Norwegian State Pollution Monitoring Programme

# Biological Effects Methods, Norwegian monitoring 1997-2001

**Rapport 869/03**

Joint Assessment and Monitoring Programme (JAMP)

SFT

NIVA

**Statlig program for forurensningsovervåking**
**Langtidsovervåking av miljøkvaliteten langs Norges kyst**

Rapport: 869/03
TA-nummer: 1948/2003
ISBN-nummer: 82-577-4313-5

Oppdragsgiver: Statens forurensningstilsyn
Utførende institusjon: Norsk institutt for vannforskning

# Biological Effects Methods, Norwegian monitoring 1997-2001

**Rapport 869/03**

NIVA rapport nr. 4649-2003

Norwegian Institute for Water Research

# REPORT

| Main Office | Regional Office, Sørlandet | Regional Office, Østlandet | Regional Office, Vestlandet | Akvaplan-NIVA A/S |
|---|---|---|---|---|
| P.O. Box 173, Kjelsås<br>N-0411 Oslo<br>Norway<br>Phone (47) 22 18 51 00<br>Telefax (47) 22 18 52 00 | Televeien 1<br>N-4890 Grimstad<br>Norway<br>Phone (47) 37 29 50 55<br>Telefax (47) 37 04 45 13 | Sandvikaveien 41<br>N-2312 Ottestad<br>Norway<br>Phone (47) 62 57 64 00<br>Telefax (47) 62 57 66 53 | Nordnesboder 5<br>N-5008 Bergen<br>Norway<br>Phone (47) 55 30 22 50<br>Telefax (47) 55 30 22 51 | Søndre Tollbugate 3<br>N-9000 Tromsø<br>Norway<br>Phone (47) 77 68 52 80<br>Telefax (47) 77 68 05 09 |

| Title | Serial No. | Date |
|---|---|---|
| Joint Assessment and Monitoring Programme (JAMP). Biological Effects Methods, Norwegian Monitoring 1997-2001<br><br>(Norwegian State Pollution Monitoring Programme Report no. 869/03. TA-no. 1948/2003) | 4649-2003<br><br>Report No. Sub-No.<br>O-80106 | 28.02.03<br><br>Pages Price<br>139 |
| Author(s)<br>Anders Ruus<br>Ketil Hylland<br>Norman W. Green | Topic group<br>Marine ecology<br><br>Geographical area<br>Oslofjord to Varangerfjord | Distribution<br><br>Printed<br>NIVA |

| Client(s) | Client ref. |
|---|---|
| Norwegian Pollution Control Authority (SFT) | |

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.

| 4 keywords, Norwegian | 4 keywords, English |
|---|---|
| 1. Biologiske effekter | 1. Biological effects |
| 2. Organismer | 2. Organisms |
| 3. Marin | 3. Marine |
| 4. Norge | 4. Norway |

*Norman W. Green*
Project manager

*Kristoffer Næs*
Research manager

*Jens Skei*
Research director

ISBN 82-577-4313-5

**O-80106**

# JOINT ASSESSMENT AND MONITORING PROGRAMME (JAMP)

# BIOLOGICAL EFFECTS METHODS,

# NORWEGIAN MONITORING 1997-2001

Oslo, 28. Februar 2003


| | |
|---|---|
| Submitted by: | NORWAY<br>Norman W. Green<br>Norwegian Institute for Water Research (NIVA)<br>PB 173 Kjelsås<br>N-0411 Oslo |
| Submitted to: | Norwegian Pollution Control Authority (SFT)<br>att. Per Erik Iversen<br>PB 8100 Dep.<br>N-0032 Oslo<br>Oslo and Paris Commissions (OSPAR)<br>att. Dornford Rugg<br>New Court<br>48 Carey Street<br>London WC2A 2JQ<br>International Council for the Exploration of the Seas (ICES)<br>att. Janet Pawlak<br>Palægade 2-4<br>DK-1261 Copenhagen |

# *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).

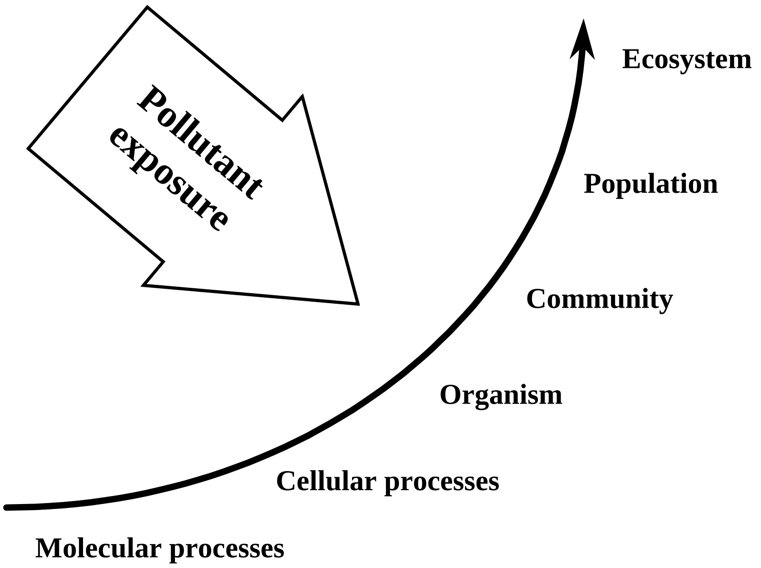



**Figure 1**. Sequential order of responses to pollutant exposure within a biological system.

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).

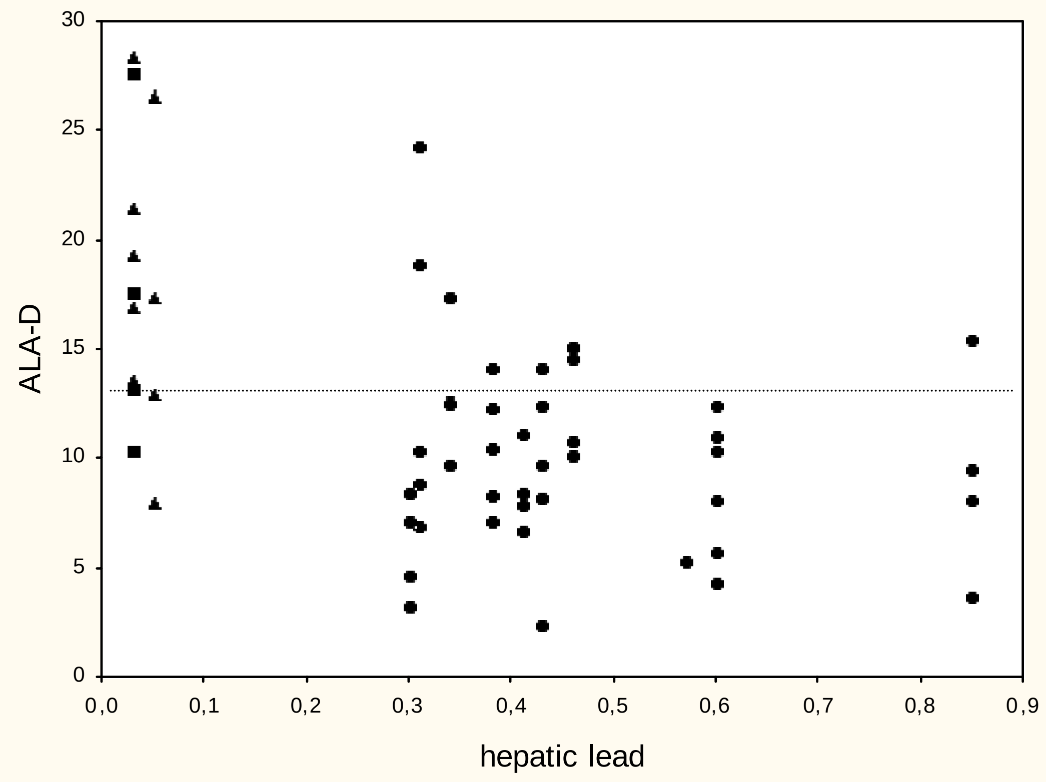



**Figure 2.** Relationship between hepatic lead (µg/g w.w.) and red blood cell ALA-D (ng PBG/min/mg protein) in flounder from Sørfjord (circles), Hardangerfjord (squares), Åkrafjord (triangles).

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).

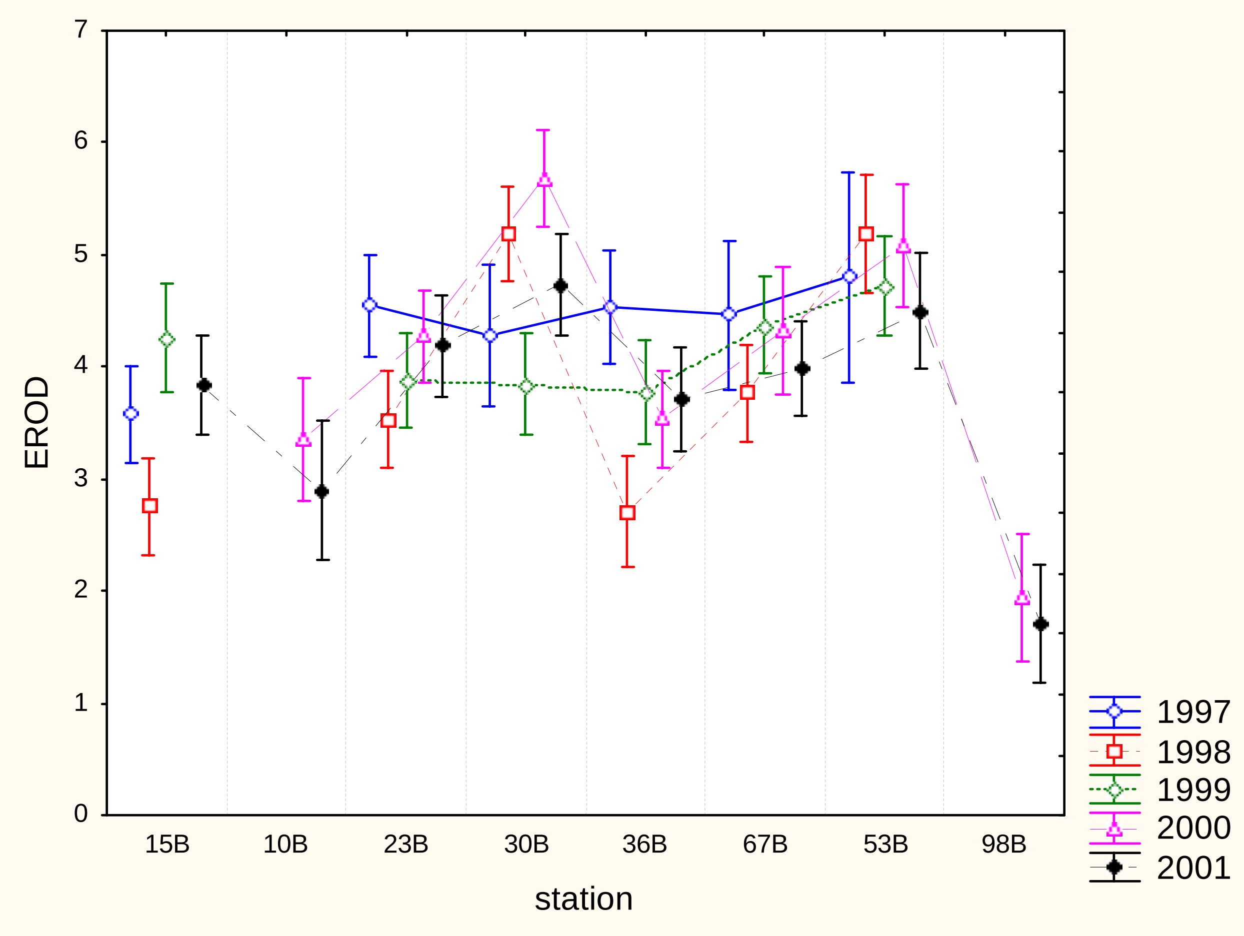



**Figure 3**. EROD activity ($log_2$-transformed; Least Squares Means) in cod at the various stations, the different years. (See Table 17 in Appendix E for model effects).

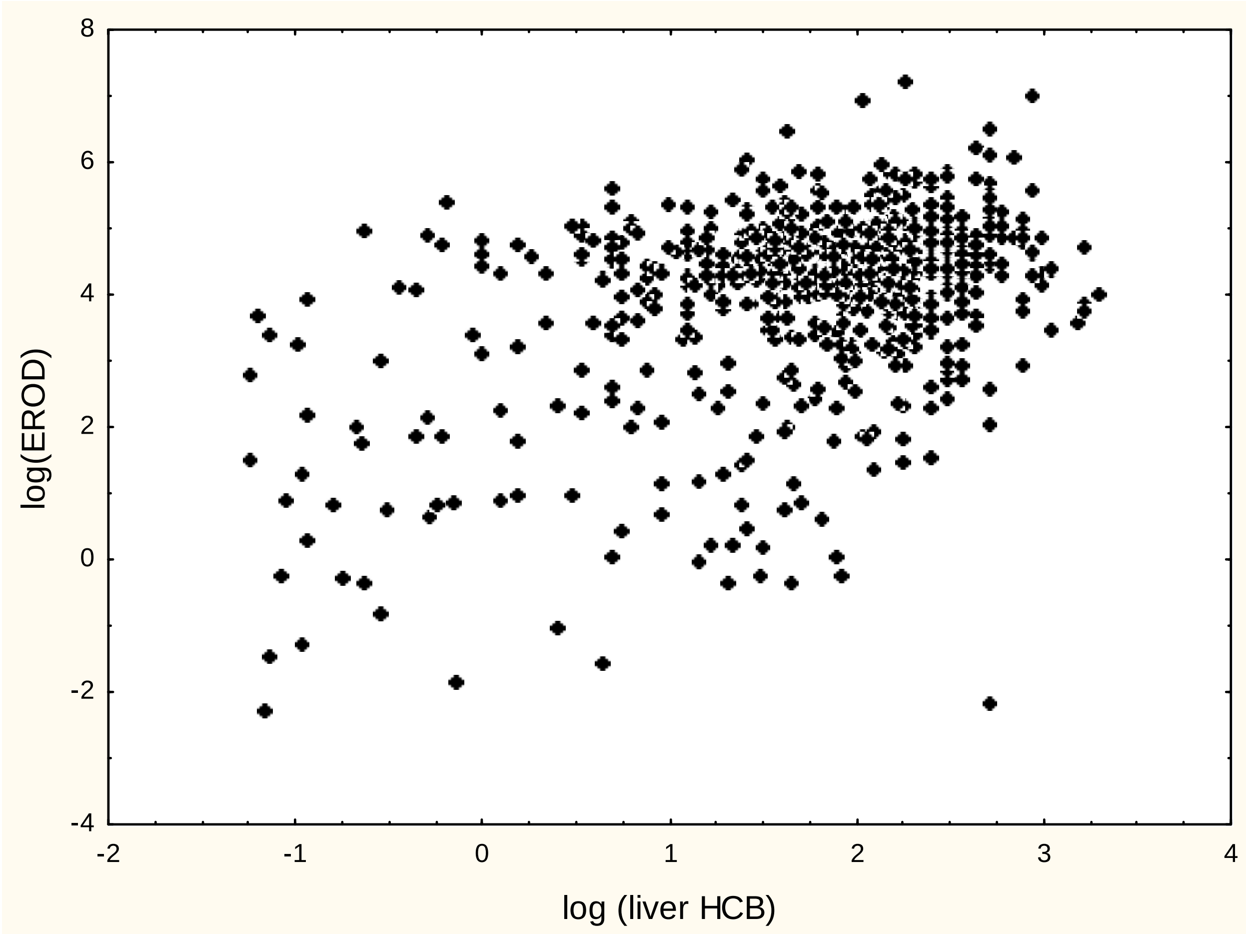



**Figure 4**. Relationship between concentrations of hepatic HCB concentration and EROD activity in *Gadus morhua* (all stations and years included). Both variables were log-2 transformed.

**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.

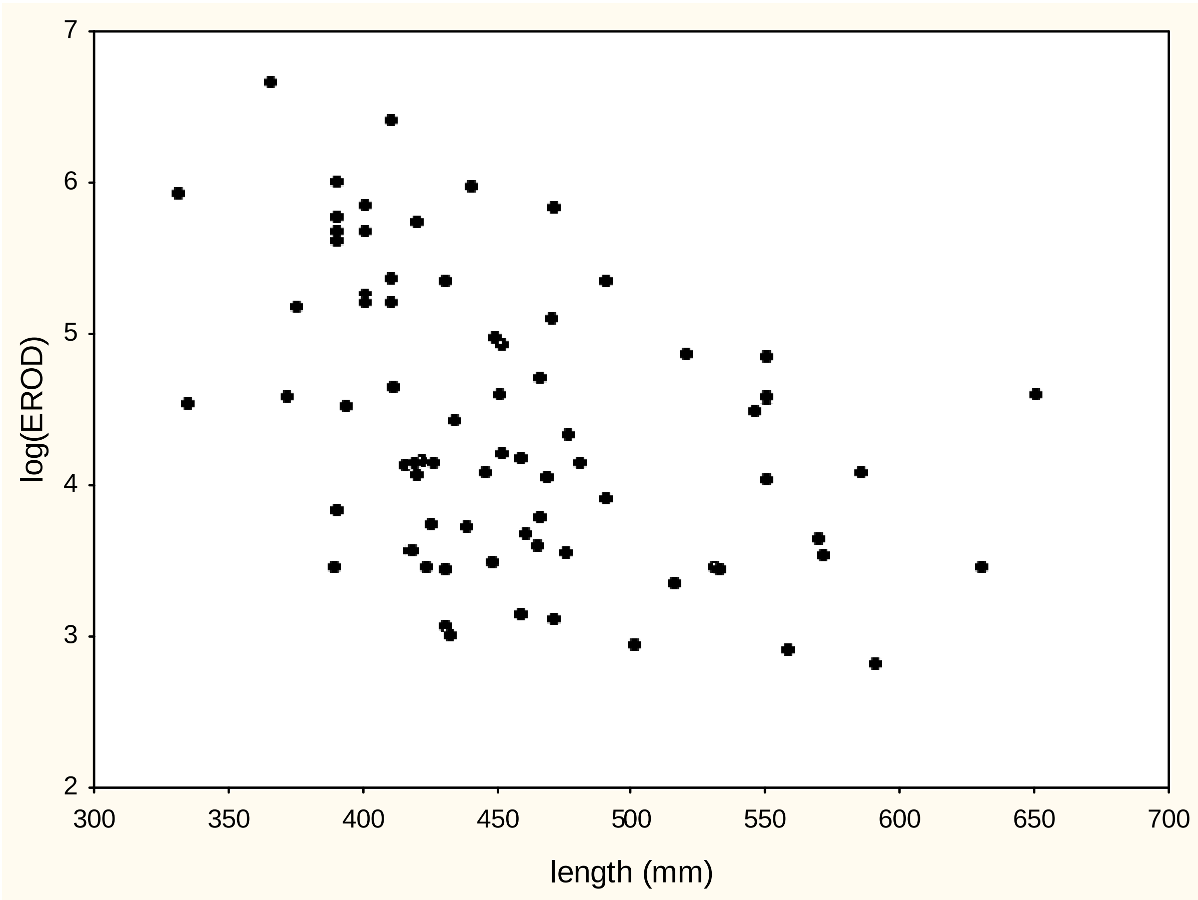



**Figure 5.** Relationship between length and EROD activity (pmol/min/mg protein) for *Pleuronectes platessa* (both years, 2000 and 2001, and both stations, 10 and 98, included). EROD has been log-2 transformed.

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.

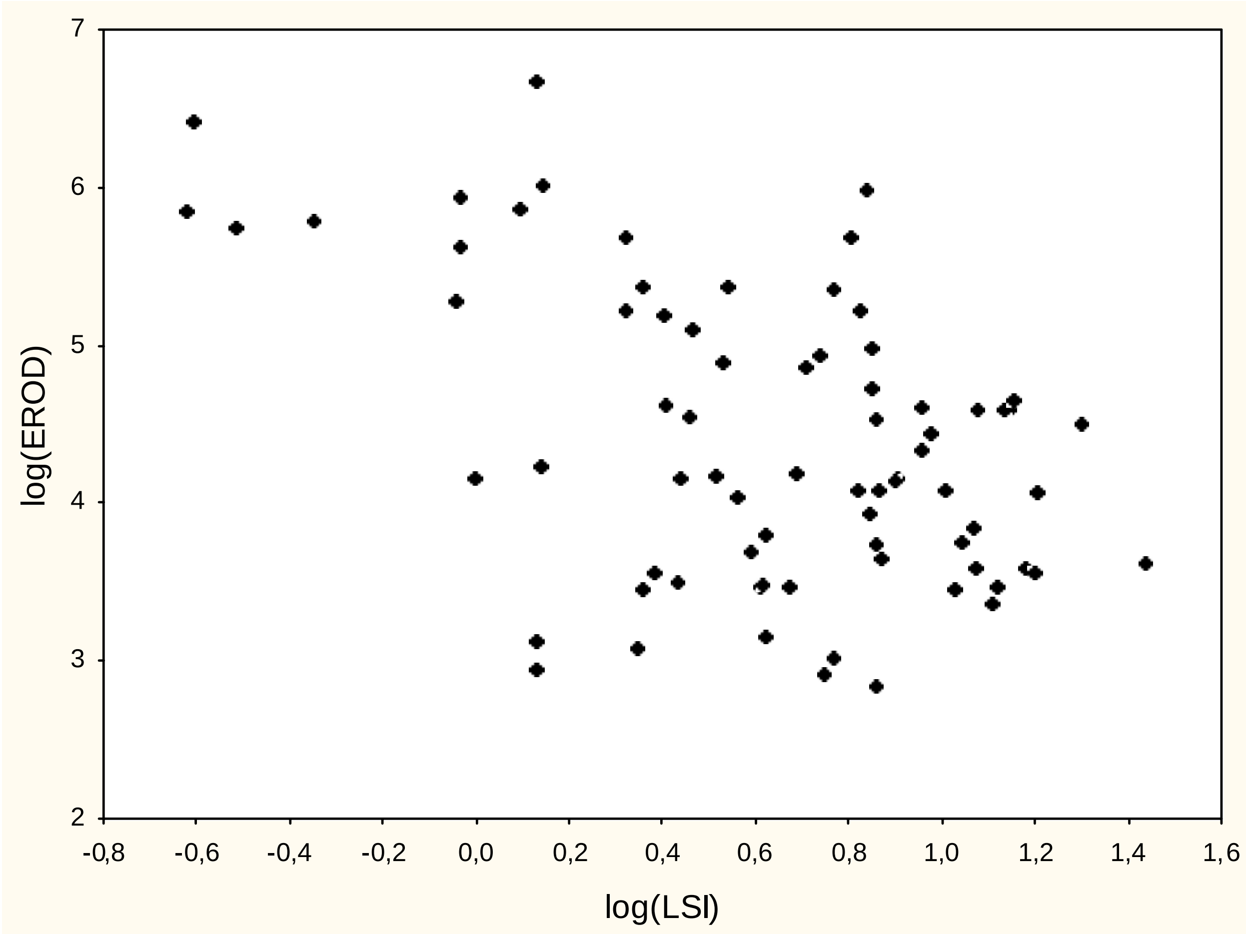



**Figure 6.** Relationship between liver-somatic index (LSI) and hepatic EROD activity (pmol/min/mg protein) in *Pleuronectes platessa* (both years, 2000 and 2001, and both stations, 10 and 98, included). Both variables were log-2 transformed.

## 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.

# 6. References

Titles translated to English in square brackets [ ] are not official.


Addison, R.F., Fitzpatrick, D., Renton, K.W. 1990. Distribution of delta -aminolevulinic acid synthetase and δ -aminolevulinic acid dehydratase in liver and kidney of rainbow trout (*Salmo gairdneri*). Comp. Biochem. Physiol. 95B:317-319.

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

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

Andersson, T., Förlin, L. 1985. Spectral properties of substrate-cytochrome P-450 interaction and catalytic activity of xenobiotic metabolizing enzymes in isolated rainbow trout liver cells. Biochem. Pharmacol. 34:1407-1413.

ASMO, 1994. Draft assessment of temporal trends monitoring data for 1983-91: Trace metals and organic contaminants in biota. Environmental Assessment and Monitoring Committee (ASMO). Document ASMO(2) 94/6/1.

ASMO, 1997. Summary Record. Environmental Assessment and Monitoring Committee (ASMO). Document ASMO 97/9/1.

Bayne, B.L., Brown, D.A., Burns, K., Dixon, D.R., Ivanovici, A., Livingstone, D.A. Lowe, D. M., Moore, M. N., Stebbing, A.R.D. Widdows, J. 1985. The effects of stress and pollution on marine animals. Praeger, New York, USA.

Bogovski, S., Sergeyev, B., Muzyka, V., Karlova, S. 1998. Cytochrome P450 System and Heme Synthase Enzymes Activity in Flounder Liver as Biomarkers of Marine Environments Pollution. Mar. Environ. Res. 46:13-16.

Boon, J.P., Van Arnhem, E., Jansen, S., Kannan, N., Petrick, G., Schulz, D., Duinker, J.C. Reijnders, P.H.J., Goksøyr, A., 1992. The toxicokinetics of PCBs in marine mammals with special reference to possible interactions of individual congeners with the cytochrome P450-dependent monooxygenase system: an overview. In: Walker C.H., Livingstone, D.R. (eds.), Persistent pollutants in marine ecosystems, 1st ed, Pergamon Press, Oxford, pp. 119-159.

Burden, V.M., Sandheinrich, M.B., Caldwell, C.A. 1998. Effects of lead on the growth and delta -aminolevulinic acid dehydratase activity of juvenile rainbow trout, *Oncorhynchus mykiss*. Environ. Pollut. 107:285-289.

Burke, M.D., Mayer, R.T. 1974. Ethoxyresorufin: Direct fluorimetric assay of a microsomal O-dealkylation which is preferentially inducible by 3-methylchoalanthrene. Drug metabolism and Disposition. 2:583-588.

Collier, T.K., Varanasi, U. 1991. Hepatic activities of xenobiotic metabolising enzymes and bilary levels of xenobiotics in English sole (*Parophrys vetulus*) exposed to environmental contaminants. Arch. Environ. Contam. Toxicol. 20:463-473.

Creaven, P.J., Parke, D.V., Williams, R.T: 1965. A fluorimetric study of the hydroxylation of biphenyl in vitro by liver preparations of various species. Biochemistry Journal. 96:879-885.

Følsvik N., Berge J.A., Brevik E. M. & M. Walday. 1999. Quantification of organotin compounds and determination of imposex in populations of dogwhelks (*Nucella lapillus*) from Norway. *Chemosphere*. 38 (3): 681-691.

Geyer, H.J., Steinberg, C.E., Scheunert, I., Brüggemann, R., Schütz, W., Kettrup, A., Rozman, K. 1993. A review of the relationship between acute toxicity ($LC_{50}$) of γ-hexachlorocyclohexane (γ-HCH, lindane) and total lipid content of different fish species. Toxicology. 83:169-179.

Goksøyr, A. 1995. Cytochrome P450 in marine mammals: isozyme forms, catalytic functions, and physiological regulations. In Blix A.S., Walløe L., Ulltang Ø. (eds), Whales, seals, fish and man Developments in marine biology 4, Elsevier, Amsterdam, The Netherlands, pp 629-639.

Goksøyr, A., Förlin, L. 1992. The cytochrome *P*-450 system in fish, aquatic toxicology and environmental monitoring. Aquat. Toxicol. 22:287-312.

Granick, S., Sassa, S., Granick, J.L., Levere, R.D., Kappas, A. 1972. Assays for porphyrins, δ-amino levulinic-acid dehydratase, and porphyrinogen synthetase in microliter samples of whole blood: Applications to metabolic defects involving the heme pathway. Procedures, the National Academy of Science, USA, 69:2381-2385.

Green, N.W., 1987. "Joint Monitoring Group" (JMG). Felles monitoring program i Norge: Oslofjord-området, Sørfjorden og Hardangerfjorden, og Orkdalsfjorden. Programforslag for 1988. 4.Dec.1987. NIVA-project 80106, 12 pp..

Green, N.W., 1989. The effect of depuration on mussels analyses. Report of the 1989 meeting of the working group on statistical aspects of trend monitoring. The Hague, 24-27 April 1989. ICES-report C.M.1989/E:13 Annex 6:52-58.

Green, N.W., 1991. Joint Monitoring Programme. National Comments to the Norwegian Data for 1989. Norwegian Institute for Water Research (NIVA) memo 27pp.. JMG 16/info 13-E.

Green, N.W., 1997. Joint Assessment and Monitoring Programme (JAMP) National Comments to the Norwegian Data for 1995. Norwegian Pollution Control Authority, Monitoring report no. 685/97 TA no. 1405/1997. Norwegian Institute for Water Research project 80106, report number 3597-97, 124 pp.. ISBN number 82-577-3152-8. (Also as document SIME 97/5/5).

Green, N.W., 2001 Joint Assessment and Monitoring Programme in Norway 2001 Contaminants - Oslofjord area, Lista, Sørfjorden, Hardangerfjorden, Bømlo, Lofoten area and Varangerfjord. Programme for 2001 NIVA project 80106, 8.3.2001. 54 sider.

Green, N.W., Bjerkeng B., Berge J.A., 1996. Depuration (12h) of metals, PCB and PAH concentrations by blue mussels (Mytilus edulis). Report of the Working Group on the Statistical Aspects of Environmental Monitoring. Stockholm 18-22 March 1996. ICES C.M.1996/D:1 Annex 13:108-117.

Green, N.W., Bjerkeng, B, Helland, A., Hylland, K., Knutzen, J., Walday, M., 2000. Joint Assessment and Monitoring Programme (JAMP) National Comments regarding the Norwegian Data for 1998 and supplementary investigations on cod (1996) and sediment (1996-1997). Norwegian Pollution Control Authority, Monitoring report no. 788/00 TA no. 1702/2000. Norwegian Institute for Water Research project 80106, report number 4171-2000, 206 pp.. ISBN number 82-577-3787-9. (Also presented as SIME 2000 document 00/3/6).

Green, N.W., Følsvik, N., Oredalen, T.J., Prestbakmo, G., 2001b. Joint Assessment and Monitoring Programme (JAMP). Overview of analytical methods 1981-2000. SFT Statlig overvåkingsprogram rapport nr. 822/01, TA nr. 1800/2001. NIVA, rapport nr. 4353-2001, 68 s. ISBN nr. 82-577-3989-8.

Green, N.W., Helland, A., Hylland, K., Knutzen, J., Walday, M., 2001c. Joint Assessment and Monitoring Programme (JAMP). Overvåking av miljøgifter i marine sedimenter og organismer 1981-1999. SFT Statlig overvåkingsprogram rapport nr. 819/01, TA nr. 1797/2001. NIVA, rapport nr. 4358-2001, 191 s. ISBN nr. 82-577-3995-2.

Green, N.W., Hylland, K., Ruus, A., Walday, M., 2002e. Joint Assessment and Monitoring Programme (JAMP). National Comments regarding the Norwegian Data for 2000. Norwegian Pollution Control Authority, Monitoring report no. 842/02 TA no. 1854/2002. Norwegian Institute for Water Research project 80106, report number 4468-2002, 197 pp.. ISBN number 82-577-4115-9. (Also presentert som SIME 2002 document 02/2/info. 2).

Green, N.W., Hylland, K., Walday, M., 2001a. Joint Assessment and Monitoring Programme (JAMP). National Comments regarding the Norwegian Data for 1999. SFT Statlig overvåkingsprogram 812/01 TA no. 1780/2001. NIVA, rapport nr. 4335-2001, 181 s. ISBN nr. 82-577-3969-3.

Green, N.W., Knutzen, J., 2001. Joint Assessment and Monitoring Programme (JAMP). Forurensnings- og referanseindeks basert på observasjoner av miljøgifter i blåskjell fra utvalgte områder 1995-1999.[Joint Assessment and Monitoring Programme (JAMP). Pollution and reference indicies based on contaminants in blue mussels 1995-1999]. Norwegian Pollution Control Authority, Monitoring report no. 821/01 TA no. 1799/2001. NIVA project O-80106, (report number 4342-2001) 35 pp.. ISBN number 82-577-3977-4.

Green, N.W., Knutzen, J., Helland, A., Brevik, E.M., 1995. Overvåking av miljøgifter i sedimenter og organismer 1981-92. "Joint Monitoring Programme (JMP)". [Monitoring av contamiants in sediment and organisms 1981-92 "Joint Assessment and Monitoring Programme (JMP)".] Norwegian Pollution Control Authority, Monitoring report no. 593/95. Norwegian Institute for Water Research project 80106, report number 3184, 195 pp.. ISBN-82-577-2676-1.

Green, N.W., Severinsen G., Rogne, Å.K., 2002a. Joint Assessment and Monitoring Programme (JAMP). Contaminant data for sediments 1986-1997. Norwegian Pollution Control Authority, Monitoring report no. 861/02 TA no. 1918/2002. Norwegian Institute for Water Research project 80106, report number 4599-2002, 230 pp.. ISBN number 82-577-4259-7.

Green, N.W., Severinsen G., Rogne, Å.K., 2002b. Joint Assessment and Monitoring Programme (JAMP). Contaminant data for shellfish 1998-2001. Norwegian Pollution Control Authority, Monitoring report no. 862/02 TA no. 1919/2002. Norwegian Institute for Water Research project 80106, report number 4600-2002, 269 pp.. ISBN number 82-577-4260-0.

Green, N.W., Severinsen G., Rogne, Å.K., 2002c. Joint Assessment and Monitoring Programme (JAMP). Contaminant data for fish 1998-2001. Norwegian Pollution Control Authority, Monitoring report no. 863/02 TA no. 1920/2002. Norwegian Institute for Water Research project 80106, report number 4601-2002, 336 pp.. ISBN number 82-577-4261-9.

Green, N.W., Severinsen G., Rogne, Å.K., 2002d. Joint Assessment and Monitoring Programme (JAMP). Summary statistics for contaminants in shellfish and fish 1981-2001. Norwegian Pollution Control Authority, Monitoring report no. 864/02 TA no. 1921/2002. Norwegian Institute for Water Research project 80106, report number 4602-2002, 422 pp.. ISBN number 82-577-4262-7.

Harding  M.J.C., Bailey S.K. & I..M. Davies. 1992. TBT imposex survey of the North Sea. Annex 7:Norway. Scottish Fisheries working paper No 10/92 (1992).

Haux, C., Förlin, L. 1989. Selected assays for health status in natural fish populations. In: Landner L. (Ed.), Chemicals in the aquatic environment. Berlin:  Springer Verlag. pp. 197-215.

Hodson, P.V. 1976. δ-amino levulinic acid dehydratase activity of fish blood as an indicator of a harmful exposure to lead. J. Fish. Res. Board Canada. 33:268-271.

Hodson, P.V., Blunt, B.R., Spry, D.J. 1978. Chronic toxicity of water-borne and dietary lead to rainbow trout (*Salmo gairdneri*) in Lake Ontario water. Water Res. 12:869-878.

Hodson, P.V., Blunt, B.R., Spry, D.J., Austen, K. 1977.  Evaluation of erythrocyte δ-amino levulinic acid dehydratase activity as a short-term indicator in fish of a harmful exposure to lead. J. Fish. Res. Board Canada 34:501-508.

Hodson, P.V., Blunt, B.R., Whittle, D.M. 1984. Monitoring lead exposure of fish. In: Cairns V.W., Hodson P.V. Nriagu J.O. (Eds.), Contaminant effects on fisheries. New York: John Wiley & Sons. pp. 87-98.

Hogstrand, C., Haux, C. 1990. A radioimmunoassay for perch (*Perca fluviatilis*) metallothionein. Toxicol. appl. Pharmacol. 103:56-65.

Hylland, K., Haux, C., Hogstrand, C. 1992. Hepatic metallothionein and metals in dab (*Limanda limanda* L.) from the German Bight. Mar Ecol Prog Ser 91: 89-96.

IARC, 1987. IARC [International Agency for Research on Cancer] monographs on the evaluation of the carcinogenic risk of chemicals to humans. Overall evaluations of carcinogenicity: an updating of IARC monographs. Vol., 1-42. Suppl. 7. Lyon.

ICES, 1996. ICES Environmental Data Reporting Formats. Version 2.2, revision 2 - July 1996.

Klotz, A.V., Stegeman, J. J., Walsh, C. 1984. An alternative 7-Ethoxyresorufin *O*-Deethylase activity assay: A continous visible spectrophotometric method for measurement of cytochrome *P*-450 monooxygenase activity. Anal. Biochem. 140:138-145.

Knutzen, J., Bjerkeng, B., Green, N.W., Kringstad, M., Schlaback, M., Skåre J.U., 2001. Overvåking av miljøgifter i fisk og skalldyr fra Grenlandsfjordene 2000. [Monitoring of micorpollutants in fish and shellfish from the Grenland fjords (S. Norway) 2000] Norwegian Pollution Control Authority, Monitoring report no. 835/01. TA no. 1832/2001. NIVA project O-800309, (report number 4452-2001) 230 pp.. ISBN number 82-577-4098-5.

Knutzen, J., Green, N.W., 1995. Bakgrunnsnivåer av en del miljøgifter i fisk, blåskjell og reker. Data fra utvalgte norske prøvesteder innen den felles overvåking under Oslo-/Paris-kommisjonene 1990-1993. [Background levels of some micropollutants in fish, the blue mussel and shrimps. Data from selected Norwegian sampling sites within the joint monitoring of the Oslo-/Paris Commissions 1990-1993]. Norwegian Pollution Control Authority, Monitoring report no. 594/94 TA no. 1173/1994. NIVA project O-80106/E-91412, (report number 3302) 105 pp.. ISBN number 82-577-2678-8.

Knutzen, J., Green, N.W., 2001a. Tiltaksorienterte miljøundersøkelser i Sørfjorden og Hardangerfjord 2000. Delrapport 2. Miljøgifter i organismer. [Investigation of micropollutants in the Sørfjord and Hardangerfjord 2000. Report 2. Contaminants in organisms.] Norwegian Pollution Control Authority, Monitoring report no. 836/01. TA no. 1833/2001. NIVA project O-800309, (report number 4445-2001) 51 pp.. ISBN number 82-577-4091-8.

Knutzen, J., Green, N.W., 2001b. Joint Assessment and Monitoring Programme (JAMP). "Bakgrunnsnivåer" av miljøgifter i fisk og blåskjell basert på datamateriale fra 1990-1998.[Joint Assessment and Monitoring Programme (JAMP). Background levels of some contaminants in fish and blue mussel based on data from 1990-1998]. Norwegian Pollution Control Authority, Monitoring report no. 820/01 TA no. 1798/2001. NIVA project O-80106, (report number 4339) 145 pp.. ISBN number 82-577-3973-1.

Knutzen, J., Skei, J., 1990. Kvalitetskriterier for miljøgifter i vann, sedimenter og organismer samt foreløpige forslag til klassifikasjon av miljøkvalitet. [Quality criteria for water, sediments and organisms and preliminary proposals for classification of environmental quality]. NIVA-prosjekt O-8000309 (NIVA report no. 2540), 139 sider. ISBN.82-577-1855-6.

Krahn, M.M., Rhodes, L.D., Myers, M.S., Moore, L.K., MacLeod, W.D., Malins, D.C: 1986. Associations between metabolites of aromatic compounds in bile and the occurence of hepatic lesions in English sole (*Parophrys vetulus*) from Puget Sound, Washington. Arch. Environ. Contam. Toxicol. 15:61-67.

Kägi, J.H.R., Schäffer, A. 1988. Biochemistry of metallothionein. Biochem. 27:8509-8515.

Larsson, Å., Haux, C., Sjöbeck, M.-L. 1985. Fish Physiology and Metal Pollution: Results and Experiences from Laboratory and Field Studies. Ecotoxicol. Environ. Saf. 9:250-281.

Lech, J.J., Pepple, S.K., Statham, C.N. 1973. Fish bile analysis: a possible aid in monitoring water quality. Toxicol Appl Pharmacol. 25:430-434.

Letcher, R.J., Klasson-Wehler, E., Bergman, Å. 2000. Methyl sulfone and hydroxylated metabolites of polychlorinated biphenyls. In: Paasivirta J. (ed), The handbook of environmental chemistry Vol. 3 Part K. New types of persistent halogenated compounds, Springer-Verlag, Berlin Heidelberg, Germany, pp 315-359.

Lowry, O.H., Rosebrough, N.J., Farr, A.L., Randall, R.J. 1951. Protein measurement with the folin phenol reagent. J. biol. Chem. 193:265-275.

Matthews, H.B., Dedrick, R.L. 1984. Pharmacokinetics of PCBs. Annu. Rev. Pharmacol. 24:85-103.

Mayer, F. L., Versteeg, D. J., McKee, M. J., Folmar, L. C., Graney, R. L., McCume, D. C., Rattner, B. A. 1992. Physiological and nonspecific biomarkers. In Biomarkers. Biochemical, physiological, and histological markers of anthropogenic stress. Eds: Huggett, R. J., Kimerle, R. A., Mehrle Jr., P. M. & Bergman, H. L., pp. 5-85, Lewis Publishers.

Meador, J.P., Stein, J.E., Reichert, W.L. Varanasi, U. 1995. Bioaccumulation of polycyclic aromatic hydrocarbons by marine organisms. Rev. Environ. Contam. Toxicol. 143:79-166.

Molvær, J., Knutzen, J., Magnusson, J., Rygg, B., Skei J., Sørensen, J., 1997. Klassifisering av miljøkvalitet i fjorder og kystfarvann. Veiledning. *Classification of environmental quality in fjords and coastal waters. A guide.* Norwegian Pollution Control Authority. TA no. TA-1467/1997. 36 pp.

MON, 1993. Draft Summary record. Eleventh meeting of the Ad Hoc Working Group on Monitoring, Copenhagen: 8-12 November 1993. MON 11/1/7-E.

MON, 1998. Summary record. Ad Hoc Working Group on Monitoring, Copenhagen: 23-27 February 1998. MON 98/6/1-E.

MON, 2001. The first draft of a new OSPAR Strategy for a Joint Assessment and Monitoring Programme (JAMP). Working Group on Monitoring (MON), Belfast: 4-7 December 2001. MON 01/7/1-E.

Nelson, D.R., Koymans, L., Kamataki, T., Stegeman, J.J., Feyreisen, R., Waxman, D.J., Waterman, M.R., Gotoh, O., Coon, M.J., Estabrook, R.W., Gunsalus, I.C., Nebert, D.W. 1996. P450 superfamily: update on new sequences, gene mapping, accession numbers and nomenclature. Pharmacogenetics. 6:1-42.

Nicholson, M., Fryer, R.J., Green, N.W., 1994. Focusing on key aspects of contaminant trend assessments. Nineteenth meeting of the Joint Monitoring Group 24-29 . January, 1994. Document JMG 19/3/3.

Nicholson, M., Fryer, R.J., Larsen, J.R., 1998. Temporal trend monitoring: A robust method for analysing trend monitoring data, ICES Techniques in Marine Envrionmental Sciences, No.20 September 1998.

Nicholson, M., Fryer, R.J., Maxwell, D.M., 1997. A study of the power of various methods for detecting trends. ICES CM 1997/Env.11.

Olsson, P.E. 1987. Metallothionein in fish: Aspects of biochemistry and function. PhD thesis. Gøteborgs Universitet. pp. 1-41.

OSPAR, 1990. Oslo and Paris Conventions. Principles and methodology of the Joint Monitoring Programme. [Monitoring manual for participants of the Joint Monitoring Programme (JMP) and North Sea Monitoring Master Plan (NSMMP)]. March 1990.

OSPAR, 1997. JAMP Guidelines. Oslo and Paris Commissions, Joint Assessment and Monitoring Programme (including chapter updates 1998-1999).

Payne, J.F. 1976. Field evaluation of benzopyrene hydroxylase induction as a monitor for marine petroleum pollution. Science 191:945-946.

Peakall, D. B. 1994. The role of biomarker in environmental assessment. 1. Introduction. Ecotoxicology. 3:157-160.

Rowlands, J.C., Gustafsson, J.Å., 1997. Aryl hydrocarbon receptor-mediated signal transduction. Crit. Rev. Toxicol. 27:109-134.

Ruus A., Sandvik M., Ugland K.I., Skaare J.U. 2002. Factors influencing activities of biotransformation enzymes, concentrations and compositional patterns of organochlorine contaminants in members of a marine food web. Aquat. Toxicol. 61:73-87.

Ruus, A., Green, N.W., 2002. Tiltaksorienterte miljøundersøkelser i Sørfjorden og Hardangerfjorden 2001. Delrapport 2. Miljøgifter i organismer. *Measure oriented environmental monitoring of Sørfjord and Hardangerfjord 2002. Report component 2. Contaminants in organisms.* Norwegian Pollution Control Authority, Monitoring report no. 865/02 TA no. 1922/2002. NIVA project 800309 (report number 4612-2002), 41 pp.. ISBN number 82-577-4273-2.

Ruus, A., Skaare, J.U., Ingebrigtsen, K. 2001. Disposition and depuration of lindane (γ-HCH) and polychlorinated biphenyl-110 (2,3,3′,4′,6-pentachlorobiphenyl) in cod (*Gadus morhua*) and bullrout (*Myoxocephalus scorpius*) after single oral exposures. Environ. Toxicol. Chem. 20:2377-2382.

Safe, SH. 1994. Polychlorinated biphenyls (PCBs): environmental impact, biochemical and toxic responses, and implications for risk assessment. Crit. Rev. Toxicol. 24:87-149.

Sandvik, M., Beyer, J., Goksøyr, A., Hylland, K., Egaas, E., Skaare, J.U. 1997. Interaction of benzo[a]pyrene, 2,3,3′,4,4′,5-hexachlorobiphenyl (PCB-156) and cadmium on biomarker responses in flounder (*Platichthys flesus* L.). Biomarkers. 2:153-160.

SIME, 1997. Summary Record. Oslo and Paris Conventions for the Prevention of Marine Pollution. Working Group on Concentrations, Trends and Effects of Substances in the Marine Environment (SIME), Bonn: 17-21 November 1997. SIME (2) 97/12/1-E, 29 pp. + Annexes.

SIME, 2002, OSPAR Coordinated Environmental Monitoring Programme (CEMP). Working Group on Concentrations, Trends and Effects of Substances in the Marine Environment (SIME), Oudenburg: 29-31 January 2002. Summary Record, Annex 5 SIME 02/10/1-E, 8 pp.

Skei, J., 2000. Tiltaksorienterte miljøundersøkelser i Sørfjorden og Harangerjforden 1999. Delrapport 1 Vannkjemi. [Investigation of Sørfjord and Hardangerfjord 1999. Report 1. Water Chemistry] Norwegian Pollution Control Authority, Monitoring report no. 796/00 TA no. 1724/2000. NIVA project O-800309, (report number 4236-2000) 23 pp.. ISBN number 82-577-3858-1.

Skei, J., 2001. Tiltaksorienterte miljøundersøkelser i Sørfjorden og Harangerjforden 2000. Delrapport 1 Vannkjemi. [Investigation of Sørfjord and Hardangerfjord 2000. Report 1. Water Chemistry] Norwegian Pollution Control Authority, Monitoring report no. 830/01 TA no. 1818/2001. NIVA project O-800309, (report number 4406-2001) 22 pp.. ISBN number 82-577-4048-9.

Skei, J., Knutzen, J., 2000. Utslipp av kvikksølv til Sørfjorden som følge av uhell ved Norzink AS vinteren 1999-2000. Miljømessige konsekvenser. [Accidental mercury discharge by Norzink AS to the Sørfjord, winter 1999-2000. Environmental consequences.] NIVA project O-89083 (report number 4234-2000) 12pp.. ISBN number 82-577-3856-5.

Skei, J., Rygg, B., Moy, F., Molvær, J., Knutzen, J., Hylland, K., Næs, K., Green, N. Johansen, T., 1998. Forurensningsutviklingen i Sørfjorden og Hardangerfjorden i perioden 1980-1997. Sammenstilling av resultater fra overvåking av vann, sedimenter og organismer. [The development of pollution in the Sørfjord and Hardangerfjord during the period 1980-1997. Summary of results from monitoring of water, sediment and organisms.] Norwegian Pollution Control Authority, Monitoring report no. 742/98 TA no. 1581/1998. NIVA project O-800310, (report number 3922-98) 95 pp.. ISBN number 82-577-3507-8.

Stegeman, J. J., Brouwer, M., Di Giulio, R. T., Förlin, L., Fowler, B. A., Sanders, B. M., Van Veld, P. A. 1992. Molecular responses to Environmental contamination: Enzyme and protein systems as indicators of chemical exposure and effect. In Biomarkers. Biochemical, physiological, and histological markers of anthropogenic stress. Eds: Huggett, R. J., Kimerle, R. A., Mehrle Jr., P. M. & Bergman H. L., pp. 235-335, Lewis Publishers.

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

Van den Berg, M., Birnbaum, L., Bosveld, A.T.C., Brunström, B., Cook, P., Feeley, M., Giesy, J.P., Hanberg, A., Hasegawa, R., Kennedy, S.W., Kubiak, T., Larsen, J.C., van Leeuwen, F.X.R., Liem, A.K.D., Nolt, C., Peterson, R.E., Poellinger, L., Safe, S., Schrenk, D., Tillitt, D., Tysklind, M., Younes, M., Wærn, F., Zacharewski, T., 1998.

Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife. Environ. Health Perspect. 106:775-792.

Walday M., Berge J.A. & N. Følsvik. 1997. Imposex and levels of organotin in populations of *Nucella lapillus* in Norway (English summary). Norwegian Institute for Water Research, report no. 3665-97. 28pp.

Walday, M., Green, N., Hylland, K., 1995. Kostholds- og tilstandsindikatorer for miljøgifter i marine områder. Norwegian Institute for Water Research project 93254, report number 3280, 39 pp.. ISBN number 82-577-2691-5.

WGSAEM, 1993. The length effect on contaminant concentrations in mussels. Section 13.2. in the Report of the Working Group on Statistical Aspects of Environmental Monitoring, Copenhagen 27-30, April 1993. International Council for the Exploration of the Sea. C-M- 1993/ENV:6 Ref.: D and E, 61 pp.

Williams, R.T. 1974. Inter-species variations in the metabolism of xenobiotics. Biochem. Soc. T. 2:359-377.

Aas, E., Baussant, T., Balk, L., Liewenborg, B., Andersen, O.K. 2000b. PAH metabolites in bile, cytochrome P4501A and DNA adducts as environmental risk parameters for chronic oil exposure: a laboratory experiment with Atlantic cod. Aquat. Toxicol. 51:241-258.

Aas, E., Beyer, J., Goksøyr, A. 2000a. Fixed wavelength fluorescence (FF) of bile as a monitoring tool for polyaromatic hydrocarbon exposure in fish: an evaluation of compound specificity, inner filter effect and signal interpretation. Biomarkers. 5:9-23.

# 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).

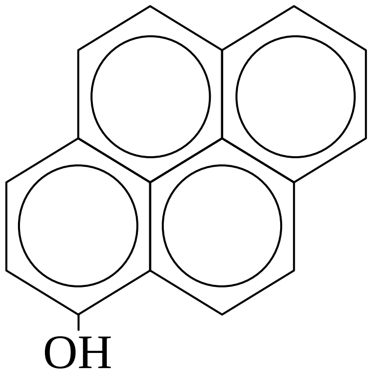



**Figure 7.** 1-OH-pyrene. Example of a PAH-metabolite. A hydroxyl-group has been added to the molecule, through biotransformation, to increase the polarity of the molecule, and thus the efficiency of excretion.

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).

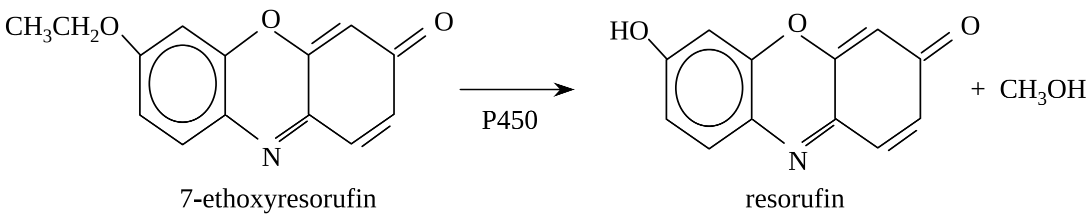



**Figure 8.** The deethylation of 2-ethoxyresorufin to resorufin, catalysed by cytochrome P450.

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 dd$H_2O$ [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], dd$H_2O$ 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.

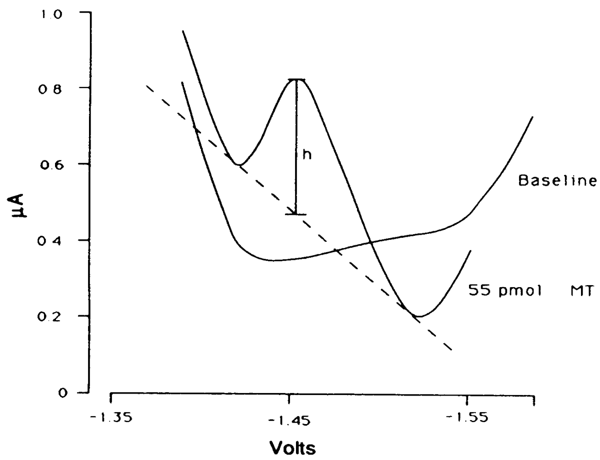



**Figure 9.** A typical scan. One baseline and one with 55 pmol rainbow trout (*Onchorynchus mykiss*) MT (from Olsson, 1987).

*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

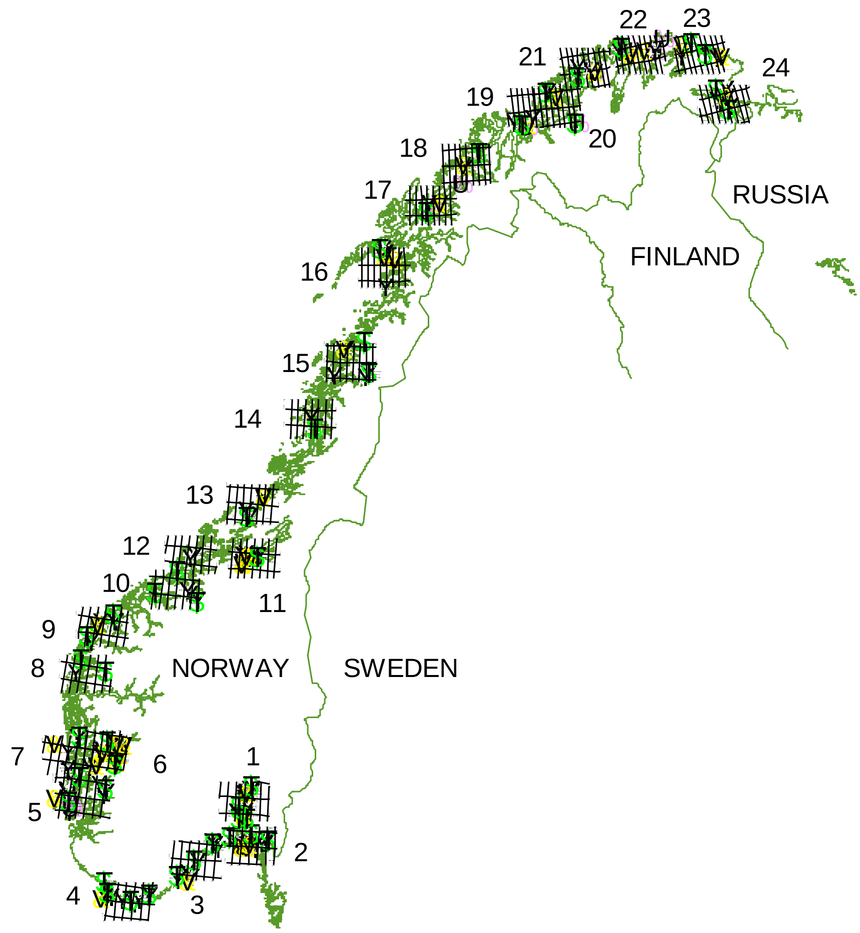
## NOTES

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.

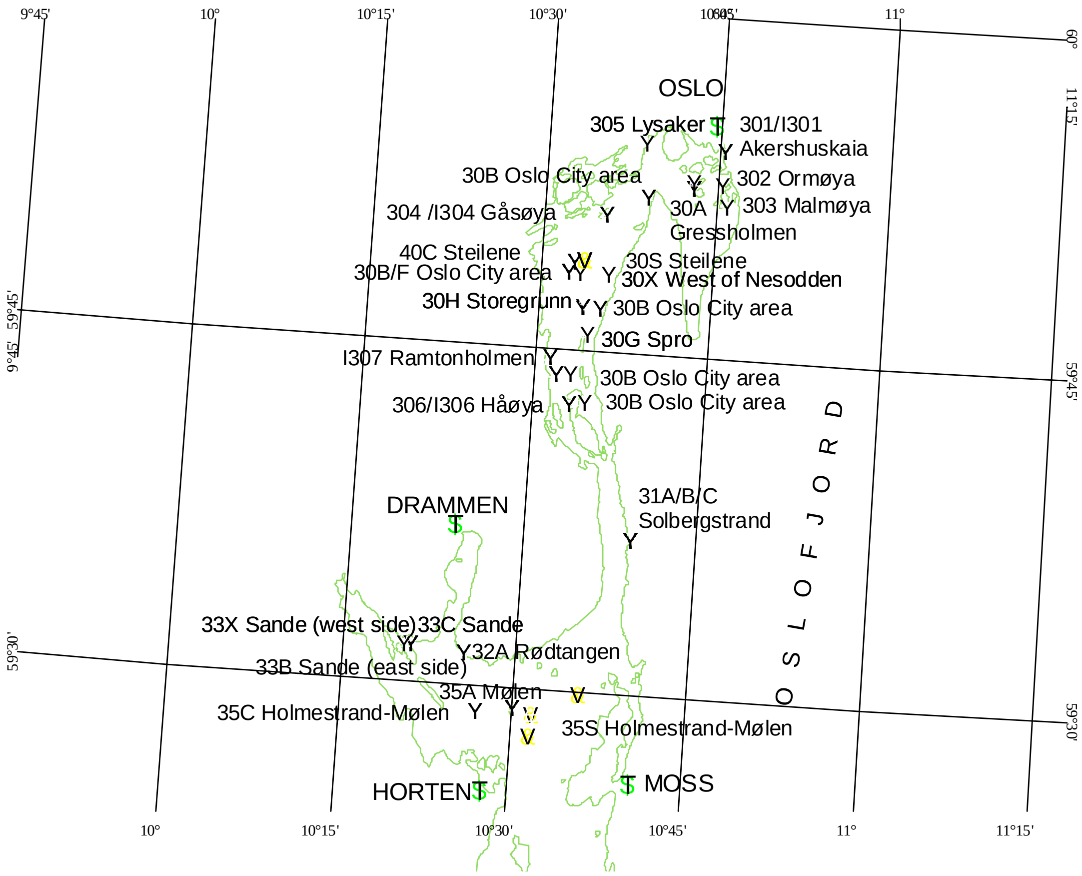
The letter A following the station identification number indicates that blue mussels were sampled. The letter B indicates sampling for cod and the letter F indicates sampling for flatfish (selected stations, marked B and/or F are used in this BEM-investigation, see Table 2). This system for fish is not 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).

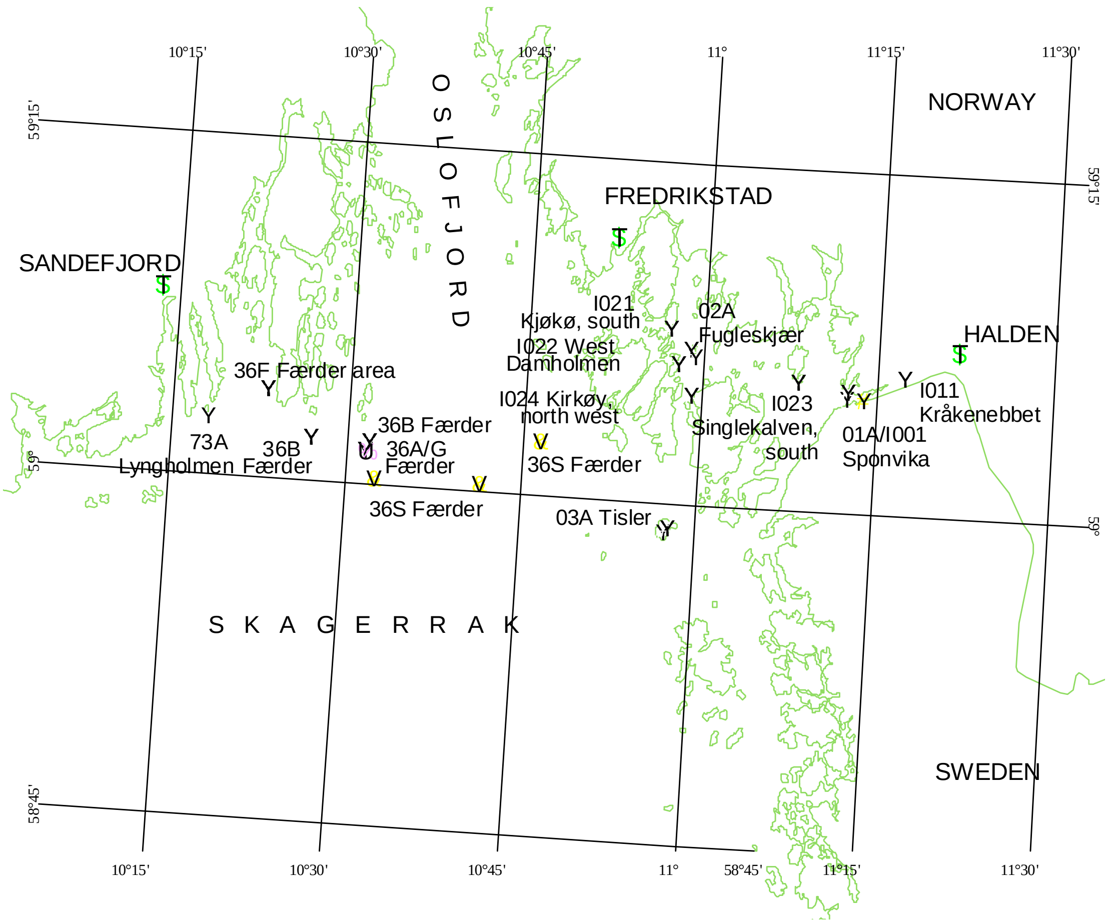
The maps are generated using ArcView GIS version 3.3.



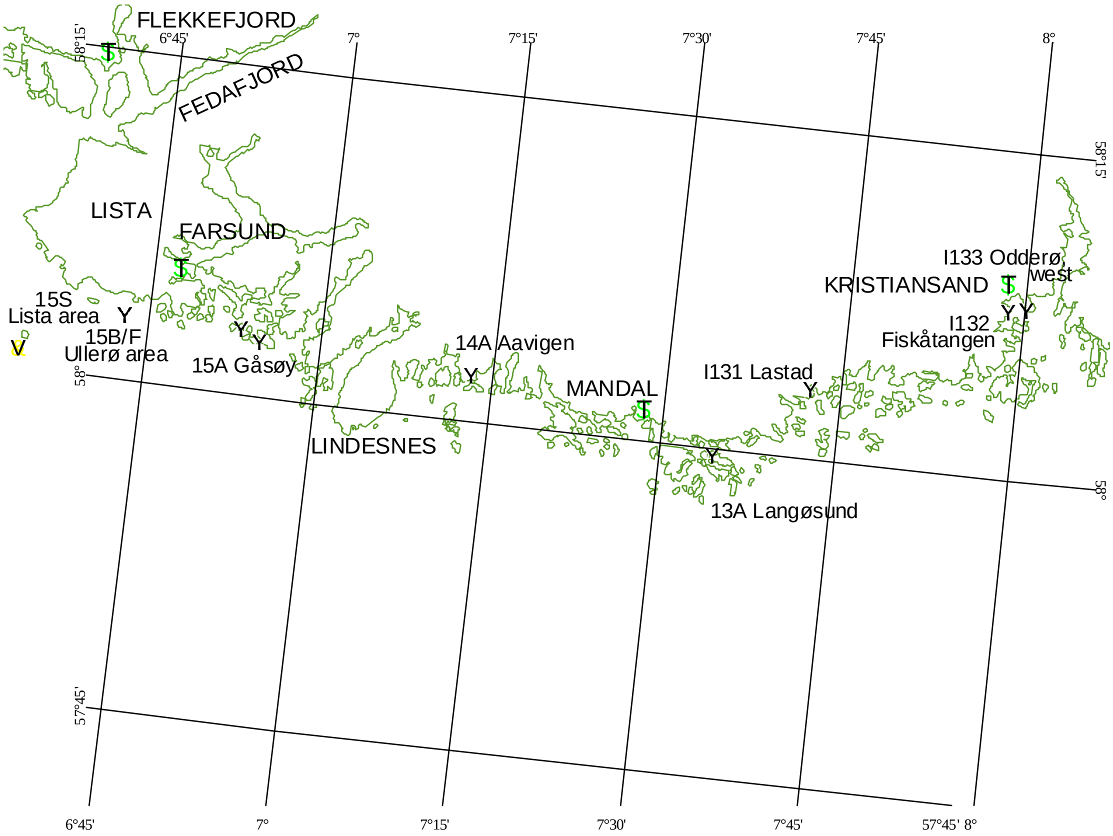

JAMP stations Norway. Numbers indicate map reference


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

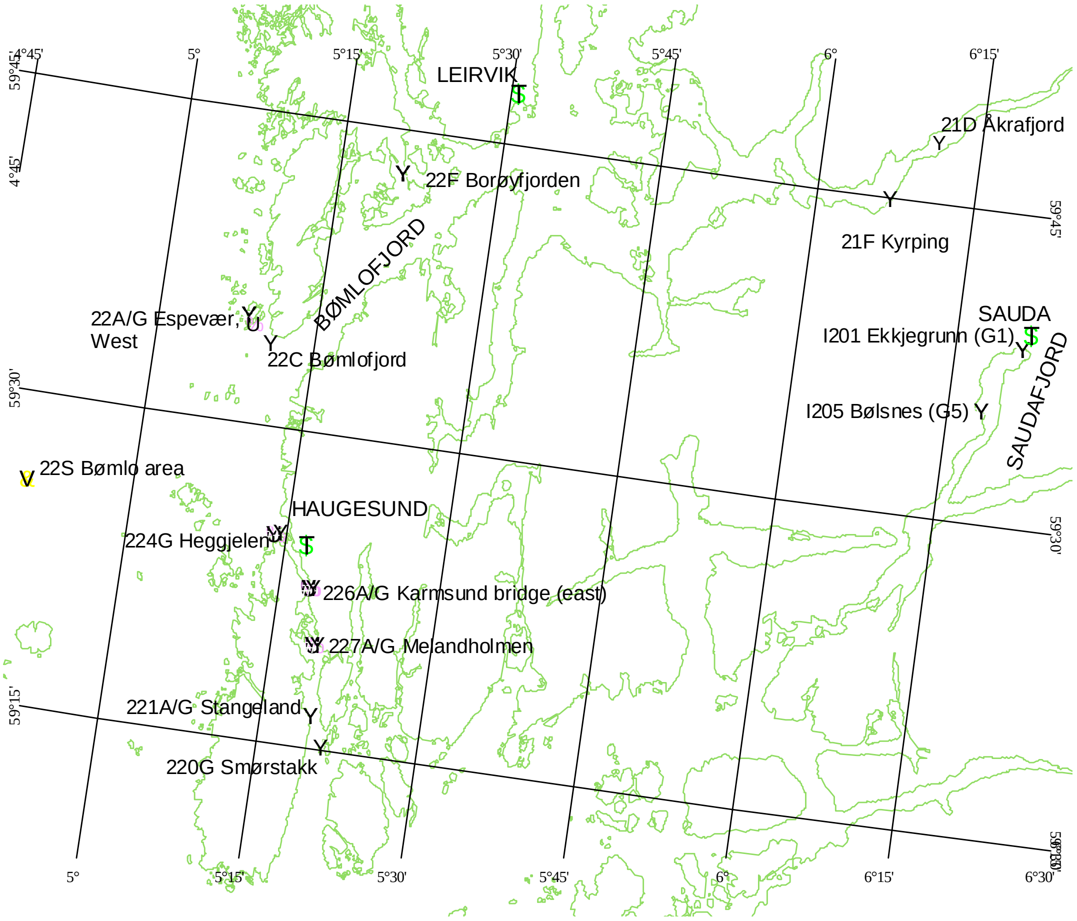
MAP 1


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
01A/I001
Sponvika
36B Færder
36A/G
Færder
73A
Lyngholmen
36B
Færder
36S Færder
36S Færder
03A Tisler
S K A G E R R A K
SWEDEN

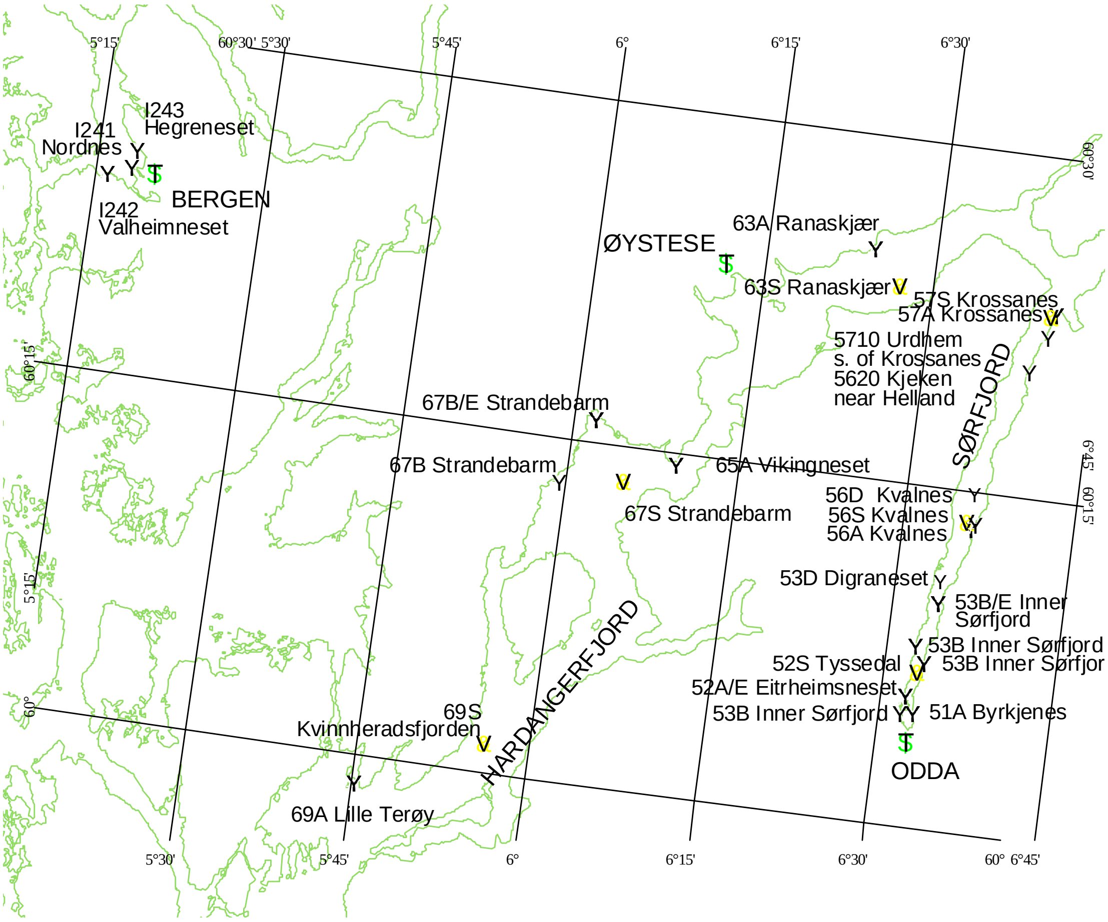
MAP 2


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

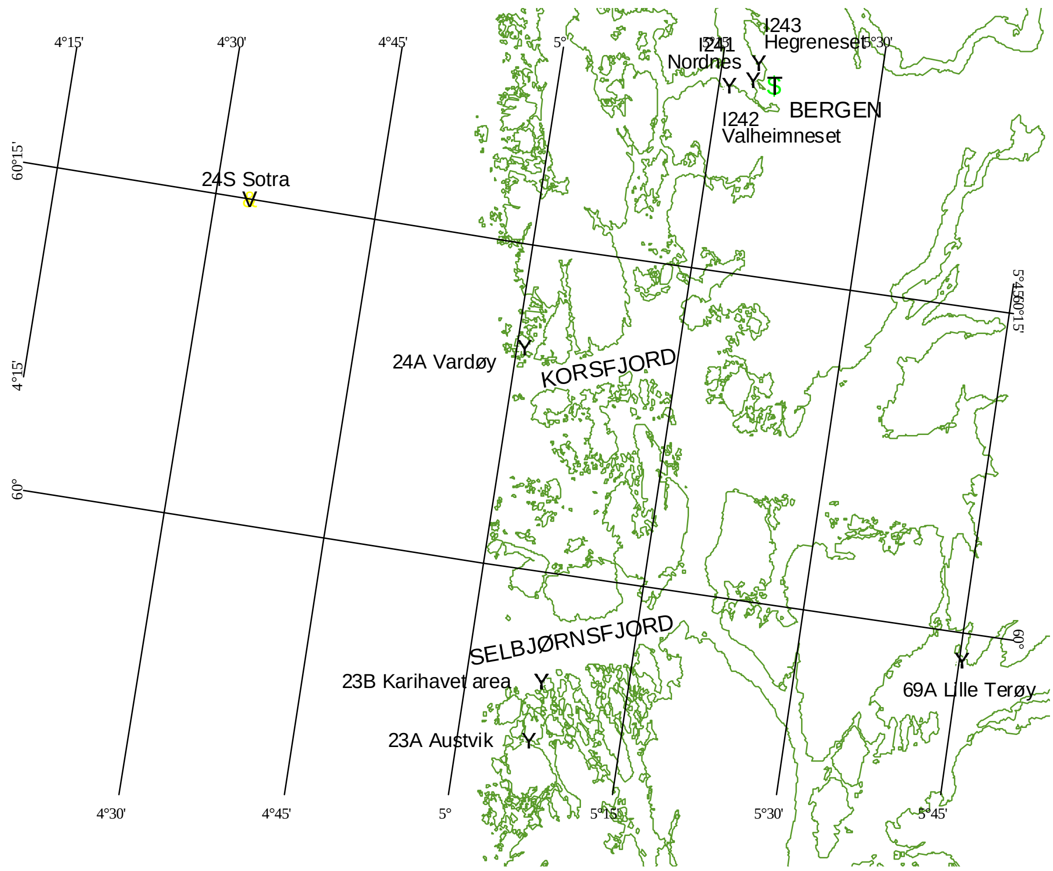
MAP 4


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'

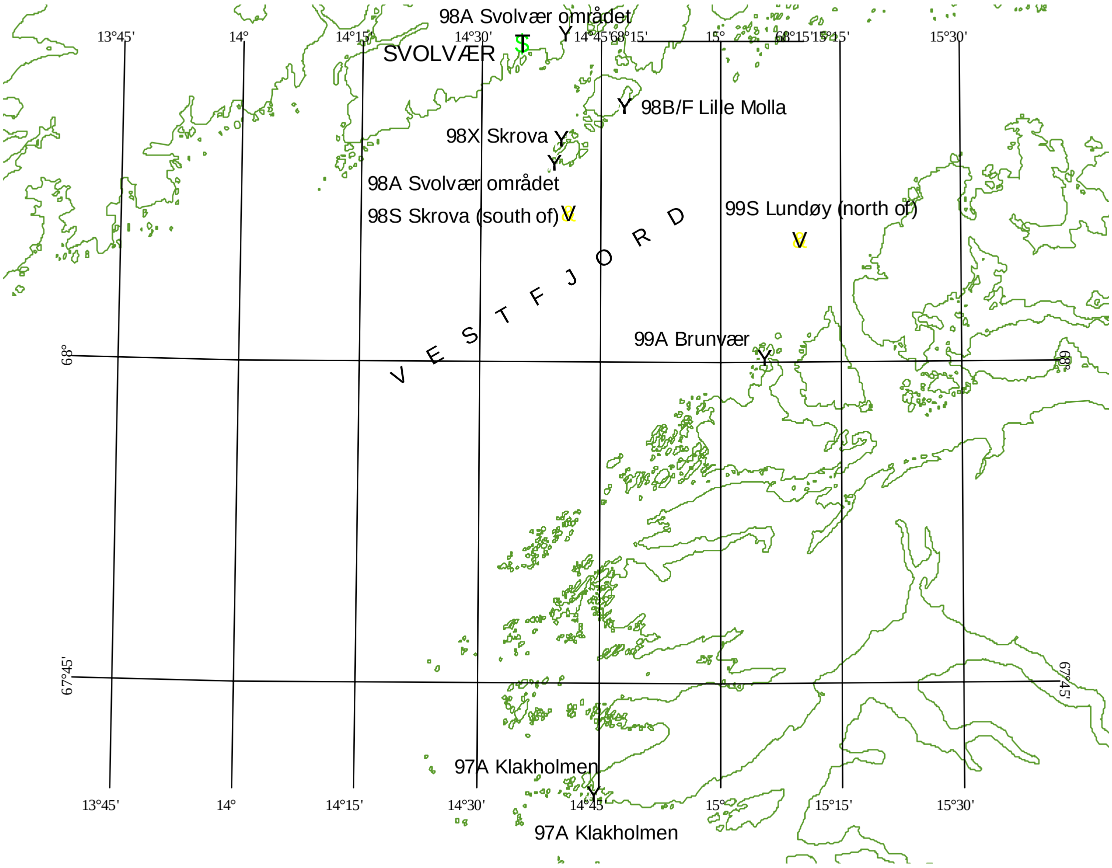
MAP 5


I241
Nordnes
I243
Hegreneset
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

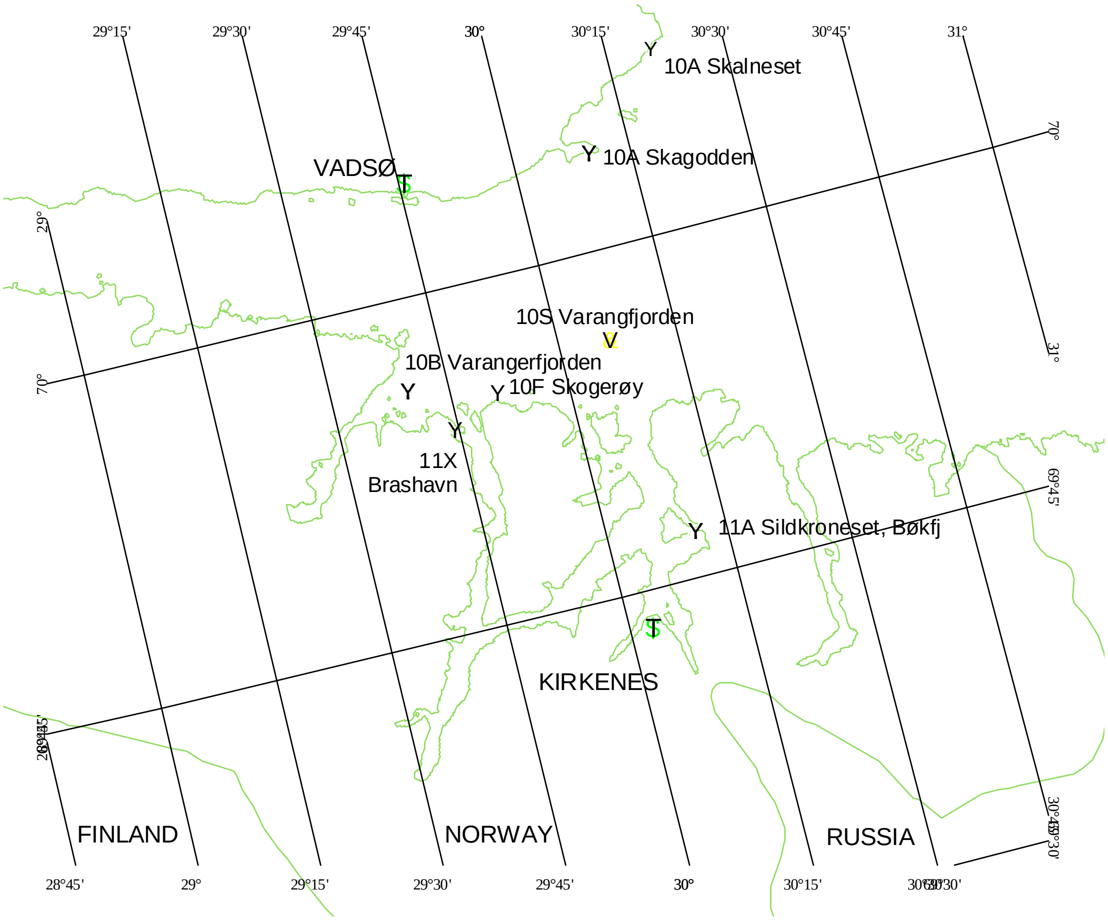
MAP 6


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°
28°45'
29°
70°
69°45'

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**

| Samp/ repl. no. | Sex F/M | Age year | Wght g | Lngt mm | mean weight g | Dry % | Fat % | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analytical lab. => | | | | | | | | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA |
| Analysis code => | | | | | | | | | | | | | |
| Detection limit => | | | | | | | | | | | | | |
| 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**

| Samp/ repl. no. | Sex F/M | Age year | Wght g | Lngt mm | mean weight g | Dry % | Fat % | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analytical lab. => | | | | | | | | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA |
| Analysis code => | | | | | | | | | | | | | |
| Detection limit => | | | | | | | | | | | | | |
| 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. => / Analysis code => / Detection limit => | | | | | Mean | | | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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. => / Analysis code => / Detection limit => | | | | | Mean | | | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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**

| 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) j/kg/ABS 380 nm w.wt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analytical lab. => | | | | | | | | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA |
| Analysis code => | | | | | | | | | | | | | | | |
| Detection limit => | | | | | | | | | | | | | | | |
| 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 | ›BG/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 | 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) 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 => | | | | | | | | | | | | | | | | | |
| 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 | ᵓBG/min/mg prot | ɴin/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 | 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 | 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/ 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) | NAP2O(BI) | PA1O(BI) | PYR1O(BI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analytical lab. => | | | | | | | | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA |
| Analysis code => | | | | | | | | | | | | | | | | | | |
| Detection limit => | | | | | | | | | | | | | | | | | | |
| Unit | | | | | | | | ABS 380 nm | mg/mL | mg/mL | mg/mL | PBG/min/mg prot | min/mg prot | µg/mg prot | g/kg/ABS 380 nm | g/kg/ABS 380 nm | µg/kg/ABS 38 | µg/kg/ABS 38 |
| Basis | | | | | | | | 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**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | 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 | ᵓBG/min/mg prot | ɪin/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 | 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 | 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**

| | 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 | 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 |
| 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**

| Samp/ repl. no. | Sex F/M | Age year | Wght g | Lngt mm | Mean weight g | Dry % | Fat % | BILIV(BI) mg/L w.wt | BLOPR(BL) mg/mL w.wt | CYTPR(LI) mg/mL w.wt | MICPR(LI) mg/mL w.wt | OHBIL(BI) µg/kg w.wt | ALAD(BL) ³BG/min/mg prot w.wt | EROD(LI) nin/min/mg prot w.wt | MT(LI) µg/mg prot w.wt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analytical lab. => | | | | | | | | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA |
| Analysis code => | | | | | | | | | | | | | | | |
| Detection limit => | | | | | | | | | | | | | | | |
| 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**

| 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 => | | | | | | | | | | | | | | | |
| 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 | ɟ/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 | ɟ/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**

| 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 |
| 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 | ›BG/min/mg prot | nin/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 | 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**

| Samp/ repl. no. | Sex F/M | Age year | Wght g | Lngt mm | Mean weight g | Dry % | Fat % | BILIV(BI) mg/L w.wt | BLOPR(BL) mg/mL w.wt | CYTPR(LI) mg/mL w.wt | MICPR(LI) mg/mL w.wt | OHBIL(BI) µg/kg 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analytical lab. => | | | | | | | | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA |
| Analysis code => | | | | | | | | | | | | | | | |
| Detection limit => | | | | | | | | | | | | | | | |
| 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**

| 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 | 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**

| 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 | 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 | ᵓBG/min/mg prot | nin/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 | 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 | ›BG/min/mg prot | ɲin/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 | 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 | 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 | 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**

| | 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 | 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 | 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 | 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 | 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 |
| 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**

| 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) min/min/mg prot w.wt | MT(LI) µg/mg prot w.wt | BAP3O(BI) /kg/ABS 380 nm w.wt | PA1O(BI) /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 | 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 | ɔBG/min/mg prot | nin/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 | 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**

| | 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 | µg/kg/ABS 380 nm | µg/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 | 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 | 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 | 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 | 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 | 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**

| 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 | in/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 |
| 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**

| 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 |
| 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**

| 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 |
| 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 | g/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 | 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 |
| 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 | BG/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 |
| 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**

| 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 | PYR1O(BI) /kg/ABS 380 nm w.wt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analytical lab. => | | | | | | | | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA | NIVA |
| Analysis code => | | | | | | | | | | | | | | |
| Detection limit => | | | | | | | | | | | | | | |
| 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**

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| 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) ᵓBG/min/mg prot w.wt | EROD(LI) ıin/min/mg prot w.wt | MT(LI) µg/mg prot w.wt | BAP3O(BI) ȷ/kg/ABS 380 nm w.wt | NAP2O(BI) ȷ/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) ᵓBG/min/mg prot w.wt | EROD(LI) ıin/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 => | | | | | | | | | | | | | | | | | |
| 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**

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | | | 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**

| 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 | 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 | 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 |
| 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 | 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 |
| 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 | min/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 | 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 |
| 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)

| 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 | ANALYSIS 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.)

| 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 | ANALYSIS 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.)

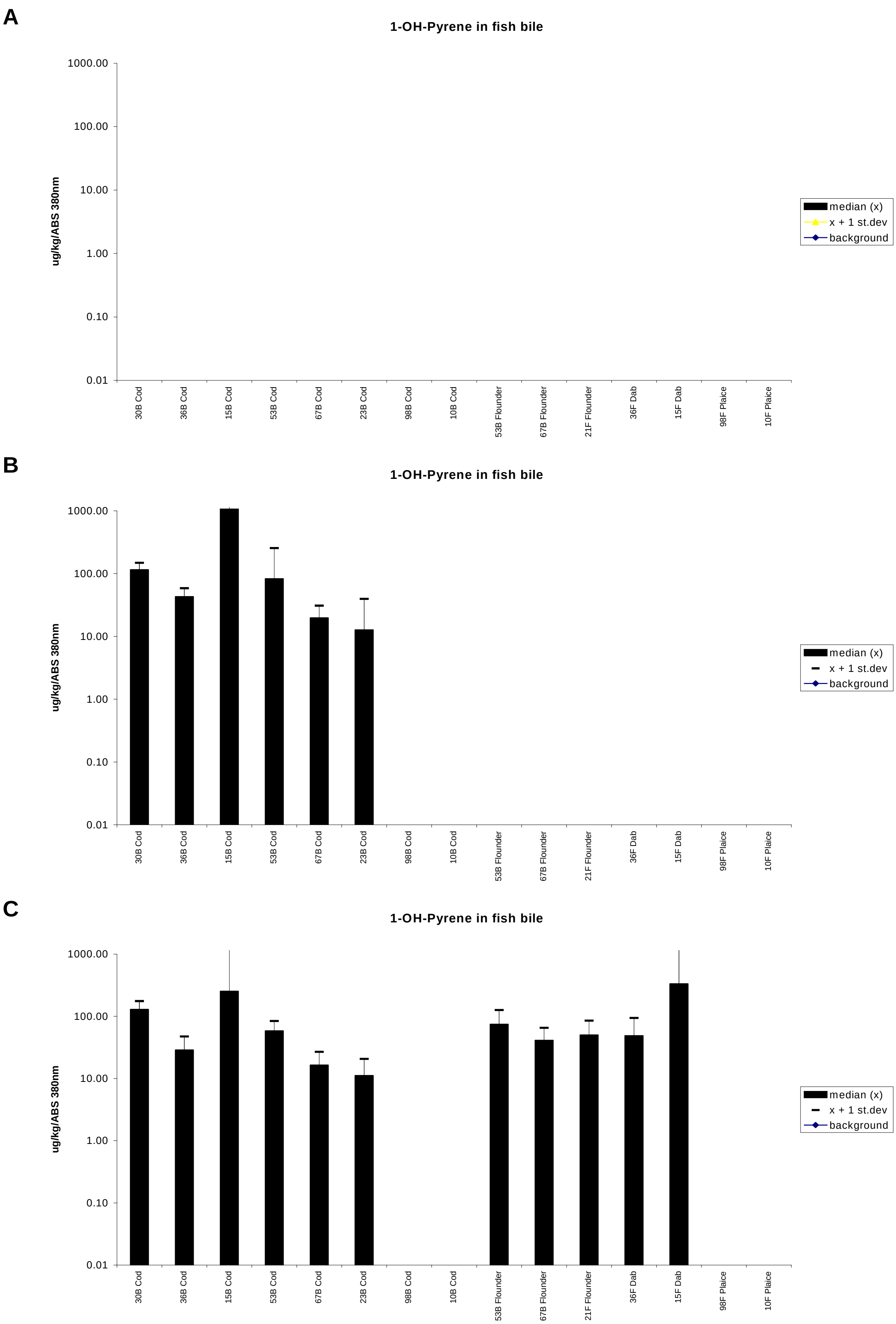
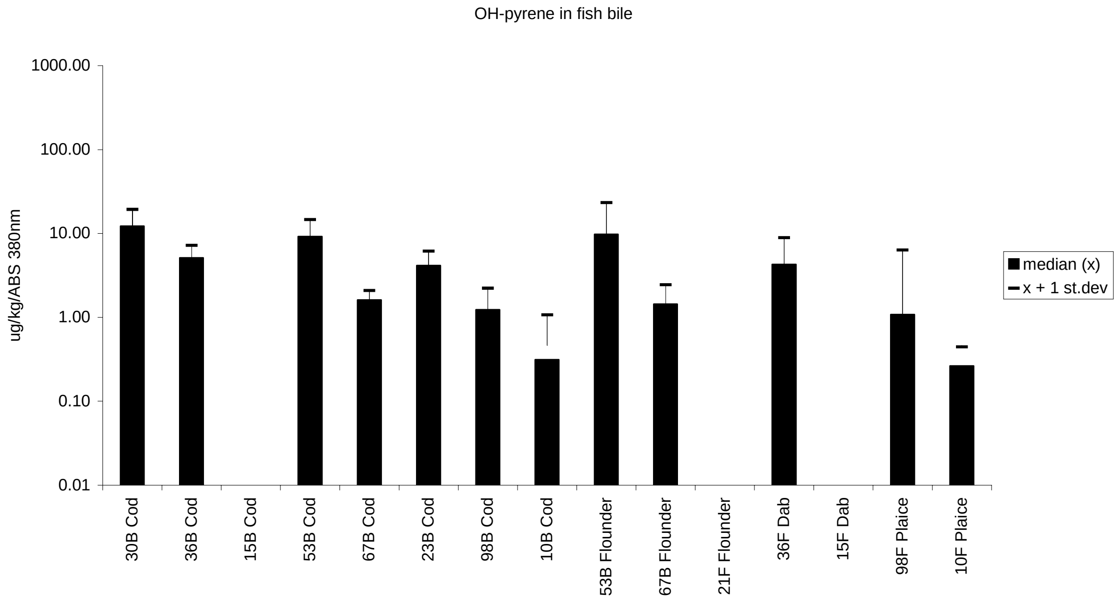



**Figure 10.** Median and standard deviation concentration for OH-pyrene (Pyrene metabolite) in fish bile 1997 (**A**), 1998 (no analyses) (**B**) and 1999 (**C**), µg/kg/ABS (absorbance) 380 nm (see maps in Appendix C).

**A**




**B**

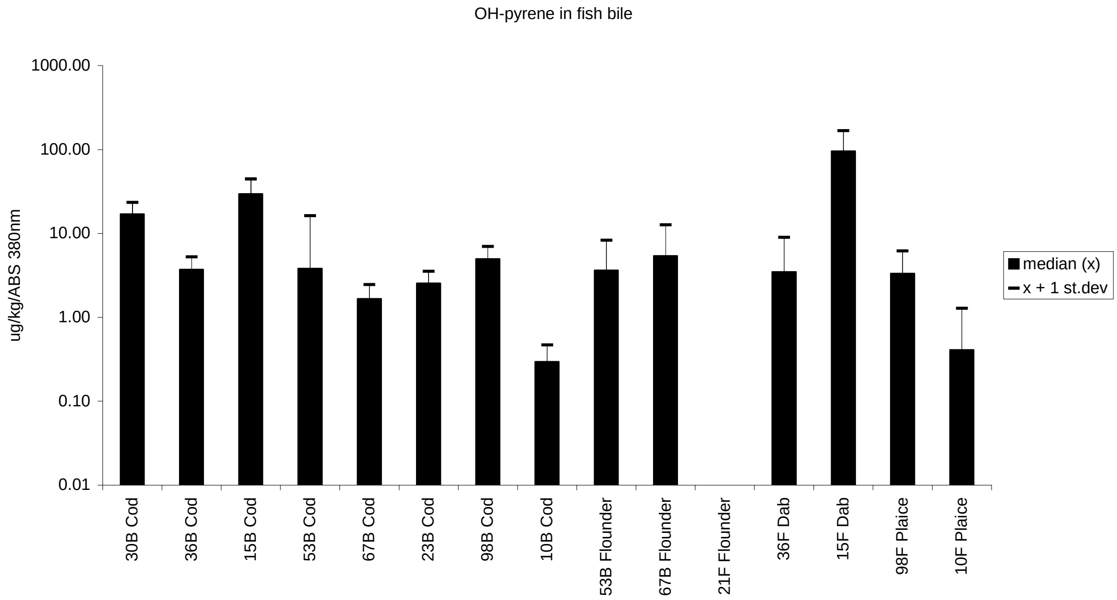



**Figure 11.** Median and standard deviation concentration for OH-pyrene (Pyrene metabolite) in fish bile 2000 (**A**) and 2001 (**B**), µg/kg/ABS (absorbance) 380 nm (see maps in Appendix C).

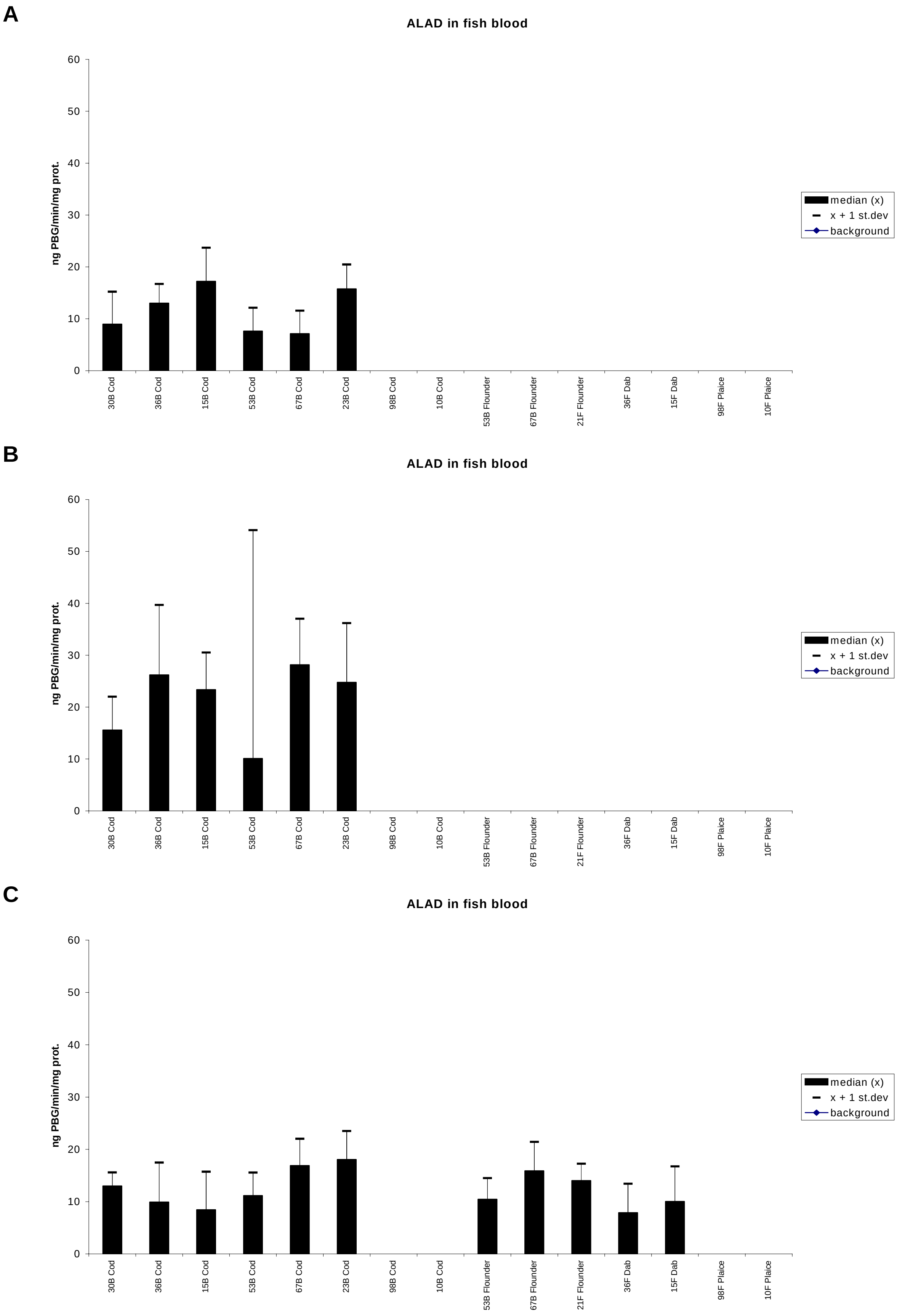
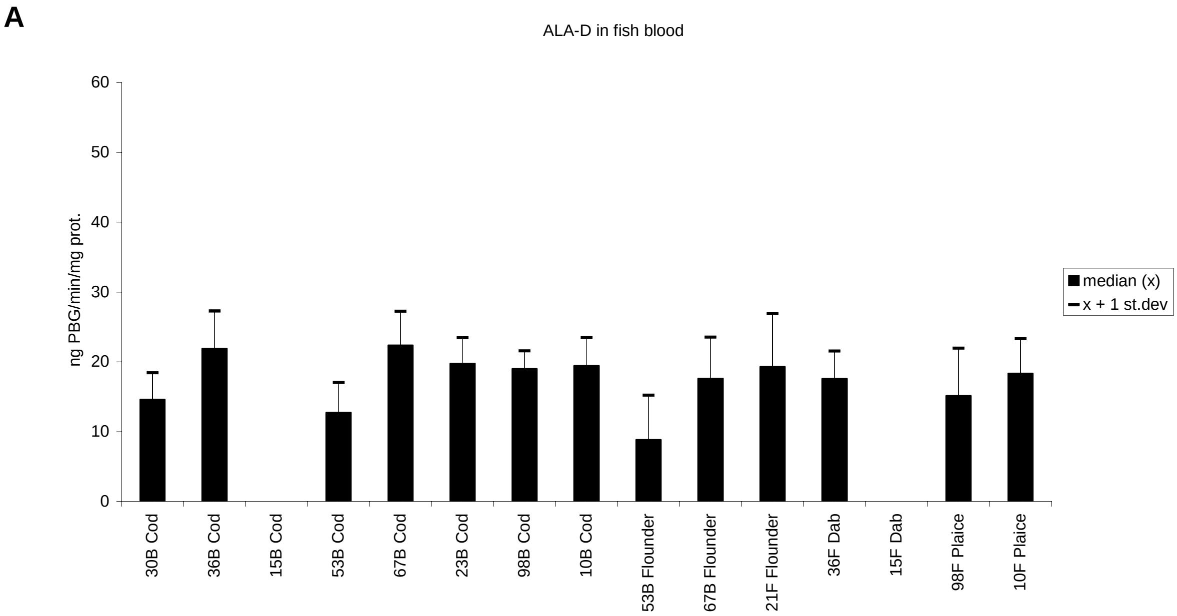



**Figure 12.** Median and standard deviation concentration for ALA-D (δ-amino levulinic acid dehydrase inhibition) in fish liver 1997 (**A**), 1998 (**B**) and 1999 (**C**), ng PBG (porphobilinogen)/min/mg protein (see maps in Appendix C).



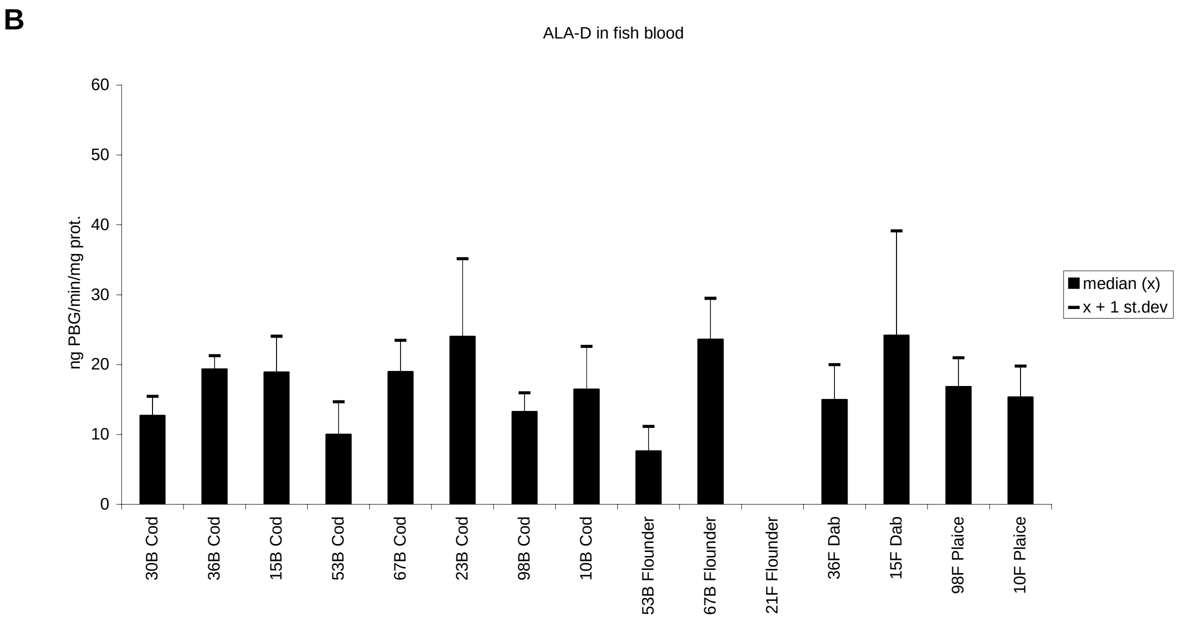
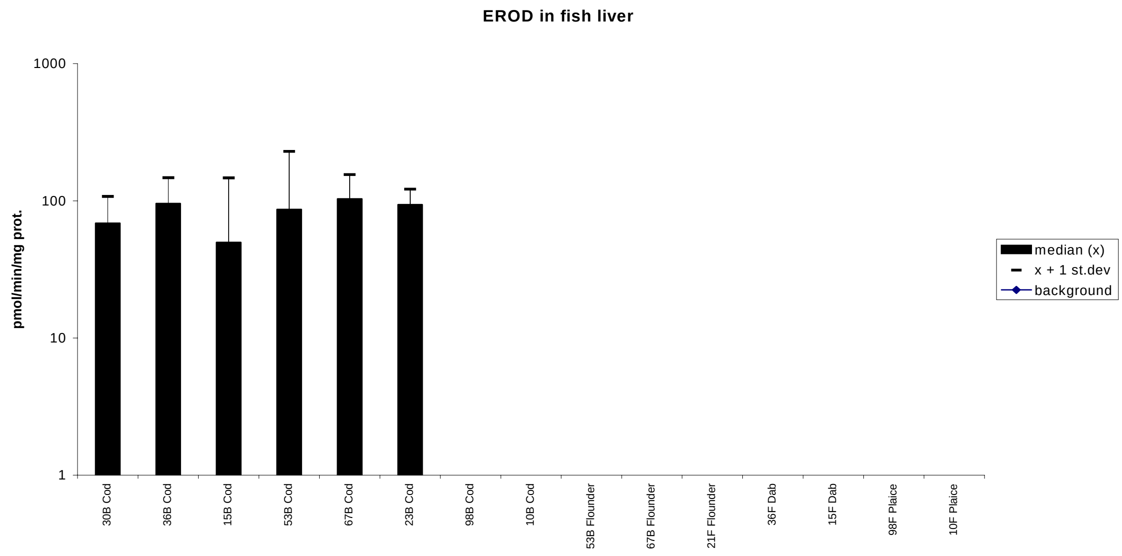
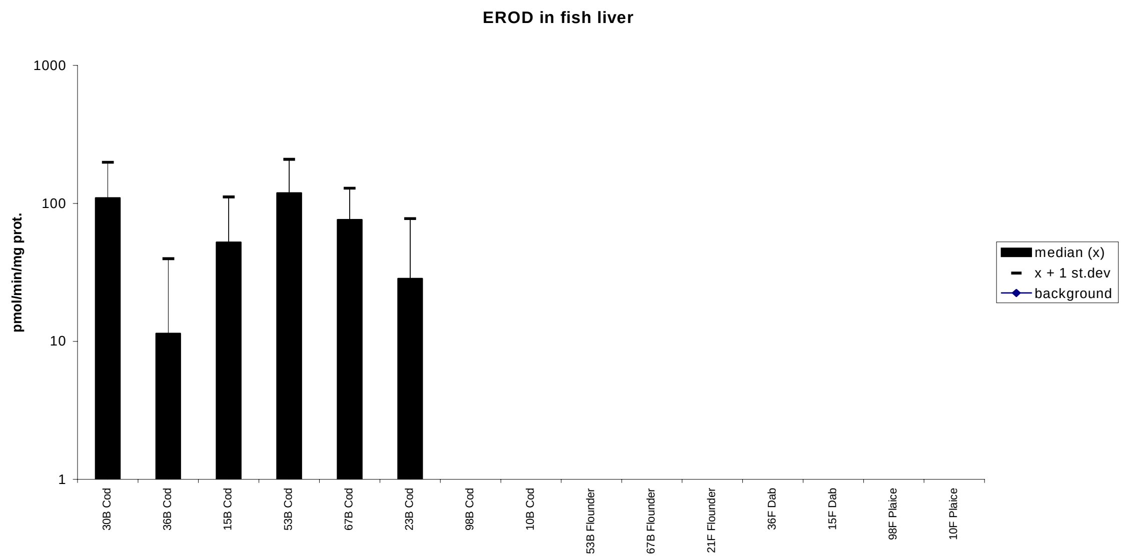




**Figure 13.** Median and standard deviation concentration for ALA-D (δ-amino levulinic acid dehydrase inhibition) in fish liver 2000 (**A**) and 2001 (**B**), ng PBG (porphobilinogen)/min/mg protein (see maps in Appendix C).

**A**




**B**




**C**

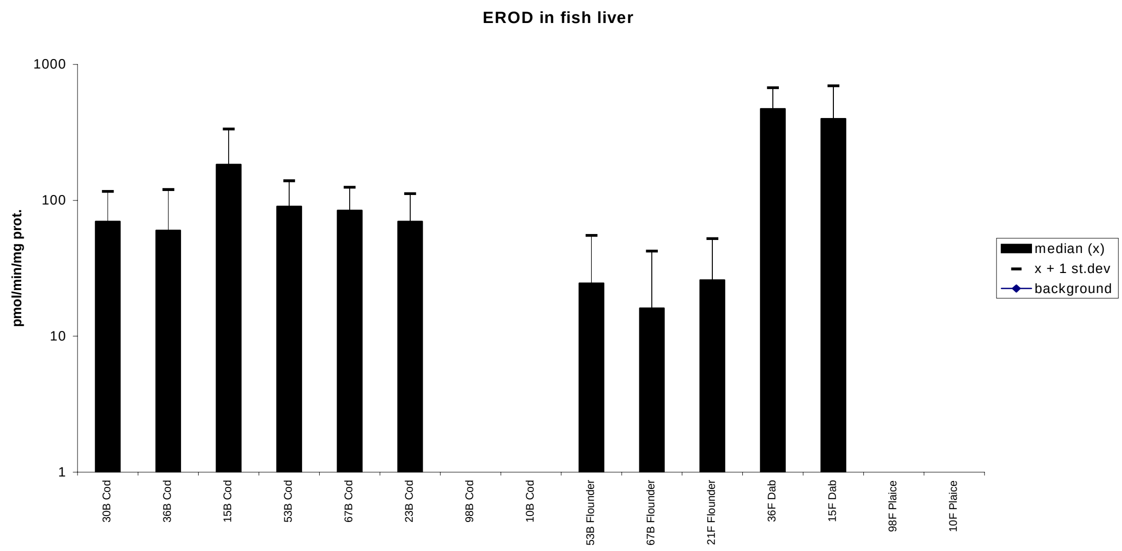
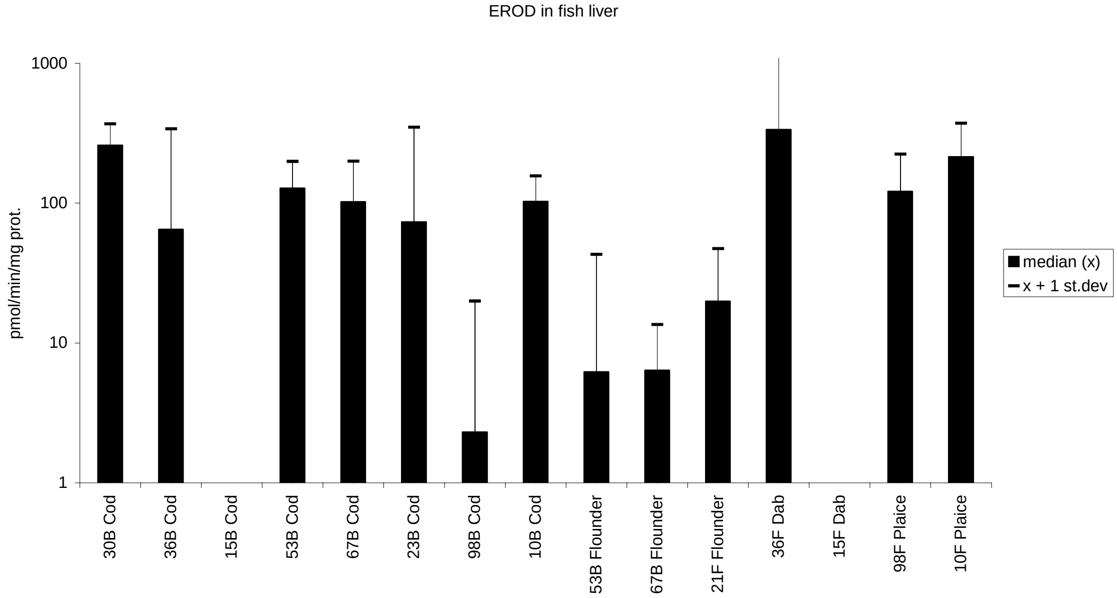



**Figure 14.** Median and standard deviation concentration for EROD (Cytochrome P4501A-activity) in fish liver 1997 (**A**), 1998 (**B**) and 1999 (**C**), pmol/min/mg protein (see maps in Appendix C).

**A**




**B**

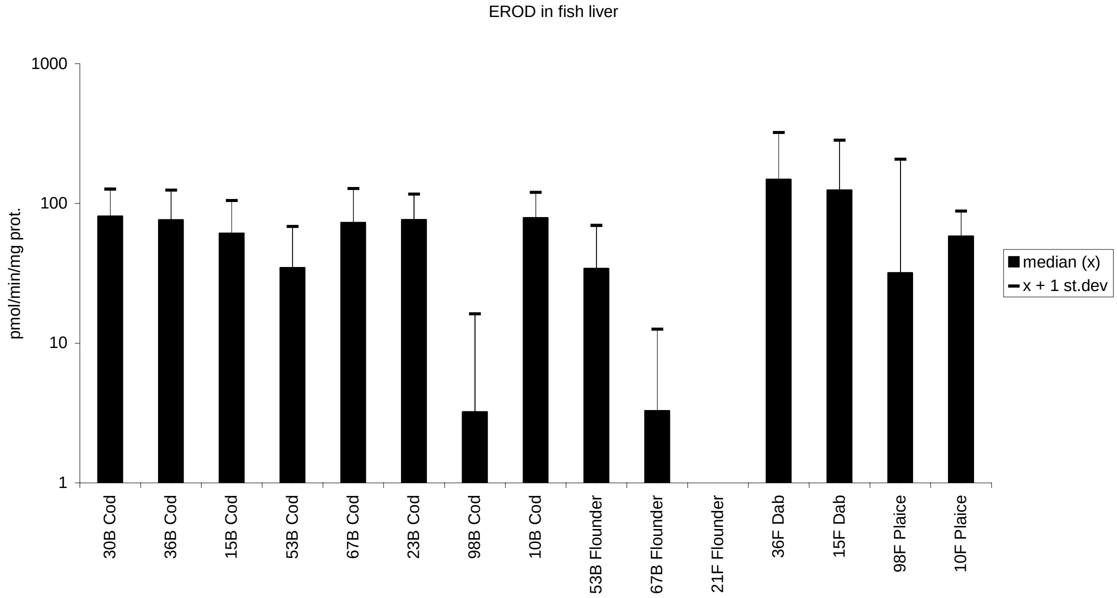



**Figure 15.** Median and standard deviation concentration for EROD (Cytochrome P4501A-activity) in fish liver 2000 (**A**) and 2001 (**B**), pmol/min/mg protein (see maps in Appendix C).

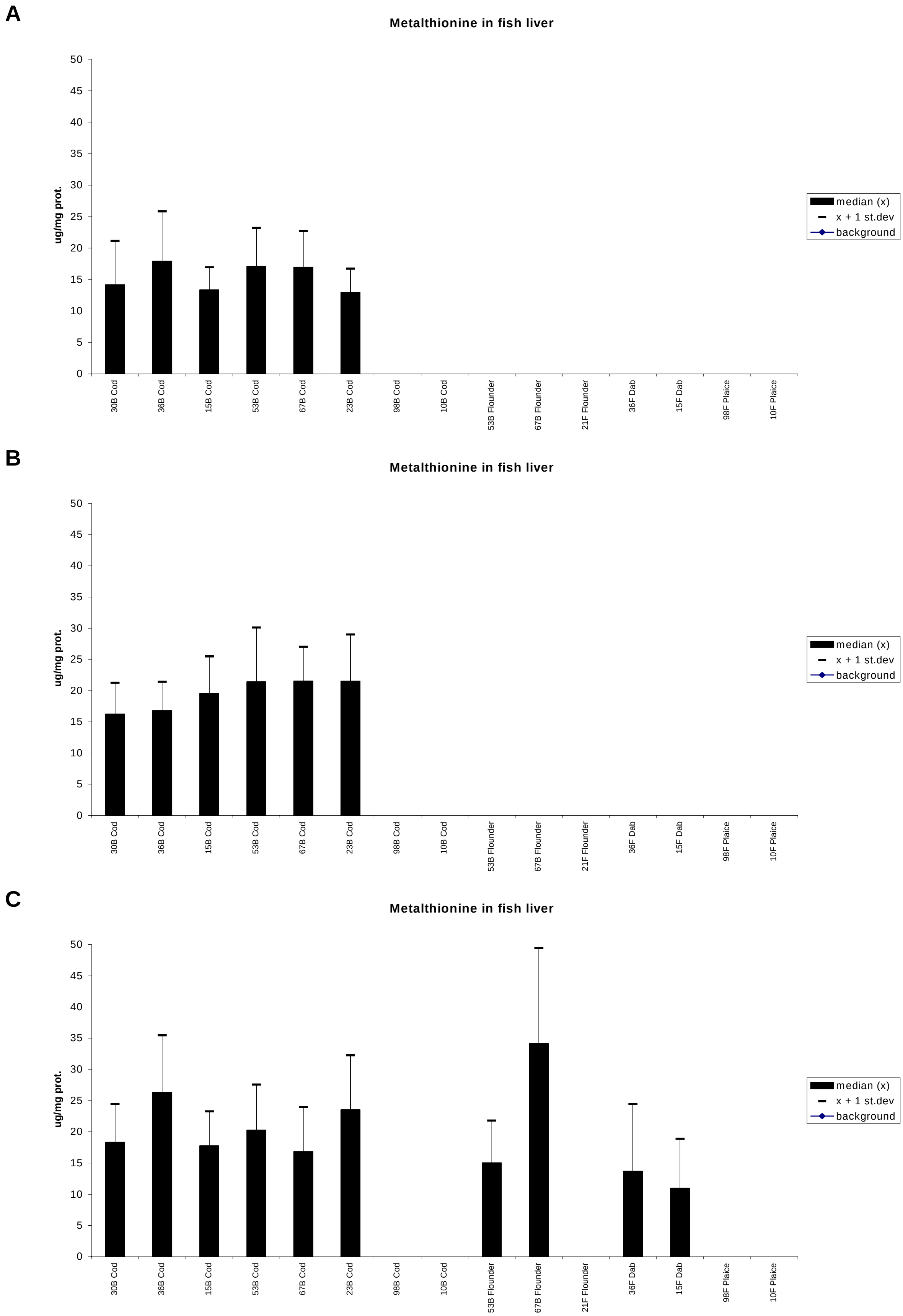
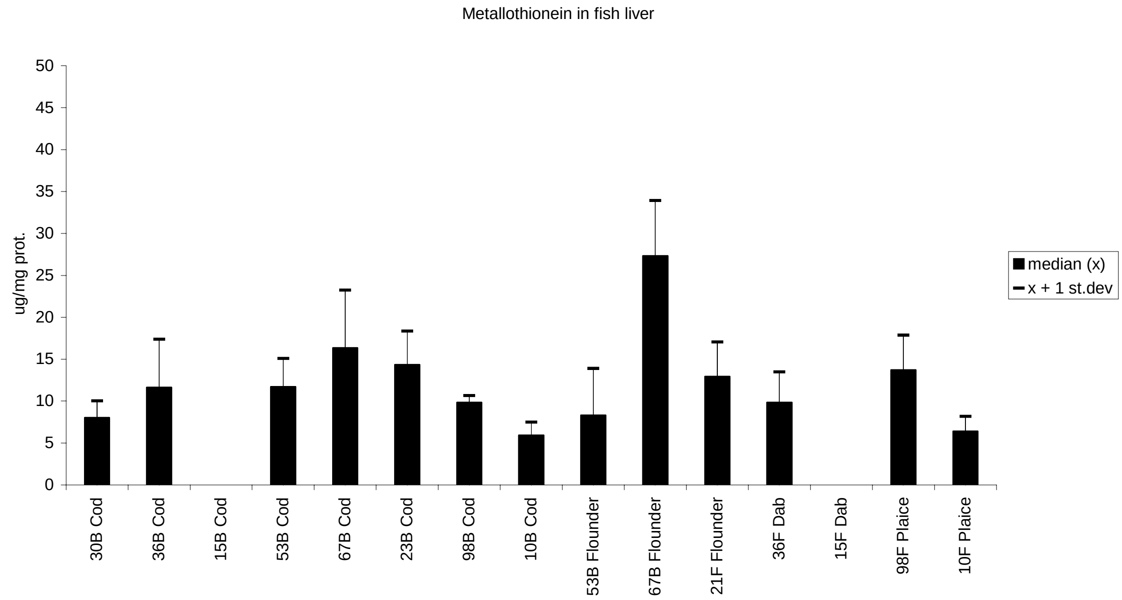



**Figure 16.** Median and standard deviation concentration for MT (Metallothionein) in fish blood 1997 (**A**), 1998 (**B**) and 1999 (**C**), µg/mg prot. (see maps in Appendix C).

**A**




**B**

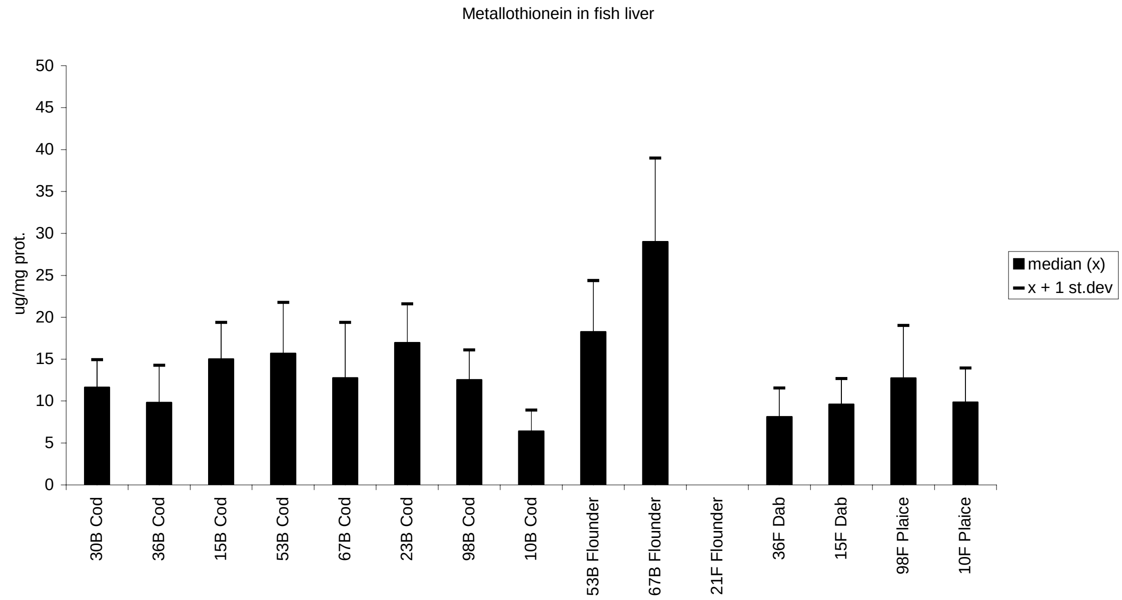



**Figure 17.** Median and standard deviation concentration for MT (Metallothionein) in fish blood 2000 (**A**) and 2001 (**B**), µg/mg prot. (see maps in Appendix C).