nd	3.418
9/1	M	4	305	310	2,3	27,3	2,4	26.46	30.47	7.944	2.413	21.44	<0.6	miss	<nd	<nd	<nd	0.907
10/1	F	4	1840	575	19,7	35,7	20,0	14.95		9.372	2.577		38.54	9.513	<nd	<nd	<nd	1.672
11/1	F	4	2346	590	78,1	66,9	60,0	5.304		3.59	1.835		61.18	miss	<nd	<nd	<nd	<nd
12/1	M	4	510	390	4,1	24,8	2,1	23.73	31.84	16.55	6.431	15.77	0.77	miss	<nd	<nd	<nd	0.8005
13/1	F	5	1309	470	17,2	35,9	22,0	11.41	39.7	11.61	3.677	15.34	25.82	10.17	<nd	<nd	<nd	1.752
14/1	M	3	463	370	4,4	28,0	9,9			12.25	4.717		1.961	9.396	<nd	<nd	<nd	<nd
15/1	M	3	238	300	1,9	28,6	5,2	10.56	15.21	6.402	3.158	18.99	2.439	miss	<nd	<nd	<nd	2.177
Mean		4	737	405	10,9	29,5	10,3	14,909	34,894	8,951	3,280	18,186	<10,881	9,908	<<0.000	<<0.000	<<0.000	<1.422
Minimum		3	143	300	1,9	21,6	2,1	5,304	15,210	3,590	1,835	15,340	<0,6	8,959	<0.000	<0.000	<0.000	<0.000
Maximum		6	2346	590	78,1	66,9	60,0	26,460	57,250	16,550	6,431	21,440	61,180	11,260	0,000	0,000	0,000	3,418
St.Dev		1	630	91	19,3	11,3	15,1	7,261	15,324	3,341	1,209	2,580	~17,594	0,809	~0.000	~0.000	~0.000	~0.985
Count		15	15	15	15	15	15	13	5	15	15	5	15	6	14	14	14	14

miss(9) ! Missing value

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined** Tissue: All
Locality : **98B Lille Molla** Latitude: 68°12.0N Longitude: 14°48.0E
Catch,date : **20010918** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) ᵖBG/min/mg prot w.wt	EROD(LI) nin/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	BAP3O(BI) ȷ/kg/ABS 380 nm w.wt	PA1O(BI) ȷ/kg/ABS 380 nm w.wt	PYR1O(BI) µg/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>																	
1/1	F	5	491	377	5,8	25,5	5,0		49.33	15.25	4.397	13.06	5.949	13.35			
2/1	M	6	898	500	6,9	35,2		24.7	50.99	18.76	6.457	13.37	6.799	15.88	<nd	1.348	3.138
3/1	F	6	1388	555	33,9	46,8	32,0	16.88	50.99	12.51	3.056	15.21	10.51	11.92	<nd	<nd	4.75
4/1	M	5	640	427	8,8	21,2	8,4	14.34	48.1	14.66	3.951	11.96	<0.6	12.53	<nd	2.559	5.613
5/1	M	4	1182	540	13,5	19,8	3,5	17.37	43.93	14.27	4.168	13.26	<0.6	12.01	<nd	2.141	4.634
6/1	X	5	1652	572	23,9	49,8	28,0	18.08	26.01	12.8	2.738	10.2	39.34	19.21	<nd	1.897	4.652
7/1	F	5	449	360	4,6	23,9		11.82	41.96	14.94	3.499	15.44	7.943	10.14	<nd	<nd	6.787
8/1	F	4	205	291	1,9	27,9		15.96	38.93	10.4	2.285	11.45	1.909	11.28	<nd	<nd	4.838
9/1	F	5	332	316	4,5	35,6		16.66	45.53	13.98	3.692	12.58	<0.6	9.508	<nd	<nd	4.974
10/1	M	5	691	404	9,1	35,1	19,0	9.494	29.67	12.57	3.753	12.14	1.242	12.74	<nd	3.939	8.469
11/1	M	4	447	367	4,5	31,9	8,0	14.95	48.87	13.17	3.956	12.67	9.445	15.2	<nd	2.382	5.392
12/1	F	4	518	399	5,1	25,9	5,4		42.05	17.33	5.015	12.24	0.7555	11.1			
13/1	M	4	420	348	11,3	51,6	32,0	14.85	42.25	9.09	2.874	15.4	48.81	14.34	<nd	2.324	5.765
14/1	F	5	698	436	8,8	32,6	16,0	18.48	38.14	13.62	4.199	13.43	7.865	9.733	<nd	<nd	4.388
15/1	M	2	137	260	1,4	36,3		14.75	44.52	16.84	4.309	16.14	1.049	8.159	<nd	2.496	5.676
16/1	M	3	155	255	2,4	29,6			29.89	9.832	2.686	9.691	<0.6	7.825	<nd	<nd	
17/1	F	2	113	235	1,0			8.989	31.28	15.93	5.065	12.56	1.763	9.981	<nd	4.138	8.889
18/1	F	4	975	519	5,7	23,5	3,4	43.59	48.74	16.04	2.999	19.37	<0.6	15.29	<nd	<nd	1.828
19/1	M	6	2003	630	47,7	58,5	49,0	35.21	50.98	9.216	2.319	16.26	34.86	16.62	<nd	<nd	2.241
20/1	F	5	2148	595	35,3	49,3	35,0	9.09	44.1	12.62	3.151	13.7	9.921	21.5	<nd	<nd	8.878
21/1	F	4	1012	468	23,1	56,9	46,0	40.4	37.96	11.03	2.86	19.53	6.128	15.81	<nd	<nd	2.03
22/1	F	3	291	285	3,4	31,6	4,2	12.73	37.92	13.71	3.523	12.77	0.7105	10.51	<nd	<nd	6.475
23/1	M	4	532	378	8,8	45,0	27,0	13.33	48.78	13.42	4.527	16.73	3.224	13.03	<nd	<nd	6.053
24/1	M	3	197	290	2,7	19,7			44.33	11.28	3.767	19.36	2.739	6.079			
25/1	F	4	476	381	4,9	25,5	3,4	19.39	47.29	13.02	3.329	11.77	8.662	14.55	<nd	<nd	4.162
Mean		4	722	408	11,2	34,9	19,1	18,622	42,502	13,452	3,703	14,012	<8,505	12,732	<<0.000	<<1.056	5,221
Minimum		2	113	235	1,0	19,7	3,4	8,989	26,010	9,090	2,285	9,691	<0,6	6,079	<0.000	<0.000	1,828
Maximum		6	2148	630	47,7	58,5	49,0	43,590	50,990	18,760	6,457	19,530	48,810	21,500	0,000	4,138	8,889
St.Dev		1	568	114	12,2	11,9	15,7	9,652	7,224	2,487	0,958	2,705	~12,885	3,572	~0.000	~1.414	2,008
Count		25	25	25	25	24	17	21	25	25	25	25	25	25	22	22	21

Species   : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99   Undefined**   Tissue: All
Locality   : **10B Varangerfjorden** Latitude: 69°56.0N Longitude: 29°40.0E
Catch,date : **20000918** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>														
	Detection limit			=>	Mean													
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	NAP2O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᵖBG/min/mg prot	ıin/min/mg prot	µg/mg prot	ȷ/kg/ABS 380 nm	ȷ/kg/ABS 380 nm	µg/kg/ABS 38	µg/kg/ABS 38
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	M	2	270	320	8,9	68,7	58,0	24.81	40.52	3.652	1.308	19.76	27.92	4.036	<nd	<nd	<nd	0.1612
2/1	M	3	427	375	14,3	66,1	57,0	20.12	30.68	4.84	1.377	21.3	10.1	4.525	<nd	<nd	<nd	0.3479
3/1	F	3	382	370	15,8	61,6	53,0	18.11	22.99	6.858	1.642	18.75	118.2	5.719	<nd	<nd	<nd	0.497
4/1	F	3	237	310	5,0	44,4	31,0		17.92	5.596	1.46	18.92	61.37	4.339				
5/1	F	2	275	335	4,2		19,0	13.08	19.42	4.312	1.308	19.45	27.79	6.482	<nd	<nd	<nd	0.5353
6/1	M	4	806	440	41,6	73,6	69,0	113.8	29.68	1.593	0.5404	20.87	85.93	9.495	<nd	<nd	<nd	3.514
7/1	M	3	265	320	9,0		53,0	29.51	34.4	3.758	1.117	21.59	64.29	4.234	<nd	<nd	<nd	0.1356
8/1	M	2	251	315	8,3		54,0	12.07	23.62	6.688	2.382	18.32	76.34	6.422	<nd	<nd	<nd	0.8284
9/1	F	3	207	310	2,4		4,3	27.83	27.98	8.146	2.313	20.05	20.02	8.129	<nd	<nd	<nd	0.2156
10/1	F	3	301	325	3,7		17,0		37.44	5.372	1.997	19.67	194.1	6.042	<nd	<nd	<nd	
11/1	F	2	228	310	4,8		24,0	7.373	44.88	5.48	2.289	16.58	64.8	5.208	<nd	<nd	<nd	<nd
12/1	F	2	358	350	5,7		31,0	7.979	50.2	4.98	1.867	20.35	113.9	9.165	<nd	<nd	<nd	0.6266
13/1	M	3	416	360	13,3	68,4	57,0		47.66	5.526	1.629	25.77	200.6	6.334	<nd	<nd	<nd	
14/1	F	3	425	370	10,1	57,3	42,0	11.31	50.12	8.918	2.366	3.836	102.6	6.527	<nd	<nd	<nd	0.3536
15/1	F	3	346	340	11,1	68,5	56,0	22.32	41.67	6.406	1.626	20.48	165.6	6.709	<nd	<nd	<nd	0.2688
16/1	F	3	322	340	4,5		26,0	7.88	42.34	6.23	2.017	18.68	110.3	4.308	<nd	<nd	<nd	0.5076
17/1	M	2	239	300	14,3	74,2	66,0	15.93	26.12	3.389	0.989	22.42	77.74	5.928	<nd	<nd	<nd	0.3139
18/1	F	3	376	350	10,1		56,0	26.49	22.23	6.75	2.369	20.5	124.6	7.161	<nd	<nd	<nd	0.1887
19/1	M	2	207	300	5,9		42,0	31.52	35.75	6.476	1.594	21.83	118.7	6.901	<nd	<nd	<nd	0.2221
20/1	M	2	138	260	2,2		24,0		33.58	5.14	1.837	14.6	118.7	3.313				
21/1	M	3	533	310	13,0	60,3	50,0	11.74	22.49	7.108	1.46	15.94	131.7	6.093	<nd	<nd	<nd	0.2556
22/1	F	3	346	350	6,6		37,0		45.89	8.38	2.688	18.11	81.53	4.631	<nd	<nd	<nd	
23/1	M	3	407	375	12,5	51,6	39,0	15.59	38.61	7.002	2.314	16.57	205.2	5.897	<nd	<nd	<nd	0.6413
24/1	M	3	281	330	6,5		54,0		39.25	5.824	1.561	13.94	151.3	4.639				
25/1	M	2	247	320	4,8		37,0	29.01	28	7.116	2.301	18.87	94.86	4.279	<nd	<nd	<nd	0.2069
Mean		3	332	335	9,5	63,2	42,3	23,499	34,138	5,822	1,774	18,686	101,928	5,861	<<0.000	<<0.000	<<0.000	<0.517
Minimum		2	138	260	2,2	44,4	4,3	7,373	17,920	1,593	0,540	3,836	10,100	3,313	<0.000	<0.000	<0.000	<0.000
Maximum		4	806	440	41,6	74,2	69,0	113,800	50,200	8,918	2,688	25,770	205,200	9,495	0,000	0,000	0,000	3,514
St.Dev		1	133	35	7,8	9,3	16,8	23,270	9,871	1,677	0,527	4,003	54,140	1,570	~0.000	~0.000	~0.000	~0.755
Count		25	25	25	25	11	25	19	25	25	25	25	25	25	22	22	22	19

Species : **GADU MOR** Gadus morhua GB: Cod, N: Torsk
Sample area: **J99 Undefined** Tissue: All
Locality : **10B Varangerfjorden** Latitude: 69°56.0N Longitude: 29°40.0E
Catch,date : **20010915** Count: 25 Sample type: **Individual**

Analytical lab.				=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code				=>													
Detection limit				=>	Mean												
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᴾBG/min/mg prot	nin/min/mg prot	µg/mg prot	ɟ/kg/ABS 380 nm	ɟ/kg/ABS 380 nm	µg/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
1/1	F	3	318	338	6,1	60,7	40,0		56.51	11.18	2.432	16	80.59	7.348	<nd	<nd	
2/1	F	2	251	313	6,4	65,4	49,0	24.64	41.72	7.908	1.489	16.81	60.54	6.344	<nd	<nd	0.2394
3/1	F	2	423	368	6,6	36,7	21,0	11.21	32.59	13.97	3.185	27.01	22.53	8.287	<nd	<nd	0.4014
4/1	F	2	308	335	6,5	55,9	39,0	18.78	43.52	11.18	2.938	19.53	84.24	7.072	<nd	<nd	0.2822
5/1	F	3	459	374	20,0	75,3	66,0	30.87	35.67	6.852	1.623	17.99	79.56	3.98	<nd	<nd	0.149
6/1	M	4	1056	486	49,8	58,4	43,0	14.85	42.91	11.5	3.011	19.16	19.01	11.64	<nd	<nd	0.2425
7/1	F	2	181	279	7,3	67,0	56,0		9.99	7.58	1.802	13.78	55.09	5.191			
8/1	F	2	253	320	5,7	50,8	34,0		38.11	13.13	3.178	18.14	77.2	8.707			
9/1	M	2	214	300	3,7				37.45	9.226	2.375	21.54	83.7	5.44			
10/1	F	2	212	300	5,6	64,8	50,0	23.03	52.19	9.324	2.46	15.74	102.3	5.313	<nd	<nd	0.1476
11/1	F	2	309	329	9,2	62,1	50,0	11.31	53.22	9.46	2.247	19.09	91.42	6.756	<nd	<nd	0.2652
12/1	F	2	256	316	3,4			23.84	38.83	11.97	2.931	10.22	1.39	8.647	<nd	<nd	0.3063
13/1	F	2	263	330	4,5				19.21	12.6	3.332	40.2	78.42	5.427	<nd	<nd	
14/1	F	3	311	344	8,5	66,3	55,0	58.18	30.92	8.306	1.853	16.46	109.5	5.963	<nd	<nd	0.1409
15/1	M	3	457	372	16,6	69,0	59,0	11.31	42.75	4.595	1.554	13.81	145.4	7.306	<nd	<nd	0.4774
16/1	M	2	309	330	3,4			8.888	51.12	14.05	3.724	12.69	63.12	6.079	<nd	<nd	0.5738
17/1	F	3	390	376	14,9	65,6	59,0	13.55	39.51	5.564	2.064	14.76		16.09	<nd	<nd	0.391
18/1	M	2	221	303	6,4	65,3	59,0	15.45	35.24	11.35	2.482	15.18	19.14	6.402	<nd	<nd	0.2847
19/1	M	2	366	359	7,2	51,2	30,0		45.65	13.1	3.21	19.06	69.69	5.787	<nd	<nd	
20/1	M	2	266	321	10,8	65,0	60,0	14.03	40.48	8.406	2.455	22.62	180.7	8.053	<nd	<nd	0.5845
21/1	M	4	342	356	3,7	57,3		19.29	35.08	11.48	2.973	14.5	136.2	9.909	<nd	<nd	0.4043
22/1	M	2	293	331	8,2		52,0		40.33	7.316	1.559	25.83	93.77	6.186			
23/1	F	2	320	308	5,3	64,2	55,0	12.42	10.71	10.44	2.011	14.26	71.61	5.242	<nd	<nd	0.4105
24/1	F	2	238	311	5,9	54,4	44,0	31.01	49.21	10.02	2.265	14.32	76.75	8.252	<nd	<nd	0.2806
25/1	M	3	288	324	7,1	55,0	43,0	5.757	52.96	11.4	2.529	12.68	108.8	5.209	<nd	<nd	0.799
Mean		2	332	337	9,3	60,5	48,2	19,356	39,035	10,076	2,467	18,055	79,611	7,225	<<0.000	<<0.000	0,354
Minimum		2	181	279	3,4	36,7	21,0	5,757	9,990	4,595	1,489	10,220	1,390	3,980	<0.000	<0.000	0,141
Maximum		4	1056	486	49,8	75,3	66,0	58,180	56,510	14,050	3,724	40,200	180,700	16,090	0,000	0,000	0,799
St.Dev		1	168	40	9,4	8,4	11,4	12,063	11,934	2,552	0,629	6,119	40,919	2,524	~0.000	~0.000	0,172
Count		25	25	25	25	20	20	18	25	25	25	25	24	25	21	21	18

Species : **PLAT FLE** Platichtys flesus GB: Flounder, N: Skrubbe
Sample area: **J63 Sørfjorden** Tissue: All
Locality : **53B Inner Sørfjord** Latitude: 60°10.0N Longitude: 6°34.0E
Catch,date : **19990930** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) PBG/min/mg prot w.wt	EROD(LI) nin/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	PYR1O(BI) g/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>															
Detection limit =>															
6/1	F		452	360	7,4			32.83	53.82	8.049	4.797	12.43	20.03	16.03	66
7/1	M		382	340	6,0			108.2	43.08	8.139	4.089	4.341	12.9	12.64	10.72
8/1	F		386	340	8,3			39.39	52.77	9.393	5.122	10.4	27.76	16.28	101.3
9/1	F		627	360	18,5			34.44		8.481	4.12		10.13	6.839	52.1
10/1	M		485	350	11,8			32.52	53.7	9.003	4.743	11.06	24.57	11.39	59.8
11/1	F		857	420	18,4			86.85	33.96	8.868	3.203	14.17	13.02	15.38	25.81
12/1	F		487	380	4,1			27.88	40.8	7.587	3.373	8.354	136.4	31.6	46.11
13/1	F		516	370	6,4			81.15	45.3	9.276	5.271	7.089	45.67	6.468	39.83
14/1	F		523	350	9,5			18.68	38.85	7.365	4.864	12.27	94.95	19.16	74.63
15/1	M		320	320	3,9			85.68	44.88	8.298	4.375	10.45	68.11	7.472	17.43
16/1	F		576	350	16,0			13.33	23.29	10.65	5.675	0.1119	18.25	13.3	134.5
17/1	F		980	420	19,2			6.666	25.28	9.411	5.013	15.08	6.22	22.08	71.34
18/1	F		626	380	10,6			3.535	38.19	8.772	5.399	10.2	12.68	3.15	89.23
19/1	F		498	370	9,3			42.42	46.83	6.801	6.024	10.78	28.49	23.31	29.8
20/1	F		570	360	12,0			13.74	50.76	6.72	3.595	14.53	15.95	14.7	166.4
21/1	M		332	320	5,6			87.86	31.71	11.35	5.124	12.6	16.14	20.77	27.64
22/1	F		615	360	14,3			12.02	60.06	9.288	4.212	9.699	29.26	20.63	141.3
23/1	F		261	280	3,2			25.45	56.22	6.258	3.494	17.43	30.9	9.36	80.83
24/1	F		305	300	5,4			19.08	35.85	10.54	6.894	12.53	25.01	13.71	168.9
25/1	M		452	330	16,1			28.5		7.638	2.997		7.87	6.808	59.85
26/1	M		280	310	5,6			54.16	43.71	8.199	3.855	3.697	41.54	6.504	90.89
27/1	F		603	370	20,4			16.56	45.6	8.301	3.076	8.143	6.27	15.76	132.6
28/1	F		368	330	5,2			6.161	54.3	8.466	4.894	8.087	53.82		127.3
29/1	M		407	350	6,4			6.464	35.25	9.333	7.227	15.42	2.952	16.39	160
30/1	M		348	320	5,3			29.17	58.23	8.76	3.539	9.47	42.89	21.16	176.1
Mean			490	350	10,0			36,509	44,019	8,598	4,599	10,363	31,671	14,620	86,016
Minimum			261	280	3,2			3,535	23,290	6,258	2,997	0,112	2,952	3,150	10,720
Maximum			980	420	20,4			108,200	60,060	11,350	7,227	17,430	136,400	31,600	176,100
St.Dev			172	33	5,4			30,208	10,197	1,211	1,124	4,044	30,516	6,749	51,662
Count			25	25	25			25	23	25	25	23	25	24	25

Species : **PLAT FLE** Platichtys flesus GB: Flounder, N: Skrubbe
Sample area: **J63 Sørfjorden** Tissue: All
Locality : **53B Inner Sørfjord** Latitude: 60°10.0N Longitude: 6°34.0E
Catch,date : **20001011** Count: 10 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) PBG/min/mg prot w.wt	EROD(LI) nin/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	BAP3O(BI) g/kg/ABS 380 nm w.wt	NAP2O(BI) g/kg/ABS 380 nm w.wt	PA1O(BI) µg/kg/ABS 38 w.wt	PYR1O(BI) µg/kg/ABS 38 w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																		
Detection limit =>																		
3/1	M		316	290	11,2			0.832	16.89	8.322	3.705	24.33	1.092	4.773	<nd	<nd	<nd	12.02
4/1	M		272	300	5,2			21.11	41.81	8.606	3.012	8.824	6.215	8.337	<nd	<nd	<nd	21.45
5/1	M		488	340	13,6			0.78	40.65	8.8	4.112	0.2003	3.855	5.901	<nd	<nd	<nd	14.1
6/1	M		424	330	9,0			3.042	25.78	8.352	3.65	6.656	2.913	6.806	<nd	<nd	<nd	19.72
7/1	F		412	350	5,6			63.21	33.56	10.34	3.187	7.939	12.24	12.82	<nd	<nd	<nd	6.47
8/1	M		387	330	5,8			116.7	30.8	10.76	6.319	11.14	2.297	6.943	0.1028	<nd	<nd	3.615
9/1	M		277	320	6,6			216.9	17.13	6.926	3.255	18.85	0.6634	7.4	<nd	<nd	<nd	2.595
10/1	M		263	300	3,0			58.28	53.53	8.43	2.599	6.954	87.33	10.15	<nd	<nd	<nd	9.747
11/1	M		148	240	1,8			39.79	34.04	11.07	5.043	9.888	9.581	8.327	0.2262	<nd	<nd	9.298
12/1	M		323	300	6,6			2.054	56.51	10.88	3.026	8.476	104.5	17.16	<nd	<nd	<nd	51.12
13/1	F		300	300	4,4			31.86	42.41	11.67	4.313	10.33	15.45	23.25	<nd	<nd	<nd	7.126
Mean			328	309	6,6			50,414	35,737	9,469	3,838	10,326	22,376	10,170	<<0.030	<<0.000	<<0.000	14,296
Minimum			148	240	1,8			0,780	16,890	6,926	2,599	0,200	0,663	4,773	<0.000	<0.000	<0.000	2,595
Maximum			488	350	13,6			216,900	56,510	11,670	6,319	24,330	104,500	23,250	0,226	<0.000	<0.000	51,120
St.Dev			94	30	3,5			65,694	12,985	1,521	1,077	6,390	36,862	5,572	~0.072	~0.000	~0.000	13,606
Count			11	11	11			11	11	11	11	11	11	11	11	11	11	11

Species : **PLAT FLE** Platichtys flesus GB: Flounder, N: Skrubbe
Sample area: **J63 Sørfjorden** Tissue: All
Locality : **53B Inner Sørfjord** Latitude: 60°10.0N Longitude: 6°34.0E
Catch,date : **20011201** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) PBG/min/mg prot w.wt	EROD(LI) nin/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	BAP3O(BI) g/kg/ABS 380 nm w.wt	PA1O(BI) g/kg/ABS 380 nm w.wt	PYR1O(BI) µg/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>																	
6/1	F	4	676	370	15,9			25.45	64.9	15.18	4.151	5.678	22.1	28.67	<nd	<nd	1.945
7/1	F	5	672	420	8,5			14.74	65.91	12.71	4.276	5.339	8.671	22.78	<nd	<nd	3.405
8/1	F	4	372	290	9,2			13.23	69.68	12.53	2.719	2.375	44.39	13.31	<nd	<nd	4.86
9/1	M	5	278	320	3,0			19.19	48.37	9.45	2.632	9.736	16.34	9.331	<nd	<nd	3.643
10/1	M	4	514	360	10,6			21.41	70.31	11.63	1.987	7.135	83.53	14.92	<nd	<nd	2.373
11/1	F	1	145	230	1,4			14.24	76.94	9.676	2.559	12.4	15.11	18.96	<nd	<nd	4.866
12/1	M	6	431	360	5,1			45.93	36.28	13.58	3.892	8.402	8.569	17.74	<nd	<nd	1.3
13/1	F	2	389	310	5,5			22.18	79.38	15.52	4.388	14.17	64.65	17.05	<nd	<nd	6.056
14/1	M	5	390	330	7,5			62.5	62.75	13.13	4.762	8.228	28.73	8.955	<nd	<nd	2.438
15/1	M	5	425	340	7,8			25.6	74.8	13.73	4.633	3.222	120.8	18.78	<nd	<nd	18.18
16/1	F	7	579	370	12,8			11.01	63.42	12.93	3.708	8.107	39.68	25.21	<nd	<nd	6.794
17/1	M	4	432	330	10,9				80.34	10.44	2.732	4.674	75.94	23.62	<nd	<nd	
Mean		4	442	336	8,2			25,044	66,090	12,542	3,537	7,456	44,043	18,277	<<0.000	<<0.000	5,078
Minimum		1	145	230	1,4			11,010	36,280	9,450	1,987	2,375	8,569	8,955	<0.000	<0.000	1,300
Maximum		7	676	420	15,9			62,500	80,340	15,520	4,762	14,170	120,800	28,670	<0.000	<0.000	18,180
St.Dev		2	153	48	4,1			15,668	12,885	1,951	0,953	3,514	35,345	6,107	~0.000	~0.000	4,679
Count		12	12	12	12			11	12	12	12	12	12	12	12	12	11

Comments Station: Inner Sørfjord Fish 1-13 fished 6.oct-10.oct Fish14-25 fished 1.dec 2001 Fished at 5-20m depth

Species : **PLAT FLE** Platichtys flesus GB: Flounder, N: Skrubbe
Sample area: **J62 Hardangerfjorden** Tissue: All
Locality : **67B Strandebarm** Latitude: 60°16.0N Longitude: 6°2.0E
Catch,date : **19990927** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>											
	Detection limit			=>	Mean										
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᵖBG/min/mg prot	nin/min/mg prot	µg/mg prot	ɟ/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
6/1	F		1731	460	71,5			26.97	51.48	6.642	3.189	16.92	2.064	25.67	23.27
7/1	F		548	380	7,9			26.46	45.57	8.508	3.769	13.44	39.69	26.34	21.42
8/1	F		877	380	25,2			4.242	48.15	6.444	4.024	15.42	12.55	77.97	53.26
9/1	F		2032	490	102,0			8.888	51.57	6.219	2.4	13.91	121.9	31.37	41.12
10/1	M		1215	440	50,5			35.45	59.76	5.556	3.504	17.24	34.4	20.6	14.8
11/1	F		1519	450	47,8			6.06	44.19	6.726	3.243	10.8	5.35	34.14	66.63
12/1	F		1998	510	62,9			5.252	52.29	7.194	4.227	22.21	8.35	52.73	69.97
13/1	F		1015	390	35,2			7.878	56.97	9.384	4.797	13.47	7.86	32.66	47.66
14/1	F		2144	490	101,1			14.24	70.56	6.504	3.824	25.89	<0.6	44.84	29.25
15/1	F		1136	390	44,6			18.99	46.98	6.996	2.841	15.89	28.46	36.15	61.06
16/1	F		1111	420	33,9			15.96	63.18	7.032	2.964	21.2	42.44		21.9
17/1	F		986	390	34,6			8.686	51.48	6.72	2.261	12.71	14.02	16.78	42.19
18/1	F		706	370	21,0			68.58	55.17	6.165	1.889	19.95	8.792	35.69	54.19
19/1	F		1752	460	70,8			15.76	47.52	6.219	5.01	13.21	8.49	40.68	41.05
20/1	M		535	320	13,4			33.73	47.4	7.266	2.752	28.26	36.58	38.14	24.19
21/1	F		457	350	4,9			27.98	49.89	8.754	3.982	15.87	28.88	23.43	10.99
22/1	F		2519	520	83,3			34.44	56.73	7.047	5.769	16.8	0.9	69.86	22.27
23/1	F		2458	510	77,3			21.21	39.51	6.852	2.906	1.668	6.39	44.72	29.59
24/1	F		1124	410	44,1			14.65	58.71	7.83	3.059	19.39	16.09	40.06	26.19
25/1	F		268	290	2,6			47.27	59.49	11.62	6.136	26.43	23.75		16.15
26/1	M		1623	480	66,2			16.46	29.78	7.071	3.458	12.5	53.54	17.71	56.99
27/1	F		1217	410	31,0			3.535	53.52	8.817	4.503	17.98	62.33	23.13	100.6
28/1	F		1673	460	58,4			8.484	45.96	8.904	2.298	16.77	19	40.03	98.11
29/1	M		926	400	27,2			4.949	53.49	7.443	4.412	15.15	16.54	20.85	47.37
30/1	F		1147	410	41,8			9.393	57.69	7.008	3.822	13.31	12.65	33.24	39.02
Mean			1309	423	46,4			19,421	51,882	7,397	3,642	16,656	<24,465	35,947	42,370
Minimum			268	290	2,6			3,535	29,780	5,556	1,889	1,668	<0,6	16,780	10,990
Maximum			2519	520	102,0			68,580	70,560	11,620	6,136	28,260	121,900	77,970	100,600
St.Dev			617	60	28,0			15,542	8,164	1,311	1,070	5,535	~26,234	15,284	23,913
Count			25	25	25			25	25	25	25	25	25	23	25

Species : **PLAT FLE** Platichtys flesus GB: Flounder, N: Skrubbe
Sample area: **J62 Hardangerfjorden** Tissue: All
Locality : **67B Strandebarm** Latitude: 60°16.0N Longitude: 6°2.0E
Catch,date : **20001013** Count: 25 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																		
Detection limit =>					Mean													
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	NAP2O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	BG/min/mg prot	in/min/mg prot	µg/mg prot	g/kg/ABS 380 nm	g/kg/ABS 380 nm	µg/kg/ABS 38	µg/kg/ABS 38
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
6/1	F		1499	470	56,0			51.31	32.76	9.002	3.769	15.09	9.924	29.62	<nd	<nd	<nd	0.5067
7/1	F		2183	510	70,2			17.47	54.22	10.64	2.377	16.08	1.327	27.33	<nd	<nd	<nd	2.404
8/1	F		1724	450	91,6			15.15	54.19	8.236	2.178	26.59	19.9	28.6	<nd	<nd	<nd	3.102
8/2													7.339					
9/1	F		2308	520	84,8			45.45	24.6	8.394	1.845	17.62	<0.6	26.86	<nd	<nd	<nd	<nd
10/1	F		1913	470	98,0			50.7	32.57	7.408	2.103	18.9	<0.6	30.51	<nd	<nd	<nd	1.755
11/1	F		816	370	20,4			41.01	52.86	10.29	2.267	17.81	7.304	40.3	<nd	<nd	<nd	1.707
12/1	F		1228	410	56,4			14.54	29.23	7.086	2.281	14.41	3.444	28.4	<nd	<nd	<nd	1.719
13/1	F		2703	560	90,6			4.545	45.83	8.448	2.359	13.85	1.107	37.83	<nd	<nd	<nd	<nd
14/1	F		1897	480	81,0			30.6	47.22	9.522	2.384	11.68	7.204	25.98	<nd	<nd	<nd	1.634
15/1	M		1267	440	45,8			58.58	57.16	7.408	3.086	19.04	19.5	22.06	<nd	<nd	<nd	0.9389
16/1	F		1712	500	75,0			58.85	49.85	7.338	3.375	18.81	2.041	34	<nd	<nd	<nd	0.7477
17/1	F		1727	480	60,4			96.91	67.05	7.338	3.324	12.18	<0.6	26.22	<nd	<nd	<nd	1.238
18/1	M		999	410	40,6			52.98	56.67	8.092	1.995	22.29	16.85	18.99	<nd	<nd	<nd	1.095
19/1	F		915	380	34,2			37.77	54.28	10.9	4.492	33.82	8.346	28.42	<nd	<nd	<nd	2.753
20/1	F		1330	430	56,0			35.35	49.76	8.788	3.154	27.1	5.584	24.29	<nd	<nd	<nd	2.546
21/1	M		1255	430	35,2			41.21	54.83	10.81	3.549	16.96	9.9	8.309	<nd	<nd	<nd	1.068
22/1	F		2190	510	102,4			22.93	57.03	11.92	3.349	20.47	4.613	24.91	<nd	<nd	<nd	1.788
23/1	F		1621	480	48,4			51.41	21.69	9.69	4.55	23.7	0.7956	30.04	<nd	<nd	<nd	0.8948
24/1	F		2392	510	113,6			3.939	63.13	10.45	1.786	10.41	1.298	18.77	<nd	<nd	<nd	<nd
25/1	F		911	370	29,0			4.646	71.56	9.636	3.115	13.18	17.55	32.43	<nd	<nd	<nd	3.229
26/1	F		1304	440	35,0			16.97	54.63	9.36	2.632	27.64	12.63	25.4	<nd	<nd	<nd	2.298
27/1	F		1963	470	96,0				58.03	7.69	2.902	17.62	<0.6	32.47				
28/1	F		577	370	8,4			5.555	65.18	11.98	4.356	13.22	17.28	25.65	<nd	<nd	<nd	<nd
Mean			1584	455	62,1			34,449	50,188	9,149	2,923	18,629	<7,347	27,278	<<0.000	<<0.000	<<0.000	<1.428
Minimum			577	370	8,4			3,939	21,690	7,086	1,786	10,410	<0,6	8,309	<0.000	<0.000	<0.000	<0.000
Maximum			2703	560	113,6			96,910	71,560	11,980	4,550	33,820	19,900	40,300	0,000	0,000	0,000	3,229
St.Dev			560	53	29,0			23,440	13,447	1,502	0,834	5,922	~6,696	6,603	~0.000	~0.000	~0.000	~1.011
Count			23	23	23			22	23	23	23	23	24	23	22	22	22	22

Species   : **PLAT FLE** Platichtys flesus GB: Flounder, N: Skrubbe
Sample area: **J62 Hardangerfjorden** Tissue: All
Locality   : **67B Strandebarm** Latitude: 60°16.0N Longitude: 6°2.0E
Catch,date : **20011012** Count: 25 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>													
	Detection limit			=>	Mean												
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot	j/kg/ABS 380 nm	j/kg/ABS 380 nm	µg/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
6/1	F	5	2086	470	124,3			4.131	19.48	7.982	3.684	25.84	<0.6	36.94	<nd	<nd	19.9
7/1	F	7	2282	500	92,6			2.652	57.81	9.918	3.309	17.53	3.286	36.56	<nd	<nd	31.45
8/1	F	5	1780	430	67,8			6.477	38.9	9.27	2.728	31.75	<0.6	49.98	<nd	2.795	12.34
9/1	M	5	1023	430	51,2			37.55	63.21	9.752	2.832	20.04	9.525	17.9	<nd	3.862	1.523
10/1	F	4	809	370	21,7			34.27	52.05	11.71	3.412	25.63	1.594	27.58	<nd	4.202	1.733
11/1	F	5	842	380	31,6			19.03	54.25	8.476	4.021	26.77	3.42	22.9	<nd	0.7411	3.931
12/1	F	5	1538	460	89,7			7.373	62.12	7.954	2.538	17.41	13.04	29	<nd	2.238	10.71
13/1	F	4	1391	430	44,3			24.64	59.22	11.88	3.776	24.22	<0.6	39.2	<nd	1.493	2.735
14/1	F	3	1045	400	40,7			11.11	71.25	10.58	4.297	23.02	6.375	21.12	<nd	1.215	7.012
15/1	M	5	835	400	22,3			68.74	64.17	11.24	2.955	25.53	3.419	18.57	<nd	0.7535	0.8248
16/1	F	5	1226	420	43,7			12.42	37.62	11.03	4.314	28.77	<0,6	29.05	<nd	4.21	5.603
17/1	F	5	1791	470	71,9			27.47	44.12	10.11	4.526	23.61	5.494	53.99	<nd	0.6735	3.054
18/1	F	5	895	370	26,6			73.1	52.74	12.18	4.41	35.05	<0.6	42.05	<nd	7.893	1.304
19/1	F	6	1564	430	63,5			8.888	40.66	12.65	3.358	33.98	1.191	30.25	<nd	1.665	9.26
20/1	M	4	1060	410	51,3			5.959		9.14	2.913		37.08	19.49	<nd	<nd	14.25
21/1	F	7	2465	530	108,6			5.252		8.002	3.398		<0.6	22	<nd	4.513	16.3
22/1	F	6	2583	510	116,8			16.16	61.75	12.03	4.301	17.6	7.304	41	<nd	<nd	5.415
23/1	F	4	1027	390	48,9			9.494	42.03	10.7	3.944	22.94	2.498	27.23	<nd	2.001	8.153
24/1	F	4	1251	440	47,3			20.03	38.99	10.15	3.518	34.71	13.27	35.55	<nd	<nd	3.484
25/1	F	4	1021	390	40,8			9.898	46.66	9.38	3.73	26.59	<0.6	35.92	<nd	3.728	7.951
26/1	F	7	2208	460	101,2			14.34	62.85	12.13	3.547	20.25	<0.6	42.18	<nd	<nd	5.425
27/1	M	4	897	400	32,8			43.93	77.62	10.35	2.75	17.02	20.85	26.15	<nd	3.369	1.302
28/1	F	4	167	250	2,0			35.04	61.57	8.212	2.353	15.23	8.149	20.52	<nd	<nd	1.901
29/1	F	4	990	380	43,9			16.46	67.48	8.59	3.715	18.67	<0.6	21.83	<nd	1.512	4.507
30/1	F	4	373	310	3,5				75.39	13.02	4.205	22.6	17.16	26.57	<nd	<nd	
Mean		5	1326	417	55,6			21,434	54,432	10,257	3,541	24,120	<<6,362	30,941	<<0.000	<<1.875	7,503
Minimum		3	167	250	2,0			2,652	19,480	7,954	2,353	15,230	<0,6	17,900	<0.000	<0.000	0,825
Maximum		7	2583	530	124,3			73,100	77,620	13,020	4,526	35,050	37,080	53,990	<0.000	7,893	31,450
St.Dev		1	632	60	33,6			19,083	14,099	1,573	0,630	5,862	~8,581	9,976	~0.000	~2.016	7,230
Count		25	25	25	25			24	23	25	25	23	25	25	25	25	24

Species : **PLAT FLE** Platichtys flesus GB: Flounder, N: Skrubbe
Sample area: **J99 Undefined** Tissue: All
Locality : **21F Åkrefjord** Latitude: 59°45.0N Longitude: 6°7.0E
Catch,date : **19991122** Count: 11 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>										
	Detection limit			=>	Mean									
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	ᵖBG/min/mg prot	ɴin/min/mg prot	ȷ/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
4/1	M		505	340	5,4			22.02	69.24	8.574	4.657	11.52	28.77	50
5/1	M		514	330	9,8			66.9	56.94	8.49	3.554	11.04	5.21	53.99
6/1	F		634	350	18,5			47.17	56.7	7.389	5.511	18.5	<0.6	26.38
7/1	M		454	320	12,5			84.08	57.12	7.416	3.482	13.04	23.21	9.377
8/1	M		496	340	11,3			26.77	58.17	6.822	2.563	11.45	61.99	48.79
9/1	F		619	360	23,4			63.73	51.87	7.062	miss	14.66	miss	15.45
10/1	F		789	370	19,9			20.3	81.75	8.376	miss	12.25	4.62	112.8
11/1	F		282	310	4,3			1.785	60.96	7.962	2.503	21.21	10.66	88.49
12/1	F		127	230	1,2			36.76	57.42	7.491	2.67	15.49	53.46	49.48
13/1	F		83	200	0,6			17.17	53.07	7.365	4.251	14.02	74.87	112
14/1	F		199	230	2,9			17.37	63.99	6.39	3.158	16.62	32.47	52.24
Mean			427	307	10,0			36,732	60,657	7,576	3,594	14,527	<29,586	56,272
Minimum			83	200	0,7			1,785	51,870	6,390	2,503	11,040	<0,6	9,377
Maximum			789	370	23,4			84,080	81,750	8,574	5,511	21,210	74,870	112,800
St.Dev			226	59	7,9			25,601	8,504	0,705	1,034	3,226	~26,111	35,016
Count			11	11	11			11	11	11	9	11	10	11

miss(3) ! Missing value

Species : **PLAT FLE** Platichtys flesus GB: Flounder, N: Skrubbe
Sample area: **J99 Undefined** Tissue: All
Locality : **21F Åkrefjord** Latitude: 59°45.0N Longitude: 6°7.0E
Catch,date : **20001016** Count: 25 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>													
Detection limit =>					Mean								
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)
repl.	F/M	year	g	mm	g	%	%	mg/mL	mg/mL	mg/mL	ᵖBG/min/mg prot	nin/min/mg prot	µg/mg prot
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
6/1	M		372	310	8,6			49.47	9.458	3.27	7.961	10.14	13.92
7/1	F		329	300	8,6			77.34	8.672	3.049	12.95	13.49	16.75
8/1	F		261	290	2,2			57.94	7.07	2.623	17.36	25.64	11.96
9/1	M		24	270	1,6			67.82	8.918	2.984	26.66	83.09	15.29
10/1	M		234	280	3,4			62.74	8.464	3.204	26.55	30.68	6.16
11/1	F		55	180				49.72			17		
12/1	M		115	220				36.05			21.48		
13/1	F		88	200				54.2			19.31		
14/1	F		122	220				53.59			28.41		
15/1	M		94	210				52.75			13.58		
16/1	M		248	270	4,4			31.05	8.638	3.674	10.37	14.15	8.383
17/1	M		102	210				64.11			28.67		
18/1	M		92	200				63.6			18.16		
19/1	M		101	220				48.34					
20/1	M		92	210				63			18.64		
21/1	F		105	210				64.45			28.82		
22/1	M		79	200				62.23			19.98		
23/1	F		98	200				53.27			13.35		
24/1	F		90	200				62.66			13.37		
25/1	M		80	200				65.12			10.4		
26/1	F		73	200				56.15			30.96		
27/1	F		78	190				39.68			23.27		
28/1	F		69	190				38.47			19.72		
29/1	M		68	190				44.81			24.03		
30/1	F		71	190				57.55			19.82		
Mean			126	222	4,8			55,044	8,537	3,134	19,618	29,532	12,077
Minimum			24	180	1,6			31,050	7,070	2,623	7,961	10,140	6,160
Maximum			372	310	8,6			77,340	9,458	3,674	30,960	83,090	16,750
St.Dev			89	39	3,1			11,033	0,797	0,348	6,552	27,404	4,104
Count			25	25	6			25	6	6	24	6	6

Species : **LIMA LIM** Limanda limanda GB: Dab, N: Sandflyndre
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **36F Færder area** Latitude: 59°4.0N Longitude: 10°23.0E
Catch,date : **19991027** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) PBG/min/mg prot w.wt	EROD(LI) nin/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	PYR1O(BI) g/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>															
Detection limit =>															
6/1	F		195	260	2,3				44.37	7.914	2.083	15.43	324.8	31.72	
7/1	M		265	290	2,8			11.21	39.36	6.495	3.208	7.966	244.5	8.904	34.12
8/1	M		200	270	3,1				40.56	8.01	2.986	1.875	472.3	12.61	
9/1	M		149	240	1,1				42.66	4.911	2.625	5.06	569.6	7.59	
10/1	F		318	300	5,1				33.36	6.123	1.972	11.2	316.1	26.04	
11/1	M		127	225					58.35			11.54			
12/1	F		347	310	4,8			10.71	42.99	7.566	3.241	4.146	622.4	12.02	53.31
13/1	F		234	270	3,3			10.5	62.97	9.579	3.339	7.808	371.4	45.66	48.84
14/1	M		278	300	4,5			12.73	40.74	8.877	2.658	10.26	181	21.94	44.77
15/1	F		138	230	2,2			5.533	50.34	3.321	1.342	5.083	600.1	5.612	114.4
16/1	M		236	280	2,7			7.777	42.66	4.68	2.135	6.851	459.8	23.65	40.42
17/1	M		281	300	4,1			5.252	35.49	4.956	2.322	6.481	400.7	35.48	79.02
18/1	M		217	270	2,5					8.139	3.227		668.6	11.44	
19/1	F		315	310	5,0				37.71	8.106	4.014	13.99	824.6	9.125	
20/1	F		227	280	3,1			7.028	43.89	10.83	5.001	5.302	930.3	20.11	164.2
21/1	M		258	290	2,4			18.99	33.93	7.077	2.054	11.62	616.7	17.68	37.66
22/1	F		205	270	3,4			34.44	33.45	9.192	3.792	24.35	841.9	11.99	16.11
23/1	F		195	260	3,2			7.812	34.62	8.475	3.365	15.13	346.2	13.68	115
24/1	M		214	280	1,5				37.05	6.549	3.499	2.397	590.8		
25/1	M		201	270	3,1				43.11	6.021	2.792	2.042	421.5	14.8	
26/1	M		153	230	1,6				41.22	6.378	3.456	8.036	469.8	7.23	
Mean			226	273	3,1			11,998	41,942	7,160	2,956	8,828	513,655	17,752	67,986
Minimum			127	225	1,1			5,252	33,360	3,321	1,342	1,875	181,000	5,612	16,110
Maximum			347	310	5,1			34,440	62,970	10,830	5,001	24,350	930,300	45,660	164,200
St.Dev			60	26	1,1			8,396	7,789	1,864	0,844	5,543	201,950	10,767	45,146
Count			21	21	20			11	20	20	20	20	20	19	11

Species : **LIMA LIM** Limanda limanda GB: Dab, N: Sandflyndre
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **36F Færder area** Latitude: 59°4.0N Longitude: 10°23.0E
Catch,date : **20001026** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) BG/min/mg prot w.wt	EROD(LI) in/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	BAP3O(BI) g/kg/ABS 380 nm w.wt	NAP2O(BI) g/kg/ABS 380 nm w.wt	PA1O(BI) µg/kg/ABS 38 w.wt	PYR1O(BI) µg/kg/ABS 38 w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																		
Detection limit =>																		
6/1	M		248	280	4,4			72.26	36.67	5.526	2.084	16.46	9.73	5.56	<nd	<nd	<nd	9.188
7/1	F		29	295	5,2			64.22	23.88	9	4.166	19.44	60.44	4.586	<nd	<nd	<nd	7.693
8/1	M		189	250	3,4			22.47	34.11	5.576	2.495	25.95	322.7	10.93	<nd	<nd	<nd	5.119
9/1	M		253	285	2,8			25.82	13.13	5.234	2.382	20.63	687.5	9.833	<nd	<nd	<nd	2.091
9/2													2919					
10/1	F		259	295	4,4			13.84	47.28	8.9	2.475	15.73	349.2	13.28	<nd	<nd	<nd	15.75
11/1	F		157	245	2,2				7.495	5.81	2.301	17.32	462.2	7.969	<nd	<nd	<nd	
12/1	F		165	255	2,0			53.49	17.33	4.858	2.149	17.58	283.6	3.733	<nd	<nd	<nd	3.421
13/1	F		278	275	1,4			26.83	6.259	4.208	1.155	11.34	98.53	12.74	<nd	<nd	<nd	2.758
14/1	F		291	290	5,8			8.383	20.32	8.656	2.866	17.99	2192	12.11	<nd	<nd	<nd	3.101
Mean			208	274	3,5			35,914	22,942	6,419	2,453	18,049	738,490	8,971	<<0.000	<<0.000	<<0.000	6,140
Minimum			29	245	1,4			8,383	6,259	4,208	1,155	11,340	9,730	3,733	<0.000	<0.000	<0.000	2,091
Maximum			291	295	5,8			72,260	47,280	9,000	4,166	25,950	2919	13,280	0,000	0,000	0,000	15,750
St.Dev			83	20	1,5			24,028	13,955	1,885	0,794	3,948	993,199	3,649	~0.000	~0.000	~0.000	4,622
Count			9	9	9			8	9	9	9	9	10	9	9	9	9	8

Species : **LIMA LIM** Limanda limanda GB: Dab, N: Sandflyndre
Sample area: **J26 Oslofjorden** Tissue: All
Locality : **36F Færder area** Latitude: 59°4.0N Longitude: 10°23.0E
Catch,date : **20011025** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) BG/min/mg prot w.wt	EROD(LI) in/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	BAP3O(BI) g/kg/ABS 380 nm w.wt	PA1O(BI) g/kg/ABS 380 nm w.wt	PYR1O(BI) µg/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>																	
6/1	F	6	436	330				96.89	51.03			14.92			<nd	<nd	0.6688
7/1	M	7	316	310	3,2			106.4	67.86	6.006	2.9	17.23	123.3	14.97	<nd	<nd	1.907
8/1	M	4	217	290	3,7			426.6	39.34	7.41	3.685	26.05	317.3	3.457	<nd	<nd	0.4899
9/1	F	4	269	300	3,4			32.12	51.21	10.5	4.702	16.84	577.8	11.9	<nd	<nd	3.114
10/1	F	4	307	310	4,6			78.13	54.5	9.514	2.955	30.52	34.78	11.1	<nd	<nd	2.125
11/1	F	2	151	240	4,2			34.39	13.99	6.592	2.467	11.87	21.33	4.68	<nd	<nd	1.227
12/1	F	4	233	280	3,1			17.68	46.98	5.74	2.474	19.14	123.4	4.775	<nd	<nd	3.717
13/1	F	4	162	260	2,0			18.68	52.71	2.583	1.357	18.05	572	9.317	<nd	<nd	3.618
14/1	M	4	234	290	3,8			7.575	23.62	6.566	2.918	18	17.18	4.472	<nd	<nd	25.35
15/1	F	5	307	300	4,5			43.26	11.63	13.99	3.337	13.01	155.5	9.706	<nd	<nd	4.115
16/1	M	4	272	310	3,1			37.73	35.82	7.598	2.263	12.95	3.59	4.327	<nd	<nd	1.768
17/1	F	4	242	285	3,2			24.95	32.8	8.724	2.775	10.87	396.8	8.129	<nd	<nd	3.311
18/1	M	3	139	230	1,3			29.86	51.28	5.022	1.866	13.89	163.8	8.447	<nd	<nd	7.334
19/1	M	3	184	260	2,8			49.52	65.79	9.366	2.622	14.35	240.7	5.19	<nd	<nd	3.352
20/1	M	3	143	245	1,8			55.94	32.28	2.142	1.306	11.17	172.7	6.36	<nd	<nd	3.879
21/1	F	2	191	270	2,0			41.2	54.59	5.332	2.123	18.07	32.18	2.305	<nd	<nd	4.684
22/1	F	4	267	310	2,8			31.37	38.74	5.59	1.992	15.03	102.8	10.91	<nd	<nd	5.578
23/1	F	3	181	250	2,7				55.8	4.758	1.393	12.07	137.7	10.64			
24/1	F	5	174	260	2,2			40.82	47.16	11.96	2.158	10.79	297	9.035	<nd	<nd	3.87
25/1	F	2	144	240	1,5				15.07	6.812	2.251	17.07	149.1	5.142	<nd	<nd	
30/1	F	5	309	305				14.24									
Mean		4	232	280	2,9			62,492	42,110	7,169	2,502	16,095	191,524	7,624	<<0.000	<<0.000	4,450
Minimum		2	139	230	1,3			7,575	11,630	2,142	1,306	10,790	3,590	2,305	<0.000	<0.000	0,490
Maximum		7	436	330	4,6			426,600	67,860	13,990	4,702	30,520	577,800	14,970	0,000	0,000	25,350
St.Dev		1	76	29	1,0			92,037	16,485	2,985	0,836	4,996	172,304	3,426	~0.000	~0.000	5,489

Count	21	21	21	19	19	20	19	19	20	19	19	19	19	18

Species   : **LIMA LIM** Limanda limanda GB: Dab, N: Sandflyndre
Sample area: **J99 Undefined**   Tissue: All
Locality   : **15F Ullerø area** Latitude: 58°3.0N Longitude: 6°43.0E
Catch,date : **19991020** Count: 25 Sample type: **Individual**

Samp/ repl. no.	Sex F/M	Age year	Wght g	Lngt mm	Mean weight g	Dry %	Fat %	AY(BI) ABS 380 nm w.wt	BLOPR(BL) mg/mL w.wt	CYTPR(LI) mg/mL w.wt	MICPR(LI) mg/mL w.wt	ALAD(BL) PBG/min/mg prot w.wt	EROD(LI) min/min/mg prot w.wt	MT(LI) µg/mg prot w.wt	PYR1O(BI) g/kg/ABS 380 nm w.wt
Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>															
Detection limit =>															
6/1			546	370	10,9			12.42	39.33	7.494	5.527	23.85	250.2	24.02	56.27
7/1	F		479	350	10,6			25.45	47.97	6.123	2.728	3.427	73.39	31.11	26.87
8/1	F		446	370	3,6			3.468	46.05	8.25	3.59	7.199	1243	7.995	284.3
9/1	M		289	310	2,2			3.737	45.21	7.074	3.074	8.664	475.5	2.12	980.6
10/1	F		482	350	4,4			6.767	42.78	8.109	3.903	6.384	545.2	15.71	97.98
11/1	F		413	360	4,6			7.07	45.45	4.737	2.47	16.08	567.6	14.24	324
12/1	F		348	310	3,5			7.373	35.7	8.37	3.599	6.751	528.5	8.3	328
13/1	F		339	320	3,1			5.959	37.23	7.29	4.296	10.05	333.5	2.058	216.6
14/1	F		412	330	7,2			5.454	47.16	6.483	2.907	22.22	239.6	15.37	339.6
15/1	M		282	310	3,0			31.31	40.02	6.108	3.987	3.255	275.7	9.666	129.9
16/1	F		331	320	4,0			19.49	42.78	8.556	3.115	9.988	353.1	23.4	305
17/1	M		275	300	2,7			2.828	36.96	8.196	3.064	4.667	398	10.97	1034
18/1	F		222	280	1,8				34.59	5.703	3.89	16.64	1171		
19/1	F		177	260	1,4				32.97	3.486	2.147	14.48	652.5	6.452	
20/1	F		172	260	1,3				30.99	6.309	3.026	17.81	884.2	14.5	
21/1	F		413	340	3,6			4.646	43.95	5.319	4.062	11.47	16.14	14.86	11030
22/1	M		397	330	3,8			13.43	55.65	5.925	3.039	11.82	243.4	7.227	3253
23/1	F		413	350	5,1			7.272	52.23	9.171	5.707	9.267	213.7	20.48	2381
24/1	F		426	350	4,0			4.284	35.1	10.59	8.448	12.9	214.1	9.646	8099
25/1	F		333	320	4,5				44.04	6.153	3.018	3.534	365.3	12.07	
26/1	M		255	280	2,1			7.878	42.87	6.039	4.674	3.837	572.4	28.99	4605
27/1	F		278	300	3,4			26.87	41.79	7.764	3.711	20.36	472.9	8.724	476.7
28/1	F		246	300	1,8				48.48	7.17	3.063	17.31	332.1	5.57	
29/1	F		227	280	2,9			3.535	35.82	7.143	3.336	3.198	565		625.7
30/1	X		259	290	2,9			5.365	28.44	3.657	2.009	23.07	625	8.283	213.2
Mean			338	318	3,9			10,230	41,342	6,849	3,696	11,529	464,441	13,120	1740
Minimum			172	260	1,3			2,828	28,440	3,486	2,009	3,198	16,140	2,058	26,870
Maximum			546	370	10,9			31,310	55,650	10,590	8,448	23,850	1243	31,110	11030
St.Dev			101	32	2,4			8,635	6,643	1,643	1,337	6,669	296,340	7,902	2968
Count			25	25	25			20	25	25	25	25	25	23	20

Species : **LIMA LIM** Limanda limanda GB: Dab, N: Sandflyndre
Sample area: **J99 Undefined** Tissue: All
Locality : **15F Ullerø area** Latitude: 58°3.0N Longitude: 6°43.0E
Catch,date : **20010927** Count: 25 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>					Mean												
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	BG/min/mg prot	in/min/mg prot	µg/mg prot	g/kg/ABS 380 nm	g/kg/ABS 380 nm	µg/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
6/1	F	4	396	339	4,9			23.13	15.29	9.838	2.107	20.33	187	13.29	<nd	3.027	199.5
7/1	F	5	411	335	8,0			16.16	17.02	6.478	2.174	55.07	78.5	9.22	<nd	1.423	164
8/1	M	4	357	334	4,6			23.43	20.47	6.9	1.812	27.36	170.2	5.18	<nd	<nd	10.16
9/1	F	3	285	297	4,1			10.1	15.52	11.07	2.224	14.85	124.7	9.348	<nd	1.98	208.9
10/1	M	5	391	358	3,4				34.09	11.55	3.08	16.23	466.4	8.896	<nd	<nd	
11/1	F	4	364	331	4,7			18.18	26.06	13.73	2.154	42.95	165.5	10.72	<nd	<nd	12.82
12/1	F	3	328	320	4,9			24.24	30.94	6.896	1.829	20	84.74	9.627		miss	
13/1	F	4	324	305	6,3			14.75	29.64	9.5	1.08	17.46	87.99	14.85	<nd	0.6782	49.03
14/1	F	4	364	335	3,8			20.2	14.11	10.45	2.979	70.42	96.63	13.07	<nd	1.238	133.8
15/1	F	2	235	287	2,5			7.171	38.92	9.83	2.375	29.76	298.6	11.95	<nd	<nd	48.67
16/1	F	3	296	309	2,6			6.161	43.88	12.1	3.402	26.61	404.9	10.05	<nd	<nd	139.1
17/1	F	5	405	330	9,5			38.4	30	10.97	2.493	18.89	61.24	6.483	<nd	<nd	59.08
18/1	F	3	312	310	1,9			10.1	32.35	6.27	2.071	8.224	555.5	8.18	<nd	<nd	104.8
19/1	M	5	401	336	5,9			48.08	35.83	7.552	2.125	20.65	129.8	7.042	<nd	<nd	25.19
20/1	F	4	493	357	7,4			8.686	23.59	7.97	1.312	11.18	103.4	11.23	<nd	<nd	121.6
21/1	F	4	419	350	5,2			7.878	30.07	7.624	2.051	24.17	104.7	5.026	<nd	<nd	281
22/1	F	5	516	392	6,6				28.84	9.434	2.241	21.74	34.13	5.003			
23/1	F	4	368	331	7,8			14.95	47.09	13.02	2.712	16.17	21.25	9.802	<nd	<nd	100.8
24/1	F	3	389	361	6,2			54.81	17.48	9.966	2.425	47.49	140.5	7.297	<nd	<nd	24.78
25/1	F	4	307	314	4,8			11.92	22.68	11.69	3.312	31.27	211.2	12.67	<nd	1.51	77.53
26/1	F	4	422	344	7,6				32.91	9.898	2.251	35.53	44.65	11.63			
27/1	F	2	219	277	2,2				27.39	11.34	2.954	27.15	32.08	5.5			
28/1	F	6	413	341	7,3			22.83	25.33	12.8	2.845	51.98	47.83	15.66	<nd	1.008	90.95
29/1	F	4	465	359	4,1			11.41	47.93	12.53	3.47	23.63	553.3	8.718	<nd	2.19	76.93
30/1	F	3	289	315	4,5			13.64	54.48	9.878	2.403	24.17	126.9	12.41	<nd	3.3	136.4
Mean		4	367	331	5,2			19,344	29,676	9,971	2,395	28,131	173,266	9,714	<<0.000	<<0.779	103,252
Minimum		2	219	277	1,9			6,161	14,110	6,270	1,080	8,224	21,250	5,003	<0.000	<0.000	10,160
Maximum		6	516	392	9,5			54,810	54,480	13,730	3,470	70,420	555,500	15,660	0,000	3,300	281,000
St.Dev		1	73	26	2,0			13,144	10,768	2,170	0,598	14,955	158,346	3,056	~0.000	~1.080	71,761
Count		25	25	25	25			21	25	25	25	25	25	25	21	21	20

miss(1) ! Missing value

Species : **PLEU PLA** Pleuronectes platessa GB: Plaice, N: Rødspette
Sample area: **J99 Undefined** Tissue: All
Locality : **98F Lille Molla** Latitude: 68°12.0N Longitude: 14°48.0E
Catch,date : **20000921** Count: 20 Sample type: **Individual**

		Analytical lab. =>						NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
		Analysis code =>																
		Detection limit =>			Mean													
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	NAP2O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	BG/min/mg prot	in/min/mg prot	µg/mg prot	g/kg/ABS 380 nm	g/kg/ABS 380 nm	µg/kg/ABS 38	µg/kg/ABS 38
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
5/1	F		636	390	5,0			2.856	46.56	9.788	4.444	10.89	325.3	miss	<nd	<nd	<nd	<nd
6/1	F		1075	410	19,0			0.91	62.28	11.68	3.926	12.99	185.4	14.99	<nd	<nd	<nd	23.08
7/1	F		1333	465	24,0			13.82	41.53	10.76	4.396	20.43	112.7	17.37	<nd	<nd	<nd	1.447
8/1	M		715	420	5,0			13.64	44.55	5.706	2.935	11.37	312.8	miss	<nd	<nd	<nd	1.467
9/1	M		721	400	9,0			16.77		12.84	3.458		184.9	miss	<nd	<nd	<nd	1.253
10/1	F		2101	550	31,0			15.86	48.66	9.768	3.999	16.22	56.92	miss	<nd	<nd	<nd	<nd
11/1	F		1808	530	28,8			44.64		7.994	3.708		32.15	miss	<nd	<nd	<nd	0.4928
12/1	F		2141	550	35,0			12.12	31.48	9.808	2.422	34.2	129.9	miss	<nd	<nd	<nd	1.65
13/1	F		2033	545	50,0			13.74	47.7	10.04	2.22	11.76	90.16	19.93	<nd	<nd	<nd	1.456
14/1	F		1869	520	27,0			8.925	42.77	11.67	3.877	15.14	132.1	10.66	<nd	<nd	<nd	2.577
15/1	M		1298	470	17,9			16.56	42.17	10.4	2.916	23	165	8.233	<nd	<nd	<nd	1.147
16/1	M		1062	440	19,0			5.916		9.264	2.721		399.2	7.857	<nd	<nd	<nd	<nd
17/1	F		1529	490	26,0			15.81	38.06	10.75	3.298	16.33	211.5	16	<nd	<nd	<nd	<nd
18/1	F		1054	450	14,0			18.79		12.22	3.784		101.4	12.08	<nd	<nd	<nd	1.011
19/1	M		1021	430	13,0			21.31	46.1	10.88	0.857	12.84	21.61	7.143	<nd	<nd	<nd	0.9854
20/1	F		3303	650	64,0			31.01	45.1	10.72	2.712	12.15	100.8	13.73	<nd	<nd	<nd	0.645
21/1			2310	550	51,0			30.85		11.64	3.272		98.03	13.89	<nd	<nd	<nd	0.6159
22/1	F		2413	550	53,0			16.97	48.52	10.33	4.099	24.41	98.67	miss	<nd	<nd	<nd	1.473
Mean			1579	489	27,3			16,694	45,037	10,348	3,280	17,056	153,252	12,898	<<0.000	<<0.000	<<0.000	<2.183
Minimum			636	390	5,0			0,910	31,480	5,706	0,857	10,890	21,610	7,143	<0.000	<0.000	<0.000	<0.000
Maximum			3303	650	64,0			44,640	62,280	12,840	4,444	34,200	399,200	19,930	<0.000	<0.000	<0.000	23,080
St.Dev			718	70	17,3			10,510	7,021	1,626	0,896	6,809	103,035	4,136	~0.000	~0.000	~0.000	~5.262
Count			18	18	18			18	13	18	18	13	18	11	18	18	18	18

miss(7) ! Missing value
Station: Lille Molla Fish from 1-16 and 21,22 are fished 20.09.2000
Fish 23,24,25 are fished in januar 2001

Species : **PLEU PLA** Pleuronectes platessa GB: Plaice, N: Rødspette
Sample area: **J99 Undefined** Tissue: All
Locality : **98F Lille Molla** Latitude: 68°12.0N Longitude: 14°48.0E
Catch,date : **20010919** Count: 25 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>					Mean												
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	BG/min/mg prot	in/min/mg prot	µg/mg prot	g/kg/ABS 380 nm	g/kg/ABS 380 nm	µg/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
6/1	M	8	1067	448	14,4				91.22	11.51	2.791	14.08	33.02	4.752			
7/1	M	8	1036	451	11,4			58.35	52.35	11.35	3.333	22.13	68.5	4.618	<nd	<nd	1.284
8/1	F	8	1161	471	12,7			35.21	69.68	12.55	3.167	24.33	22.61	6.433	<nd	<nd	2.224
9/1	F	15	2892	590	52,5			61.03	61.93	12.82	4.15	14.53	16.98	19.8	<nd	<nd	1.33
10/1	F	15	2551	585	45,0			53.49	54.64	10.88	4.939	21.9	59.66	19.55	<nd	<nd	1.443
11/1	F	13	2182	569	39,8			51.47	65.15	14.11	3.283	21.96	38.49	20.59	<nd	<nd	1.541
12/1	F	12	2179	558	36,6			95.13	40.81	10.63	3.708	13.57	18.5	12.73	<nd	<nd	0.8441
13/1	F	12	2278	571	29,7			28.17	64.69	13.14	4.109	14.32	34.84	13.78	<nd	<nd	2.695
14/1	F	7	997	432	17,0			21.55	65.88	12.64	3.753	21.52	20.53	25.24	<nd	<nd	3.625
15/1	F	9	1344	500	14,7			39.9	61.11	10.64	4.93	19.75	19.05	9.677	<nd	<nd	1.965
16/1	F	12	1940	532	24,8			53.99	62.24	13.08	4.519	16.82	31.84	18.83	<nd	<nd	1.439
17/1	M	6	1089	449	19,6			18.4	49.24	10.78	2.909	11.64	145.7	5.829	<nd	<nd	4.468
18/1	F	6	887	426	12,0			7.07	52.01	14.61	4.001	22.1	63.98	18.3	<nd	<nd	11.43
19/1	F	14	3098	630	47,4			10.91	57.36	14	3.537	20.51	32.34	16.23	<nd	3.264	7.453
20/1	F	6	467	365	5,1			18.38	49.11	14.38	4.451	16.24	785.9	6.434	<nd	2.133	4.553
21/1	F	11	1186	458	18,2			25.45	59.88	11.8	3.094	13.41	23.42	12.9	<nd	<nd	3.179
22/1	M	7	791	419	7,9			58.97	59.65	12.35	4.339	10.46	64.16	6.703	<nd	<nd	1.274
23/1	F	6	420	331	4,1			10.71	36.12	10.22	3.158	15.45	379.7	15.23	<nd	3.4	4.866
24/1	M	8	1046	471	6,8			11.31	41.86	16.7	6.503	17.11	347.4	6.56	<nd	3.324	7.39
25/1	F	10	1291	478	19,1			14.04		10.41	5.085		<0.6	13.19	<nd	<nd	5.777
26/1	F	7	961	428	5,9			8.364		8.504	2.69		<0.6	21.07	<nd	4.495	9.194
27/1	F	7	930	430	11,9					11.09	2.553		<0.6	7.065		<nd	
28/1	M	6	760	399	6,1			15.96		9.814	2.015		<0.6	6.721	<nd	2.394	4.932
29/1	M	5	503	361	2,0			24.24		6.88	1.848		<0.6	5.913	<nd	1.687	3.465
30/1	M	5	511	341	1,4			15.65		8.26	1.48		<0.6	7.961			
Mean		9	1343	468	18,6			32,076	57,628	11,726	3,614	17,465	<88,409	12,244	<<0.000	<<0.900	3,926
Minimum		5	420	331	1,4			7,070	36,120	6,880	1,480	10,460	<0,6	4,618	<0.000	<0.000	0,844
Maximum		15	3098	630	52,5			95,130	91,220	16,700	6,503	24,330	785,900	25,240	0,000	4,495	11,430
St.Dev		3	771	82	14,9			22,960	12,281	2,199	1,137	4,162	~174,774	6,272	~0.000	~1.477	2,861
Count		25	25	25	25			23	19	25	25	19	25	25	22	23	22

Station: Lille Molla Fished from16.-19.sept.2001(no1-19)
Fished 22.sept.2001(20-25)

Species   : **PLEU PLA** Pleuronectes platessa GB: Plaice, N: Rødspette
Sample area: **J99 Undefined**   Tissue: All
Locality   : **10F Skogerøy** Latitude: 69°55.0N Longitude: 29°51.0E
Catch,date : **20000919** Count: 15 Sample type: **Individual**

	Analytical lab.			=>				NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
	Analysis code			=>														
	Detection limit			=>	Mean													
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	NAP2O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	PBG/min/mg prot	nin/min/mg prot	µg/mg prot	µg/kg/ABS 380 nm	µg/kg/ABS 380 nm	µg/kg/ABS 38	µg/kg/ABS 38
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
4/1	F		634	390	7,0			7.171	47.66	9.464	3.646	21.09	409.6	5.387	<nd	<nd	<nd	0.2789
5/1	F		649	400	8,1			10.81	48.1	9.898	3.376	23.6	295.5	9.326	<nd	<nd	<nd	0.2776
6/1	F		552	390	5,4			19.39	32.12	9.588	3.487	13.77	277	7.084	<nd	<nd	<nd	0.2063
7/1	F		666	400	7,1			5.304	49.44	13.23	3.882	16.8	353.5	5.503	<nd	<nd	<nd	<nd
8/1	F		757	390	13,2			14.14	41.71	7.278	2.829	19.21	294.3	5.427	<nd	<nd	<nd	0.2829
9/1	F		982	460	14,8			19.04	66.51	9.604	3.735	14.11	39.92	7.628	<nd	<nd	<nd	<nd
10/1	F		930	420	18,7			27.98	45.38	8.708	2.864	16.91	58.85	6.944	<nd	<nd	<nd	0.1072
11/1	F		942	430	13,7			14.54	45.83	7.354	2.871	15.64	214	5.73	<nd	<nd	<nd	0.3438
12/1	M		1013	465	15,6			14.95		9.802	3.018		44.53	8.272				
13/1	F		1004	445	18,3			23.43		9.042	3.716		59.6	9.529				
14/1	F		655	410	4,3			6.812	41.24	10.54	3.558	18.33	615.8	4.73	<nd	<nd	<nd	0.5872
14/2													256.6					
15/1	F		1081	375	14,3			37.88	40.8	8.672	3.389	26.59	178.7	6.402	<nd	<nd	<nd	0.264
16/1	F		732	400	7,1			8.585		6.062	2.409		195.2	4.52				
17/1	F		757	410	9,7			21.72		11.89	3.627		215	4.751				
18/1	F		1149	490	20,6			9.292	40.82	11.06	4.508	28.7	50.64	9.297	<nd	<nd	<nd	<nd
Mean			834	418	11,9			16,070	45,419	9,479	3,394	19,523	222,421	6,702	<<0.000	<<0.000	<<0.000	<<0.213
Minimum			552	375	4,3			5,304	32,120	6,062	2,409	13,770	39,920	4,520	<0.000	<0.000	<0.000	<0.000
Maximum			1149	490	20,6			37,880	66,510	13,230	4,508	28,700	615,800	9,529	0,000	0,000	0,000	0,587
St.Dev			189	33	5,2			9,029	8,509	1,818	0,524	4,965	157,506	1,761	~0.000	~0.000	~0.000	~0.179
Count			15	15	15			15	11	15	15	11	16	15	11	11	11	11

Species : **PLEU PLA** Pleuronectes platessa GB: Plaice, N: Rødspette
Sample area: **J99 Undefined** Tissue: All
Locality : **10F Skogerøy** Latitude: 69°55.0N Longitude: 29°51.0E
Catch,date : **20010916** Count: 25 Sample type: **Individual**

Analytical lab. =>								NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA	NIVA
Analysis code =>																	
Detection limit =>					Mean												
Samp/	Sex	Age	Wght	Lngt	weight	Dry	Fat	AY(BI)	BLOPR(BL)	CYTPR(LI)	MICPR(LI)	ALAD(BL)	EROD(LI)	MT(LI)	BAP3O(BI)	PA1O(BI)	PYR1O(BI)
repl.	F/M	year	g	mm	g	%	%	ABS 380 nm	mg/mL	mg/mL	mg/mL	›BG/min/mg prot	ıin/min/mg prot	µg/mg prot	ȷ/kg/ABS 380 nm	ȷ/kg/ABS 380 nm	µg/kg/ABS 380 nm
no.								w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt	w.wt
6/1	F	10	1210	468	27,9			4.343	48.5	14.56	3.227	13.47	58.38	11.6	<nd	<nd	<nd
7/1	F	9	1354	480	25,4			10.2	43.7	12.99	4.226	13.18	64.31	9.241	<nd	<nd	0.5294
8/1	F	9	1603	515	34,6			9.999	49.68	17.02	4.542	9.727	28.97	8.66	<nd	<nd	0.29
9/1	F	8	1098	458	17,7			20.2	50.9	13.87	4.043	18.19	65.48	14.98	<nd	<nd	0.1337
10/1	F	8	945	417	21,4			10.3	46.08	12.28	3.123	10.81	35.97	18.67	<nd	<nd	0.1844
11/1	F	13	1287	462	31,5			4.646	46	13.94	4.454	12.42		16.85	<nd	<nd	0.904
12/1	F	8	1359	464	36,8			31.61	51.68	12.16	4.313	12.43	37.04	13.03	<nd	<nd	0.1329
13/1	F	12	1319	475	30,3			13.53		14.98	7.369		35.28	14.73	<nd	<nd	0.5837
14/1	M	4	466	334	6,4			7.373	66.79	9.088	2.871	21.6	94.63	4.082	<nd	<nd	0.5425
15/1	F	6	899	423	13,7			4.04	61.05	12.37	3.139	19.74	31.92	9.859	<nd	<nd	2.475
16/1	F	10	735	415	13,7			2.397	64.94	13.38	4.174	18.59	62.57	7.853	<nd	<nd	<nd
17/1	F	10	1044	434	20,5			4.242	48.56	13.67	3.974	20.3	84.97	10.51	<nd	<nd	1.839
18/1	F	8	750	390	15,7			3.621	53.12	15.18	3.426	16.8	46.55	14.73	<nd	<nd	1.74
19/1	F	8	824	411	18,3			8.686	45.85	14.46	2.508	10.94	104.6	3.241	<nd	<nd	2.233
20/1	F	8	620	371	13,1			14.54	53.31	12.83	3.201	23.92	98.75	5.75	<nd	<nd	0.33
21/1	F	8	1030	438	18,7			6.161	61.42	12.13	1.674	11.34	41.74	5.767	<nd	<nd	2.143
22/1	F	8	1004	418	21,1			6.666	45.45	14.39	3.865	25.16	35.96	13.83	<nd	<nd	0.7801
23/1	F	7	664	476	12,9			21.82	68.04	11.99	3.535	14.6	77	8.764	<nd	<nd	0.3254
24/1	M	7	813	421	11,6			31.31	72.89	14.71	3.023	18.59	64.53	6.241	<nd	<nd	0.1373
25/1	F	7	683	393	12,4			28.58	50	9.682	2.751	11.05	92.67	13.06	<nd	<nd	0.2169
26/1	F	8	955	451	15,9			12.22	71.28	14.36	4.326	18.11	140.2	9.639	<nd	<nd	0.3928
27/1	F	7	783	390	8,4			17.57	73.38	8.726	3.618	16.8		16.31	<nd	<nd	0.2788
28/1	F	7	704	389	15,3			27.47	57.63	13.18	3.656	11.79	32.06	12.6	<nd	<nd	0.455
29/1	F	10	892	430	18,2			9.494	50.62	12.62	3.856	16.06	31.8	9.33	<nd	<nd	0.4108
30/1	F	9	830	425	17,1			5.656	57.13	12.63	3.961	11.43	42.66	9.364	<nd	<nd	2.988
Mean		8	955	430	19,1			12,667	55,750	13,088	3,714	15,710	61,219	10,748	<<0.000	<<0.000	<0.802
Minimum		4	466	334	6,4			2,397	43,700	8,726	1,674	9,727	28,970	3,241	<0.000	<0.000	<0.000
Maximum		13	1603	515	36,8			31,610	73,380	17,020	7,369	25,160	140,200	18,670	<0.000	<0.000	2,988
St.Dev		2	277	40	7,9			9,161	9,464	1,898	1,023	4,428	29,834	4,086	~0.000	~0.000	~0.874
Count		25	25	25	25			25	24	25	25	24	23	25	25	25	25

Appendix E

Biomarkers in fish 1997-2001
Statistical analyses

EROD in:

GADU MOR - Atlantic cod (*Gadus morhua***)**
LIMA LIM - Dab (*Limanda limanda***)**
PLAT FLE - Flounder (*Platichthys flesus***)**
PLEU PLA - Plaice (*Pleuronectes platessa***)**

Table 9. Test of significance for OH-pyrene in *Gadus morhua* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	32,8243	1	32,8243	59,6133	0,000000
year	758,2135	3	252,7378	459,0063	0,000000
station	90,9352	7	12,9907	23,5930	0,000000
maturation	6,5825	1	6,5825	11,9548	0,000586
year*station	110,3620	16	6,8976	12,5270	0,000000
station* maturation	14,9221	7	2,1317	3,8715	0,000396
length	12,4025	1	12,4025	22,5246	0,000003
log2lsi	1,9663	1	1,9663	3,5710	0,059310
erod	6,1138	1	6,1138	11,1035	0,000918
Error	309,4482	562	0,5506		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
oh-pyr	0,944844	0,892729	0,885667	2575,292	37	69,60249
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	309,4482	562	0,550620	126,4076	0,00	

Table 10. Test of significance for OH-pyrene in *Limanda limanda* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	612,0877	1	612,0877	494,9284	0,000000
year	94,3420	2	47,1710	38,1420	0,000000
station	130,4270	1	130,4270	105,4620	0,000000
Error	90,2805	73	1,2367		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
oh-pyr	0,874571	0,764874	0,755212	293,6869	3	97,89562
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	90,28053	73	1,236720	79,15749	0,00	

Table 11. Test of significance for OH-pyrene in *Platichthys flesus* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	61,7877	1	61,78772	125,1048	0,000000
year	132,6583	2	66,32915	134,3001	0,000000
station	21,0279	2	10,51397	21,2882	0,000000
sex	4,0777	1	4,07771	8,2564	0,004838
year*station	18,1457	2	9,07283	18,3702	0,000000
log2lsi	4,2955	1	4,29547	8,6973	0,003861
Error	56,7971	115	0,49389		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
oh-pyr	0,899805	0,809650	0,796408	241,5851	8	30,19814
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	56,79707	115	0,493888	61,14376	0,00	

Table 12. Test of significance for OH-pyrene in *Pleuronectes platessa* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	4,63711	1	4,63711	7,28467	0,008985
year	7,58946	1	7,58946	11,92267	0,001014
station	49,67124	1	49,67124	78,03108	0,000000
sex	2,74068	1	2,74068	4,30548	0,042215
length	5,65842	1	5,65842	8,88910	0,004118
Error	38,82998	61	0,63656		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
oh-pyr	0,773259	0,597930	0,571565	57,74519	4	14,43630
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	38,82998	61	0,636557	22,67872	0,000000	

Table 13. Test of significance for ALA-D in *Gadus morhua* (and test of SS Whole model vs. SS Residual).

Lead not included in the model:

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	5,1035	1	5,10349	23,53239	0,000002
year	42,0471	4	10,51178	48,47023	0,000000
station	5,3406	7	0,76295	3,51797	0,001013
year*station	26,9148	20	1,34574	6,20526	0,000000
livcd	4,8006	1	4,80060	22,13574	0,000003
muhg	1,8307	1	1,83067	8,44128	0,003784
livzn	1,7555	1	1,75553	8,09484	0,004569
Error	152,0264	701	0,21687		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
alad	0,654304	0,428113	0,400376	113,8068	34	3,347258
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	152,0264	701	0,216871	15,43434	0,00	

Lead included in the model

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	122,5785	1	122,5785	390,7963	0,000000
year	23,3339	4	5,8335	18,5979	0,000000
station	17,1979	7	2,4568	7,8327	0,000000
maturation	2,2373	1	2,2373	7,1327	0,008066
livpb	3,0380	1	3,0380	9,6855	0,002073
Error	78,4158	250	0,3137		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
alad	0,562819	0,316765	0,281237	36,35563	13	2,796587
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	78,41583	250	0,313663	8,915889	0,000000	

Table 14. Test of significance for ALA-D in *Limanda limanda* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0,50505	1	0,505049	2,08127	0,153845
year	5,35414	2	2,677071	11,03203	0,000074
station	3,12534	1	3,125341	12,87932	0,000632
livpb	0,83995	1	0,839953	3,46139	0,067273
Error	16,01579	66	0,242664		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
alad	0,728362	0,530511	0,502057	18,09744	4	4,524360
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	16,01579	66	0,242664	18,64458	0,000000	

Table 15. Test of significance for ALA-D in *Platichthys flesus* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	39,64045	1	39,64045	104,1583	0,000000
length	1,66319	1	1,66319	4,3702	0,038283
station	25,27509	2	12,63755	33,2061	0,000000
Error	56,32570	148	0,38058		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
alad	0,557570	0,310885	0,296916	25,41056	3	8,470185
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	56,32570	148	0,380579	22,25605	0,000000	

Table 16. Test of significance for ALA-D in *Pleuronectes platessa* (and test of SS Whole model vs. SS Residual).

[There were no significant model explaining ALA-D for this species]

Table 17. Test of significance for EROD in *Gadus morhua* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	61.8664	1	61.86640	56.12395	0.000000
year	25.7754	4	6.44386	5.84574	0.000127
station	188.8546	7	26.97923	24.47501	0.000000
year*station	102.6578	21	4.88847	4.43472	0.000000
log2lsi	7.7059	1	7.70587	6.99061	0.008395
livhcb	82.1490	1	82.14904	74.52395	0.000000
muhg	32.0575	1	32.05751	29.08193	0.000000
Error	705.4831	640	1.10232		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
erod	0.666527	0.444258	0.413865	563.9596	35	16.11313
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	705.4831	640	1.102317	14.61751	0.00	

Table 18. Test of significance for EROD in *Limanda limanda* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	20.97716	1	20.97716	23.93532	0.000004
year	32.74844	2	16.37422	18.68328	0.000000
station	1.54203	1	1.54203	1.75949	0.188045
year*station	5.48687	1	5.48687	6.26061	0.014152
log2lsi	6.09835	1	6.09835	6.95833	0.009829
livcb153	4.80084	1	4.80084	5.47785	0.021469
l105_118	4.88828	1	4.88828	5.57762	0.020348
Error	78.87695	90	0.87641		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
erod	0.618024	0.381954	0.333884	48.74619	7	6.963742

SS Residual	df Residual	MS Residual	F	p
78.87695	90	0.876411	7.945753	0.000000

Table 19. Test of significance for EROD in *Platichthys flesus* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	7,2567	1	7,256657	6,240097	0,014071
length	7,0907	1	7,090727	6,097412	0,015182
log2lsi	6,6126	1	6,612634	5,686293	0,018928
oh-pyr	4,5208	1	4,520821	3,887515	0,051328
livddepp	8,0317	1	8,031661	6,906533	0,009901
station	7,5950	2	3,797488	3,265511	0,042165
sex	3,1675	1	3,167506	2,723781	0,101910
station*sex	9,4637	2	4,731873	4,069001	0,019916
Error	119,7795	103	1,162908		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
erod	0,616435	0,379993	0,325817	73,41095	9	8,156772
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	119,7795	103	1,162908	7,014117	0,000000	

Table 20. Test of significance for EROD in *Pleuronectes platessa* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	34.13887	1	34.13887	78.09186	0.000000
year	5.79521	1	5.79521	13.25640	0.000525
length	9.57215	1	9.57215	21.89608	0.000014
log2lsi	5.35424	1	5.35424	12.24769	0.000827
livcb153	1.99831	1	1.99831	4.57108	0.036113
livddepp	1.54511	1	1.54511	3.53441	0.064392
Error	29.72708	68	0.43716		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
erod	0.736036	0.541749	0.508054	35.14367	5	7.028734
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	29.72708	68	0.437163	16.07807	0.000000	

Table 21. Test of significance for metallothionein in *Gadus morhua* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0,42434	1	0,424341	7,28633	0,007173
year	1,42120	4	0,355301	6,10085	0,000084
station	3,25688	7	0,465268	7,98909	0,000000
maturation	0,38217	1	0,382170	6,56222	0,010695
year*station	4,40791	20	0,220396	3,78440	0,000000
year* maturation	0,65376	4	0,163441	2,80643	0,025159
length	2,11264	1	2,112642	36,27604	0,000000
log2lsi	2,48422	1	2,484222	42,65641	0,000000
livhchg	0,33582	1	0,335815	5,76626	0,016684
livcu	5,01423	1	5,014235	86,09908	0,000000
livzn	1,02394	1	1,023938	17,58197	0,000032
Error	30,51669	524	0,058238		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
mt	0,871909	0,760225	0,741464	96,75549	41	2,359890
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	30,51669	524	0,058238	40,52151	0,00	

Table 22. Test of significance for metallothionein in *Limanda limanda* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	1,15662	1	1,156618	4,460086	0,037563
length	1,04034	1	1,040341	4,011703	0,048298
livcd	0,89780	1	0,897798	3,462040	0,066171
cu_zn	2,20945	1	2,209453	8,519969	0,004471
year	1,89240	2	0,946198	3,648676	0,030086
station	0,16139	1	0,161385	0,622325	0,432329
year*station	2,32205	1	2,322052	8,954169	0,003602
Error	22,56140	87	0,259326		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
mt	0,551351	0,303988	0,247987	9,853857	7	1,407694
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	22,56140	87	0,259326	5,428271	0,000034	

Table 23. Test of significance for metallothionein in *Platichthys flesus* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	75,39965	1	75,39965	562,4129	0,000000
year	2,42889	2	1,21445	9,0587	0,000221
station	6,51766	2	3,25883	24,3079	0,000000
sex	2,53141	1	2,53141	18,8820	0,000030
livcd	1,62411	1	1,62411	12,1144	0,000706
Error	15,55149	116	0,13406		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
mt	0,800187	0,640300	0,621695	27,68310	6	4,613849
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	15,55149	116	0,134065	34,41513	0,00	

Table 24. Test of significance for metallothionein in *Pleuronectes platessa* (and test of SS Whole model vs. SS Residual).

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0,000373	1	0,000373	0,00309	0,955847
sex	3,240956	1	3,240956	26,82878	0,000002
muhg	2,536341	1	2,536341	20,99594	0,000020
livzn	2,416526	1	2,416526	20,00411	0,000029
Error	8,456103	70	0,120801		

dep. var.	Multiple R	Multiple R^2	Adjusted R^2	SS Model	df Model	MS Model
mt	0,704827	0,496781	0,475214	8,347911	3	2,782637
	SS Residual	**df Residual**	**MS Residual**	**F**	**p**	
	8,456103	70	0,120801	23,03479	0,000000	

Appendix F
Temporal trend analyses of biomarkers in biota 1997-2001

Sorted by contaminant, species and area/station:

OH-pyrene
ALA-D (δ-amino levulinic acid dehydrase inhibition)
EROD (Cytochrome P4501A-activity)
MT (Metallothionein)

GADU MOR - Atlantic cod (*Gadus morhua*)
LIMA LIM - Dab (*Limanda limanda*)
PLAT FLE - Flounder (*Platichthys flesus*)

Tsu **tissue**

LI - Liver tissue
BL - Blood
BI - Bile

OC **Overconcentration expressed as quotient of median of last year and "high background" ("?" missing background value)**

TRND **trend**

D-	**Significant linear trend, downward**
U-	**Significant linear trend, upward**
--	**No significant trend**
-?	**No significant linear trend, systematic non-linear trend can not be tested because of insufficient data (<6 years)**
-Y	**No significant linear trend, but a systematic non-linear trend**
DY or UY	**Significant linear trend (downward or upward) and a significant non-linear trend. This is considered the same as "-Y"**

SIZE length effect (mercury in fillet)

L	**Significant difference in concentration levels but pattern of variation same**
D	**As "L" but pattern of variation significantly different**
-	**No significant difference between "small" and "large" fish**

SM+3 **Projected smoothed median for three years expressed as quotient of value and "high background" ("?" if missing background or if number of years is less than seven)**

PWR **POWER; estimated number of years to detect a hypothetical situation of 10% trend a year with a 90% power**

Annual median concentration of OH-PYRENE (ug/kg/ABS 380nm)

																										ANALYSIS		
St	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	OC	TRND	SM+3	PWR
30B	GADU MOR	BI	w.wt																		115	130	12.3	17	m	-?	m	22
36B	GADU MOR	BI	w.wt																		42.9	28.9	5.14	3.72	m	D?	m	15
15B	GADU MOR	BI	w.wt																		3770	253		29.7	m	-?	m	23
53B	GADU MOR	BI	w.wt																		83	58.6	9.23	3.81	m	D?	m	15
67B	GADU MOR	BI	w.wt																		19.8	16.5	1.62	1.66	m	-?	m	20
23B	GADU MOR	BI	w.wt																		12.7	11.2	4.15	2.55	m	D?	m	11
53B	PLAT FLE	BI	w.wt																			74.6	9.75	3.64	m	-?	m	15
67B	PLAT FLE	BI	w.wt																			41	1.71	5.42	m	-?	m	>25
36F	LIMA LIM	BI	w.wt																			48.8	4.18	3.48	m	-?	m	23

Annual median concentration of ALAD (ng PBG/min/mg prot.)

																										ANALYSIS		
St	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	OC	TRND	SM+3	PWR
30B	GADU MOR	BL	w.wt																	8.98	15.6	13	14.6	12.7	m	-?	m	10
36B	GADU MOR	BL	w.wt																	13	26.2	9.93	22	19.4	m	-?	m	15
15B	GADU MOR	BL	w.wt																	17.2	23.4	8.45		18.9	m	-?	m	17
53B	GADU MOR	BL	w.wt																	7.64	10.1	11.1	12.7	10	m	-?	m	8
67B	GADU MOR	BL	w.wt																	7.17	28.2	16.9	22.4	19	m	-?	m	16
23B	GADU MOR	BL	w.wt																	15.8	24.8	18.1	19.8	24	m	-?	m	9
53B	PLAT FLE	BL	w.wt																			10.4	8.82	7.61	m	D?	m	<=5
67B	PLAT FLE	BL	w.wt																			15.9	17.6	23.6	m	-?	m	6
36F	LIMA LIM	BL	w.wt																			7.89	17.6	15	m	-?	m	14

Annual median concentration of EROD (pmol/min/mg prot.)

																									ANALYSIS		
St	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	OC	TRND	SM+3	PWR
30B	GADU MOR	LI	w.wt																	68.8	109	70	260	81.2	m	-?	m	18
36B	GADU MOR	LI	w.wt																	95.1	14.2	62.1	64.9	79.5	m	-?	m	22
15B	GADU MOR	LI	w.wt																	49.9	52.3	184		64.4	m	-?	m	20
53B	GADU MOR	LI	w.wt																	86.5	119	90.1	133	37.4	m	-?	m	16
67B	GADU MOR	LI	w.wt																	103	76.2	84.5	103	72.9	m	-?	m	9
23B	GADU MOR	LI	w.wt																	94.1	28.6	71	73.5	77.1	m	-?	m	16
53B	PLAT FLE	LI	w.wt																			24.6	6.22	33.8	m	-?	m	>25
67B	PLAT FLE	LI	w.wt																			16.1	7.3	6.38	m	-?	m	11
36F	LIMA LIM	LI	w.wt																			471	336	149	m	-?	m	9

Annual median concentration of MT (ug/mg prot.)

																									ANALYSIS		
St	Species	Tissue	Base	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	OC	TRND	SM+3	PWR
30B	GADU MOR	LI	w.wt																	14.2	16.2	18.3	8.02	11.6	m	-?	m	12
36B	GADU MOR	LI	w.wt																	17.9	16.8	26.3	11.6	9.82	m	-?	m	13
15B	GADU MOR	LI	w.wt																	13.3	19.5	17.8		15	m	-?	m	10
53B	GADU MOR	LI	w.wt																	17.1	21.4	20.3	11.7	15.7	m	-?	m	10
67B	GADU MOR	LI	w.wt																	16.9	21.5	16.8	16.3	12.8	m	-?	m	8
23B	GADU MOR	LI	w.wt																	12.9	21.5	23.5	14.3	17	m	-?	m	12
53B	PLAT FLE	LI	w.wt																			15	8.33	18.3	m	-?	m	17
67B	PLAT FLE	LI	w.wt																			34.1	27.3	29	m	-?	m	7
36F	LIMA LIM	LI	w.wt																			13.7	9.83	8.13	m	-?	m	<=5

Appendix G
Geographical distribution of biomarkers in biota 1997-2001

Sorted by contaminant and species:

OH-pyrene
ALA-D (δ-amino levulinic acid dehydrase inhibition)
EROD (Cytochrome P4501A-activity)
MT (Metallothionein)

GADU MOR - Atlantic cod (*Gadus morhua*)
PLAT FLE - Flounder (*Platichthys flesus*)
LIMA LIM - Dab (*Limanda limanda*)
PLEU PLA - Plaice (*Pleuronectes platessa*)

Station positions are shown on maps in Appendix C

Appendix G
Geographical distribution of biomarkers in biota 1997-2001 (cont.)

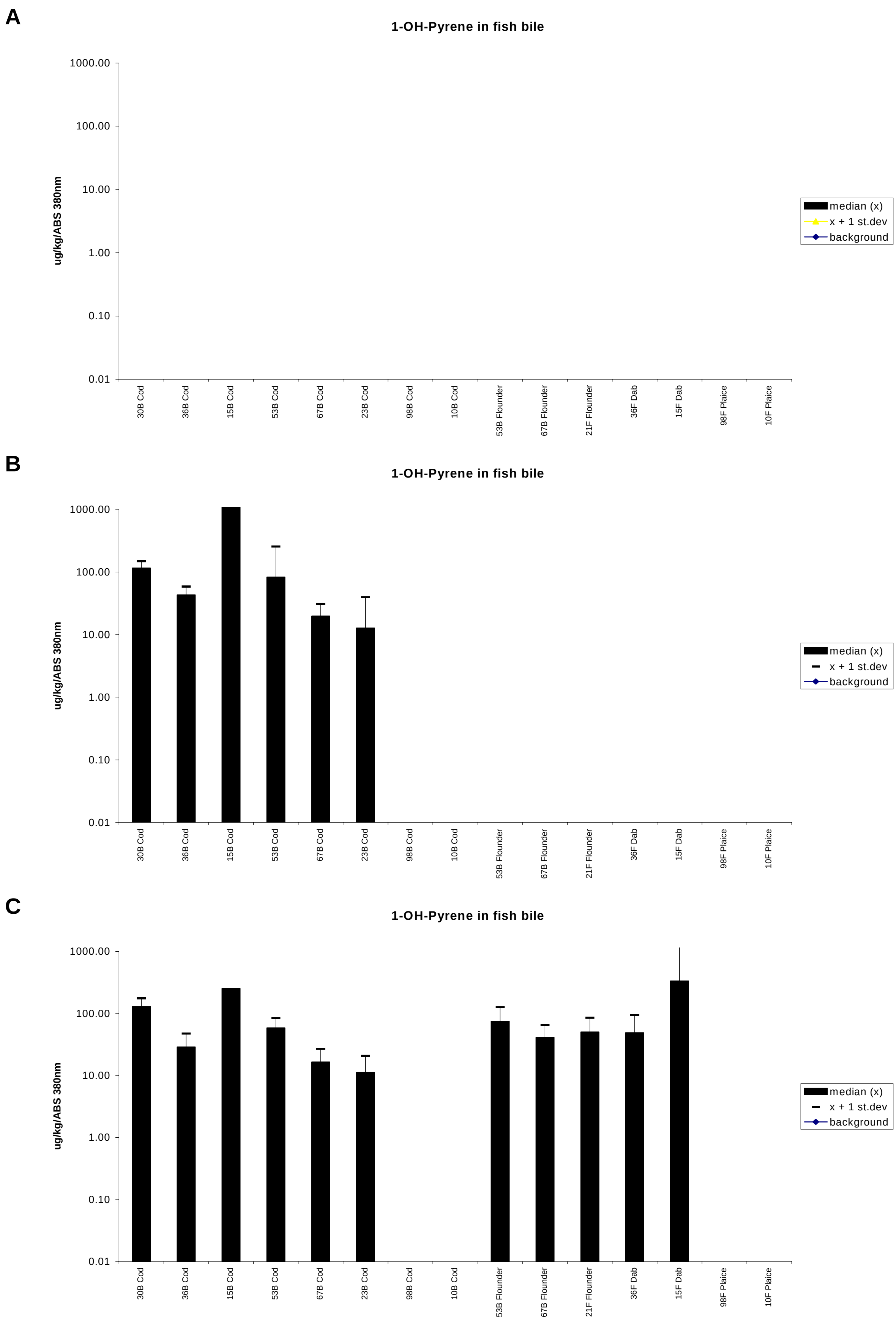
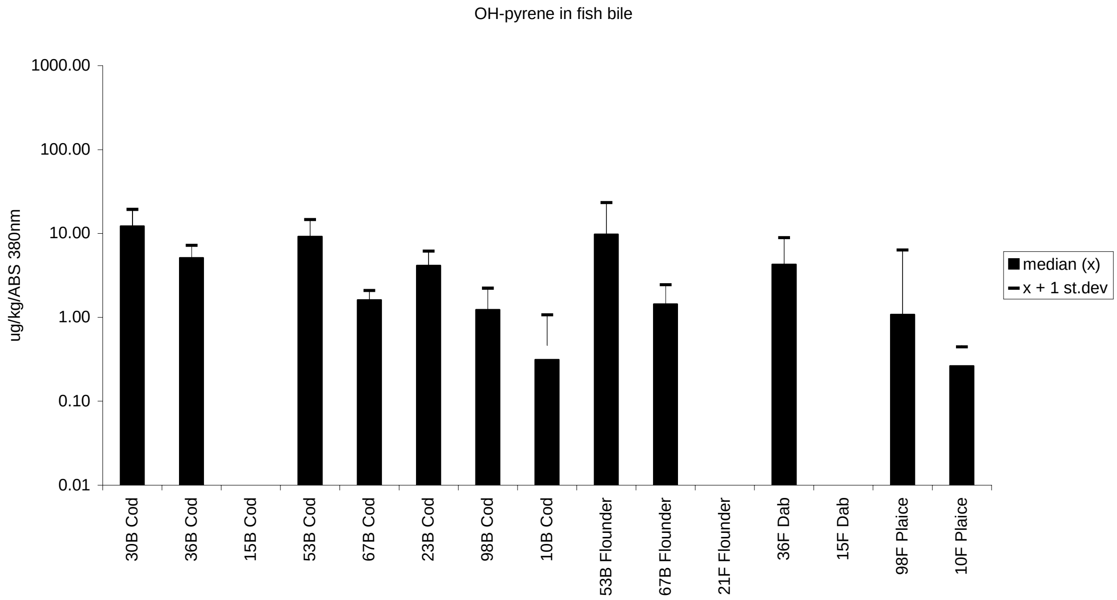


Figure 10. Median and standard deviation concentration for OH-pyrene (Pyrene metabolite) in fish bile 1997 (**A**), 1998 (no analyses) (**B**) and 1999 (**C**), µg/kg/ABS (absorbance) 380 nm (see maps in Appendix C).

A



B

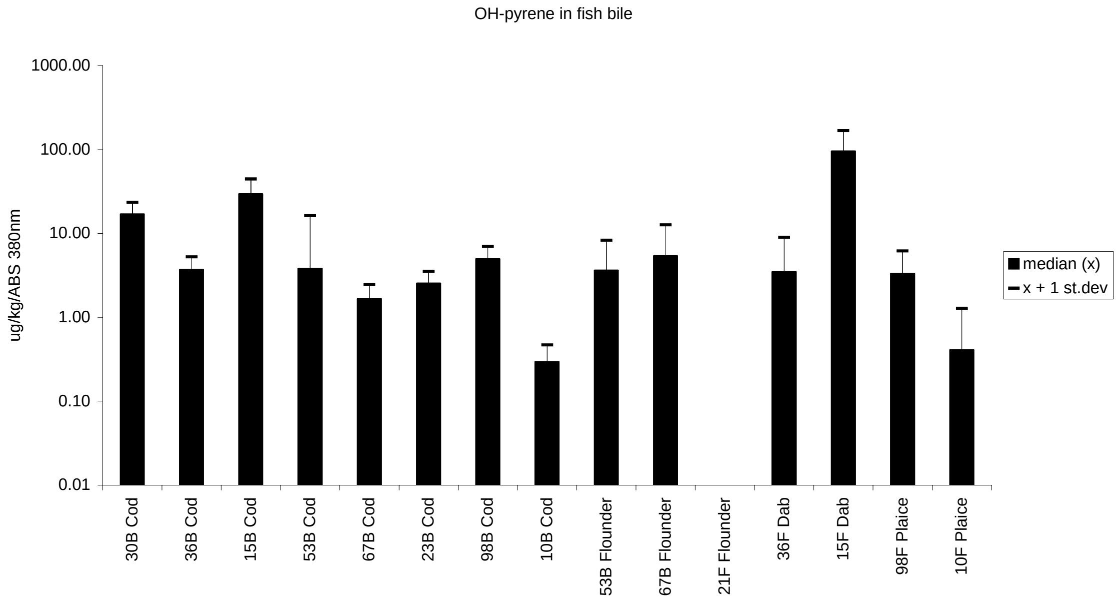
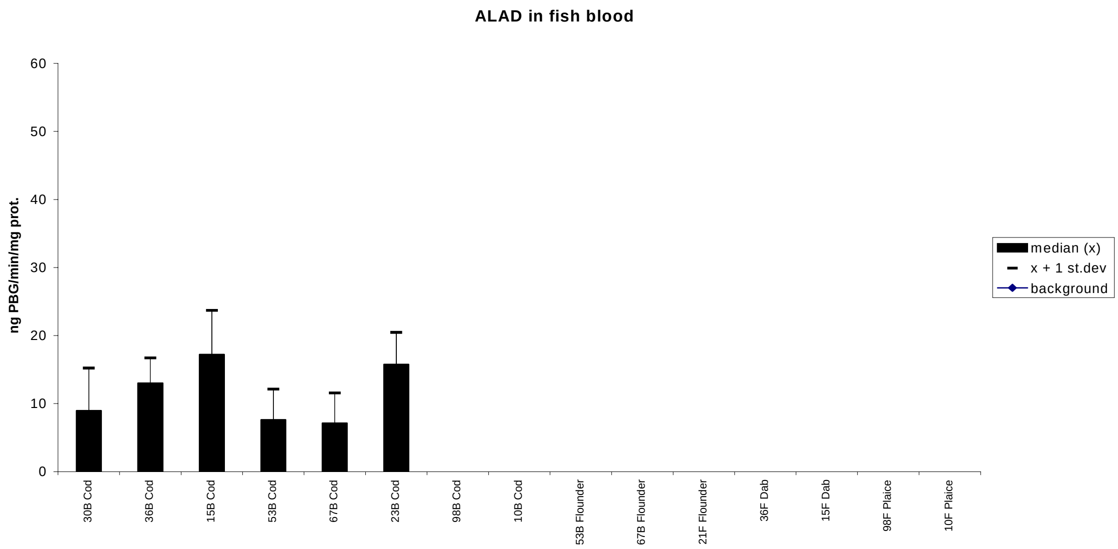
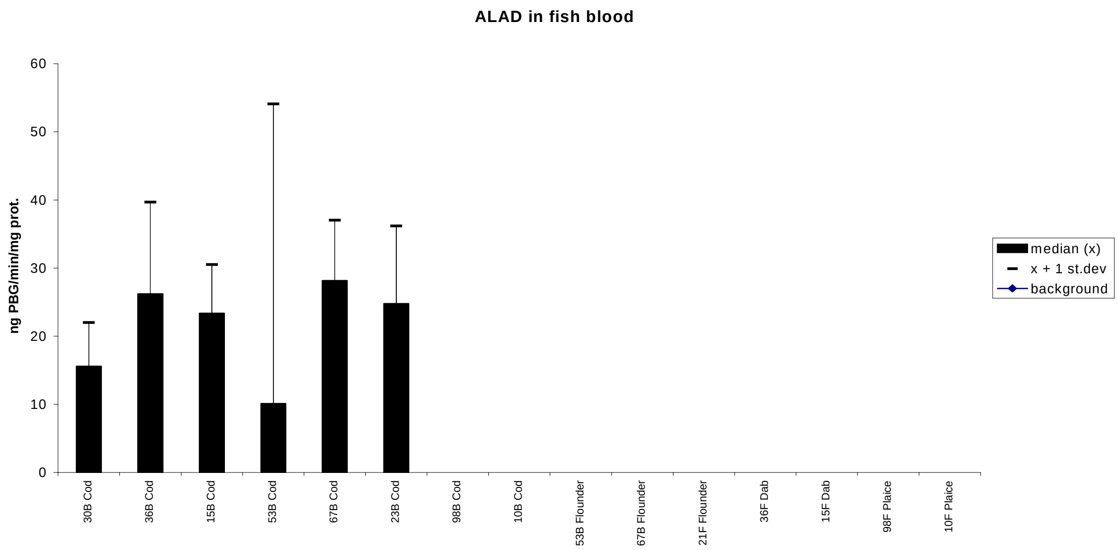


Figure 11. Median and standard deviation concentration for OH-pyrene (Pyrene metabolite) in fish bile 2000 (**A**) and 2001 (**B**), μg/kg/ABS (absorbance) 380 nm (see maps in Appendix C).

A



B



C

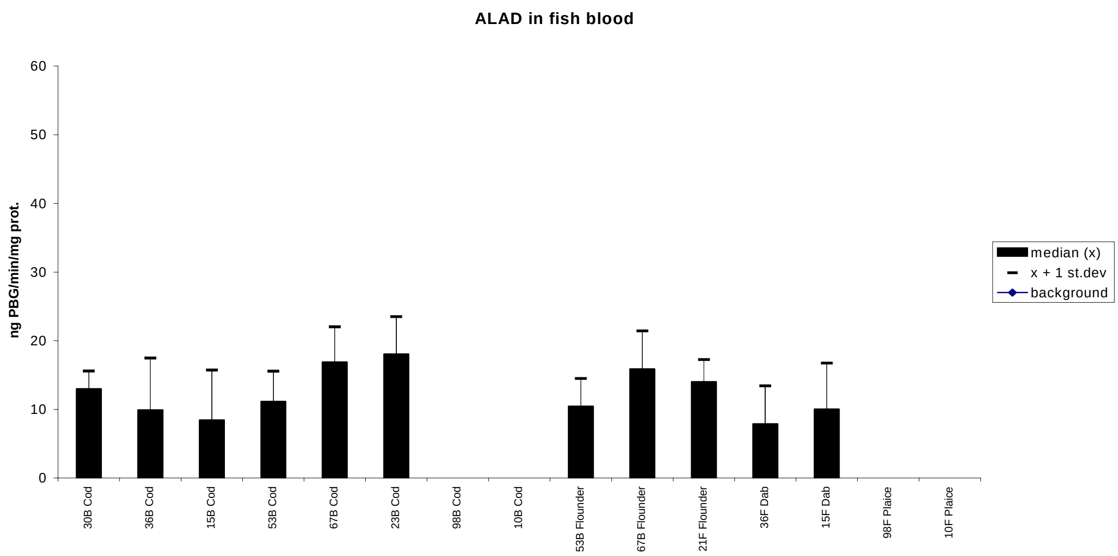
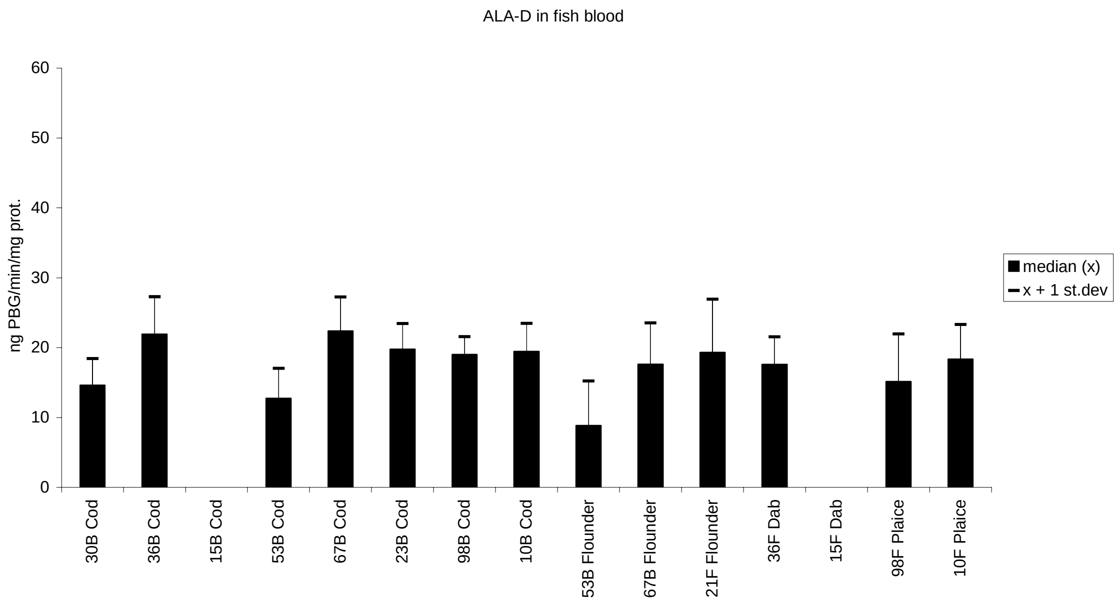


Figure 12. Median and standard deviation concentration for ALA-D (δ-amino levulinic acid dehydrase inhibition) in fish liver 1997 (**A**), 1998 (**B**) and 1999 (**C**), ng PBG (porphobilinogen)/min/mg protein (see maps in Appendix C).

A



B

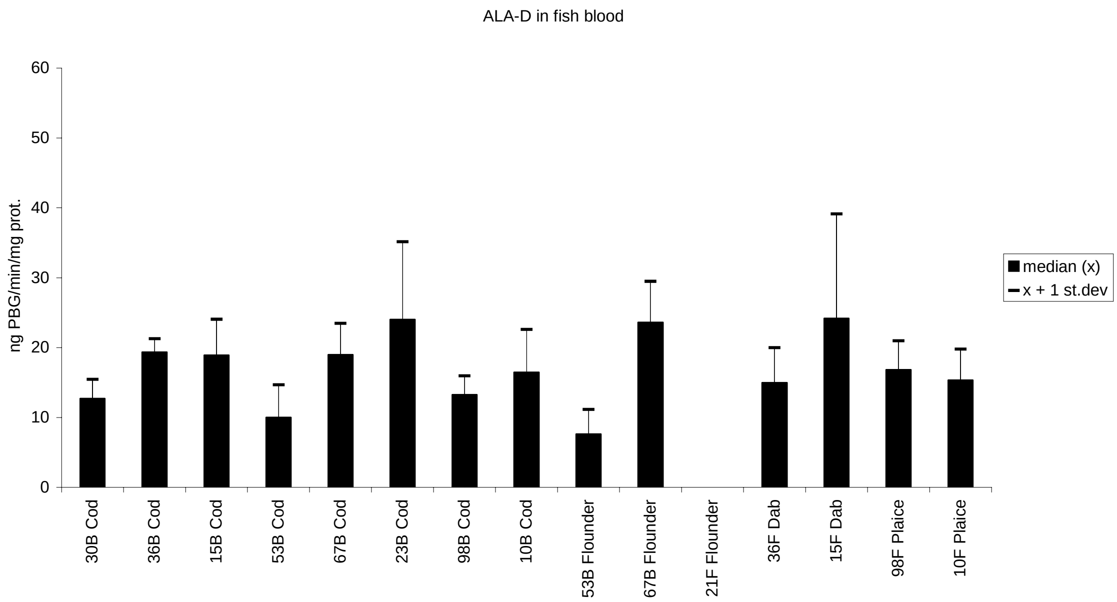
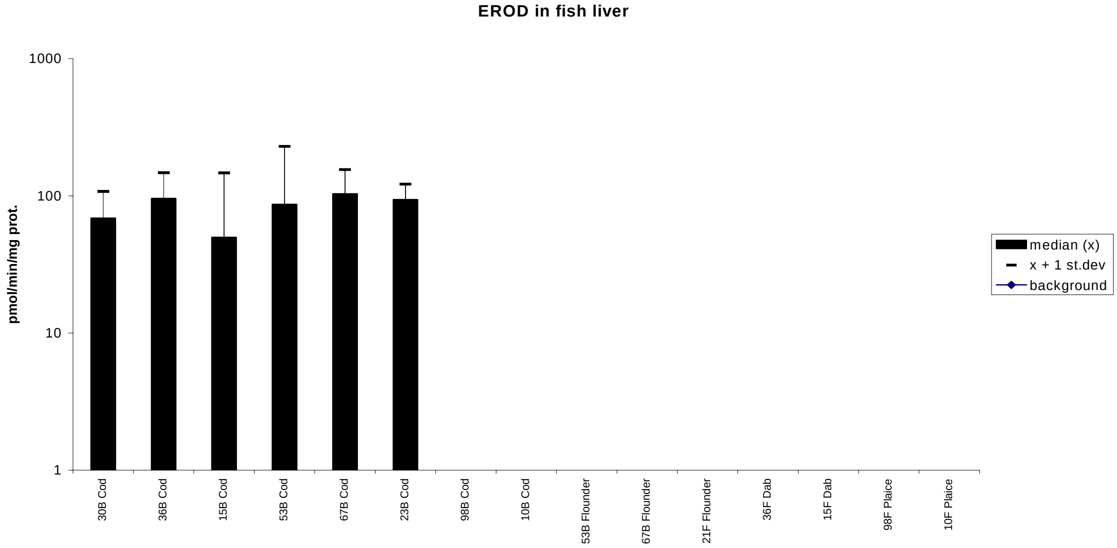
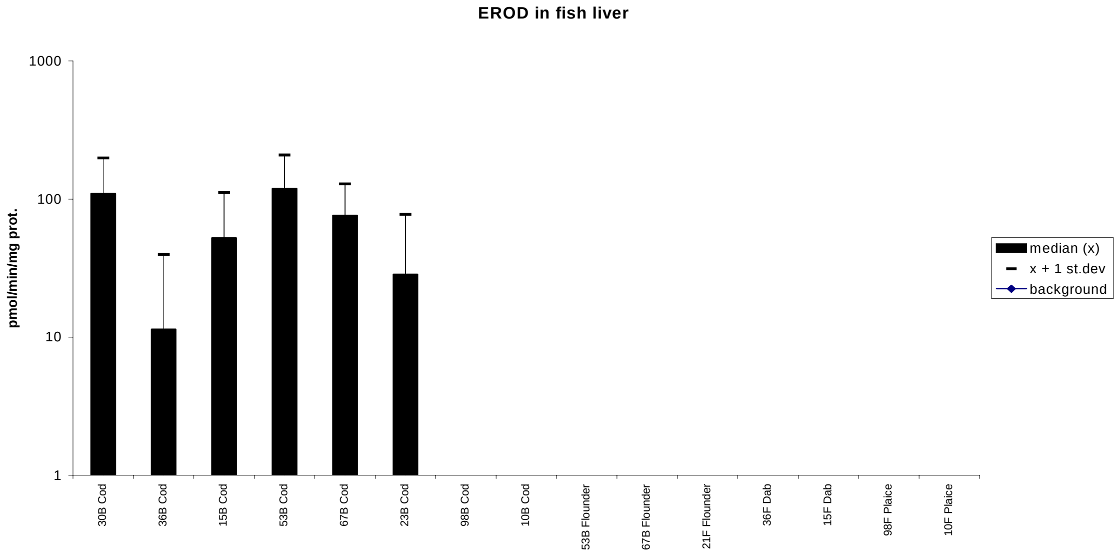


Figure 13. Median and standard deviation concentration for ALA-D (δ-amino levulinic acid dehydrase inhibition) in fish liver 2000 (**A**) and 2001 (**B**), ng PBG (porphobilinogen)/min/mg protein (see maps in Appendix C).

A



B



C

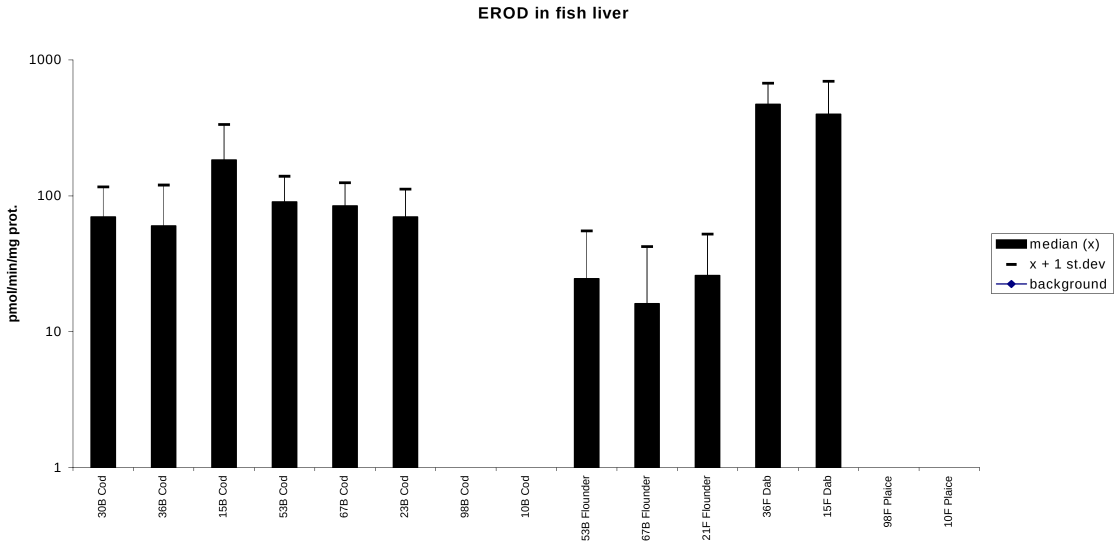
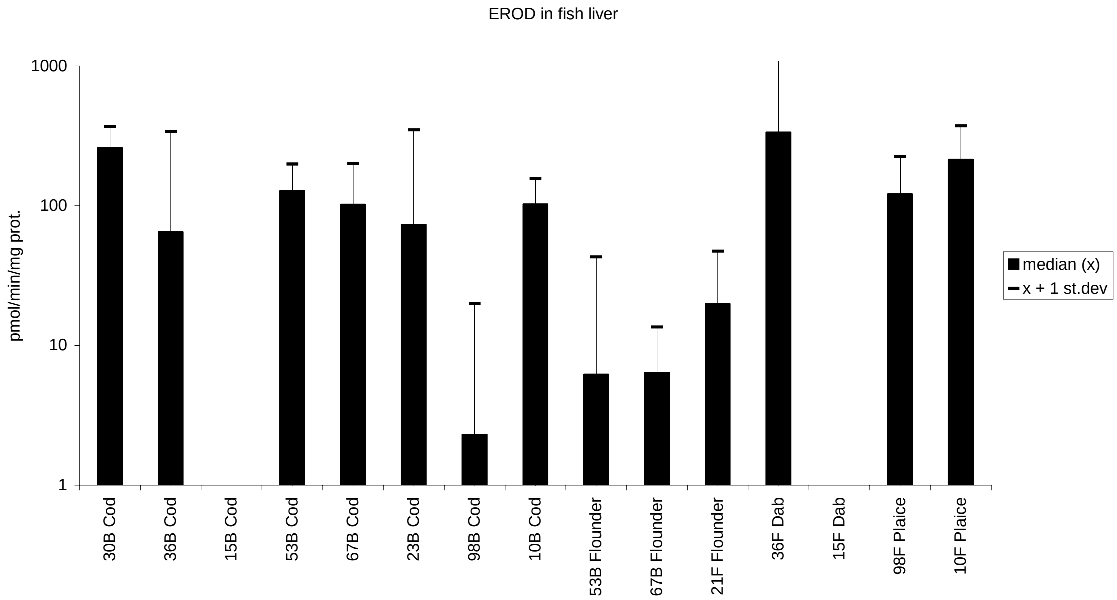


Figure 14. Median and standard deviation concentration for EROD (Cytochrome P4501A-activity) in fish liver 1997 (**A**), 1998 (**B**) and 1999 (**C**), pmol/min/mg protein (see maps in Appendix C).

A



B

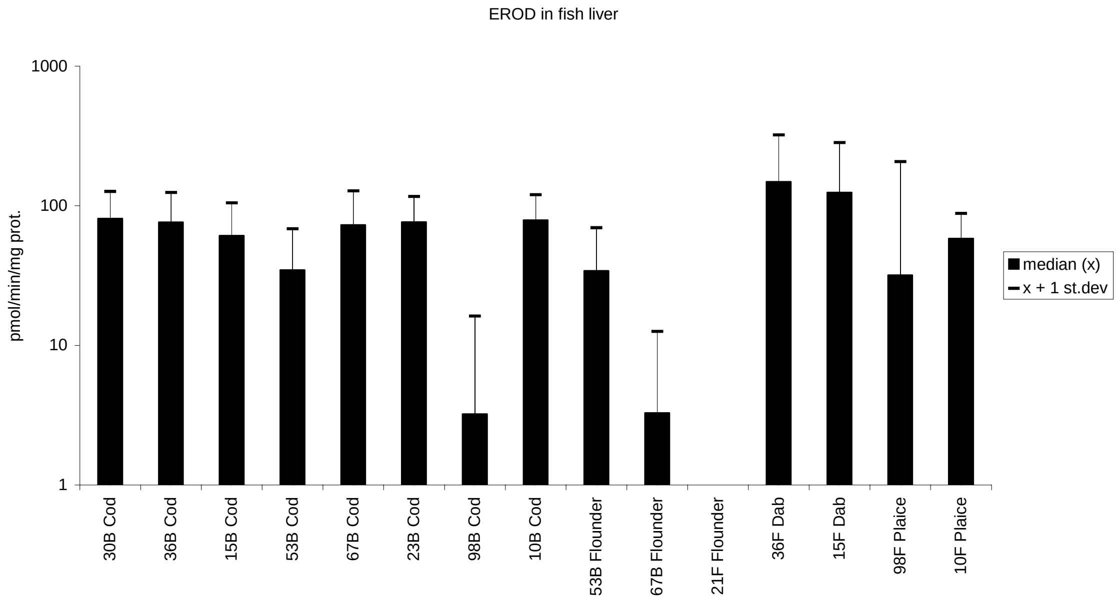
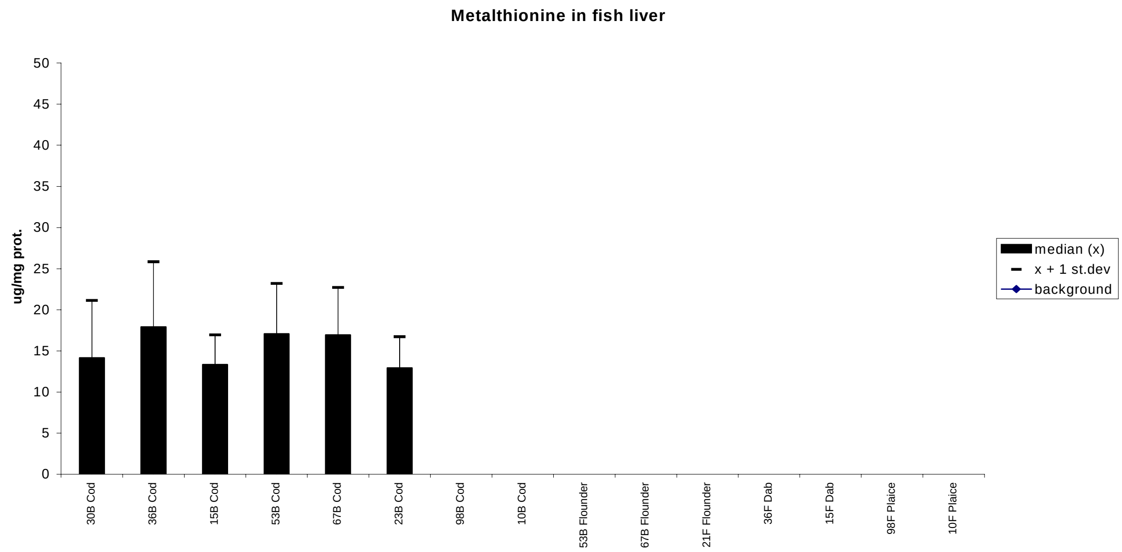
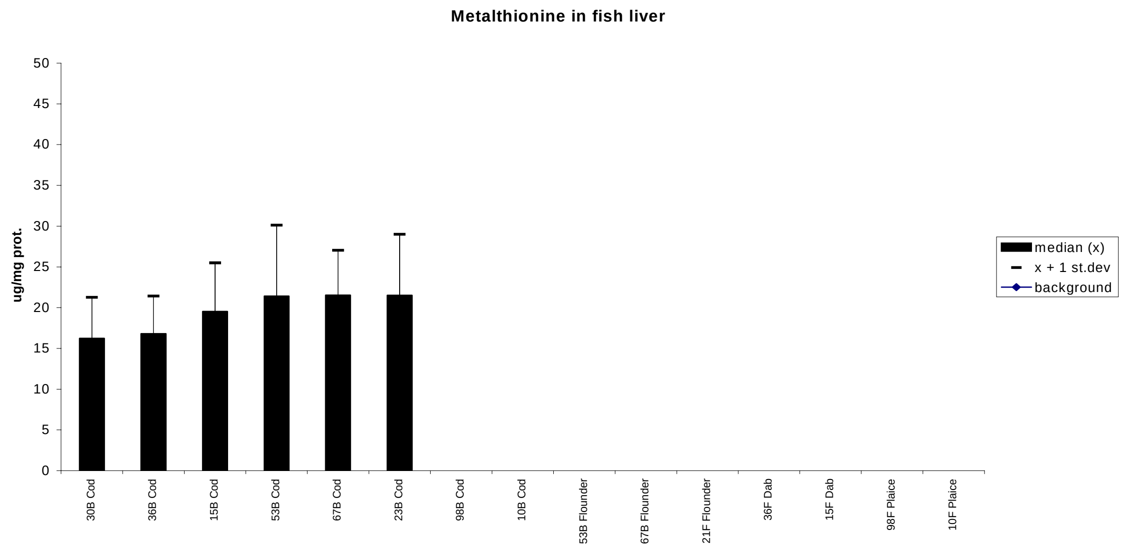


Figure 15. Median and standard deviation concentration for EROD (Cytochrome P4501A-activity) in fish liver 2000 (**A**) and 2001 (**B**), pmol/min/mg protein (see maps in Appendix C).

A



B



C

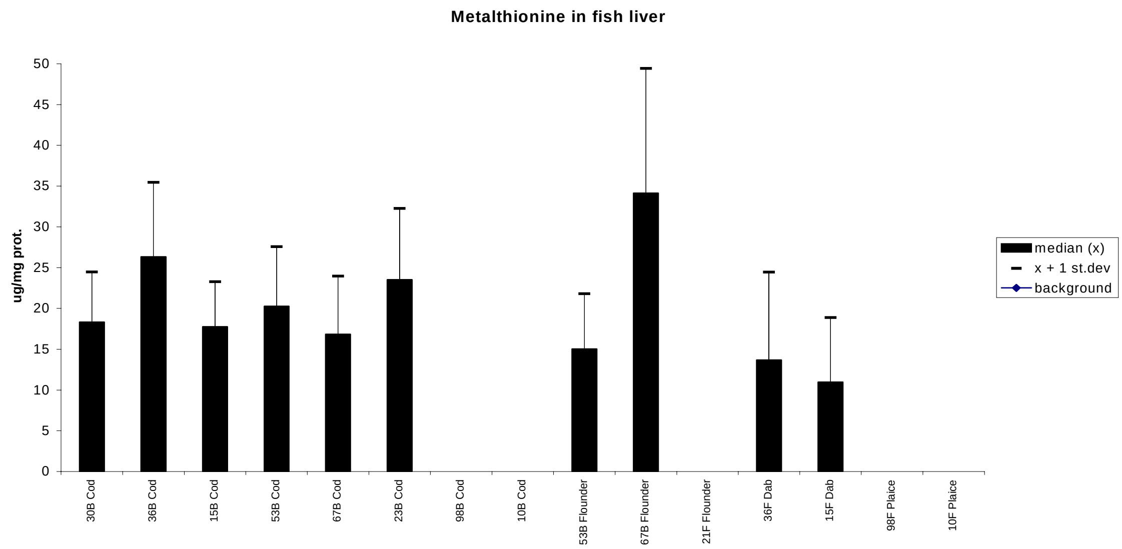
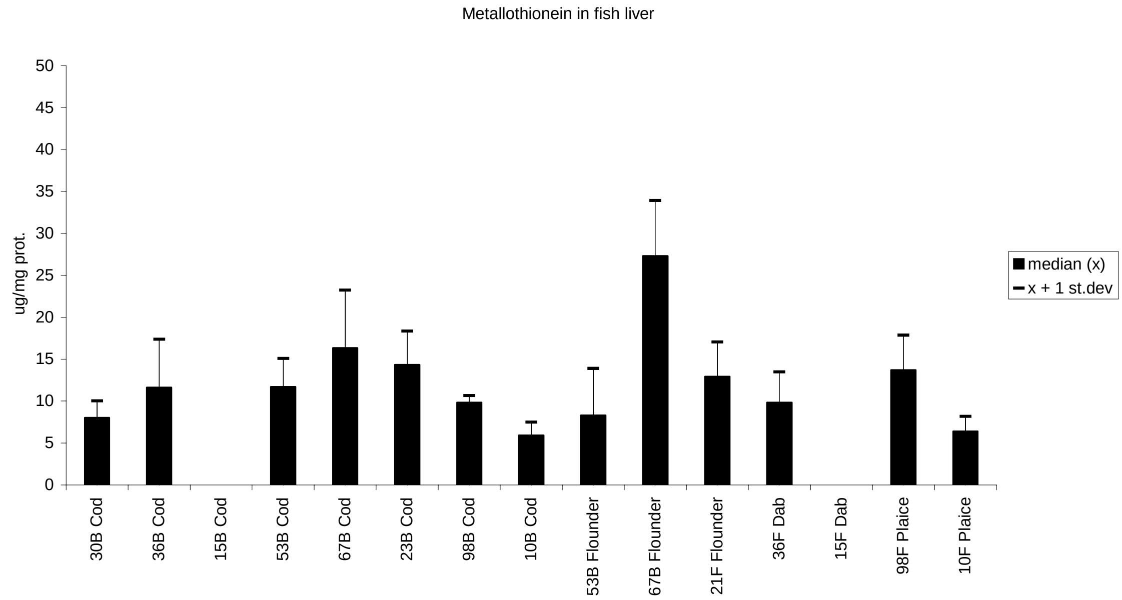


Figure 16. Median and standard deviation concentration for MT (Metallothionein) in fish blood 1997 (**A**), 1998 (**B**) and 1999 (**C**), µg/mg prot. (see maps in Appendix C).

A



B

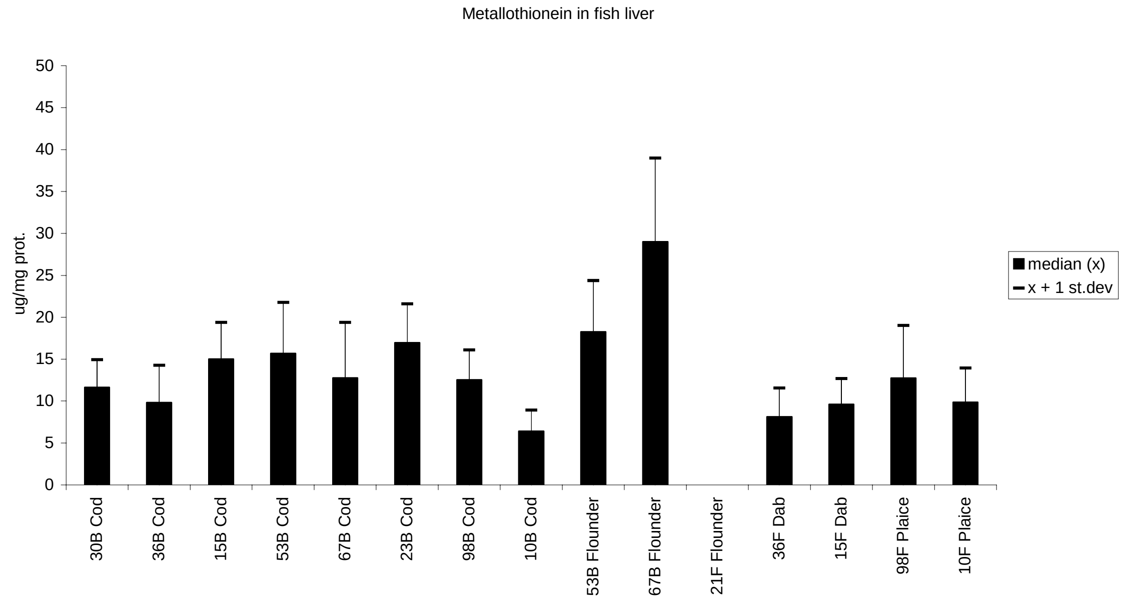


Figure 17. Median and standard deviation concentration for MT (Metallothionein) in fish blood 2000 (**A**) and 2001 (**B**), µg/mg prot. (see maps in Appendix C).