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**INTERNATIONAL COUNCIL FOR
THE EXPLORATION OF THE SEA**

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Demersal Fish Committee

**REPORT OF THE MEETING OF THE COORDINATORS IN
THE STOMACH SAMPLING PROJECT 1985 TO 1987**

IJMUIDEN, 28 MARCH - 1 APRIL 1988

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1. TERMS OF REFERENCE.

ICES passed during its 75th Statutory Meeting in Santander a resolution (C. res. 1987/2:10) that:

The species coordinators involved in the Stomach Sampling Programme in the North Sea will meet from 28 March - 1 April 1988 in IJmuiden to:

- a) evaluate the results obtained thus far with a view to providing input for the Multispecies Assessment Working Group;*
- b) organise the exchange of stomach content data and define requirements for setting up an international data base.*

2. PARTICIPATION.

The following people participated in the meeting:

Dr. P.J.Bromley	(UK, England)
Dr. N.Daan (Chairman)	(Netherlands)
Mr. H.Gislason	(Denmark)
Dr. J.R.G.Hislop	(UK, Scotland)
Mr. S.Mehl	(Norway)

3. INTRODUCTION.

Following a recommendation in 1984 (ICES C.Res. 1984/4:12), a new sampling programme for cod and whiting was started in 1985 with a view to collecting data which would allow a validation of the assumption underlying MSVPA that suitability of prey as food for predators is constant over time. During a period of three years (1985 to 1987) stomachs were to be sampled at a comparable level of intensity as in 1981, but for logistic reasons sampling was to be restricted to the first and third quarter only.

Cod and whiting were selected, because it was proven that these could be sampled adequately during routine surveys carried out during the agreed seasons. It was realized, however, that more extensive information was also required to evaluate the impact of saithe on various other exploited species and it was decided to collect as many samples as possible for this species as well.

In view of the forthcoming meeting of the Multispecies Assessment Working Group, the data obtained so far were to be analysed so as to provide the necessary input to this meeting. Since the evaluation of the results is more appropriately dealt with in association with MSVPA, this aspect was largely delayed until a later stage.

The methods used correspond largely to the ones applied to the 1981 data. However, standardization was greatly enhanced by a close cooperation between the institutes in Aberdeen and IJmuiden in setting up a common data base and using the same computer programs.

During a former meeting of the Multispecies Assessment Working Group, the wish has been expressed to split the information on sandeels into a northerly and a southerly stock component in accordance with the assessments of the Industrial Working Group. Although this could be done in principle and would not be difficult for the new data sets, it was at this stage not feasible to do so for the complete data set collected in 1981, because not all data were available for computer processing. Since a partial split would create logistic difficulties in running a MSVPA, it was decided to work up the sandeel data for the time being as if they represent one stock.

4. NEW DEVELOPMENTS IN MSVPA.

The MSVPA program has now been changed so that it can use a time series of food composition data to estimate an average suitability. The procedure was described by Gislason and Sparre (1987) and is illustrated in Fig.1.

An initial guess at the quarterly suitabilities is used to estimate predation mortalities and stock sizes. In each quarter for which food composition data are available these stock sizes are used to estimate a new suitability matrix in the usual way. The guessed suitabilities are then replaced by a weighted average of the new suitabilities and a new set of stock sizes and mortalities estimated. The procedure is repeated until the average suitability remains fairly constant.

The weight given to each suitability estimate should in some way reflect the precision with which the food composition is determined. With all the complications introduced by regurgitated stomachs, by weighting the samples with the abundance of the predator, by prey and predator ALKs etc. it is very complicated to derive a statistically sound estimate of the reliability of each individual set of data on food composition. At present the idea is therefore to use an estimate of the number of full stomachs sampled from each predator age group to weight the individual estimates of suitability.

However, an additional complication remains. In the MSVPA the food composition of each predator age class is estimated from:

$$\text{Food Comp} = \frac{G \cdot N \cdot W\text{-stom}}{\sum_{\text{prey}} G \cdot N \cdot W\text{-stom}}$$

Where G is suitability, N is the average numbers of a particular prey age group and W-stom is the average individual weight of the prey age group at ingestion. Assuming suitability to be constant, the average numbers of each prey age group can be estimated by the MSVPA, provided estimates of W-stom are available. In years and quarters with food composition data such estimates exist, but in the remaining time span W-stom must either be calculated from an additional model of size selection or it must be assumed to remain constant with time. The present version of the MSVPA model uses the second, and more simple option. Given several years of data on food composition and W-stom for a particular quarter the program initially calculates a weighted average of W-stom where the weight given to each observation equals the number of prey items observed. This quarterly average is then used in all subsequent calculations.

5. RESULTS.

The tables presented for the three species correspond largely to the lay-out used for the tables to be included in the Cooperative Research Report on the 1981

Stomach Sampling project. They include numbers per stomachs sampled per size class, area and quarter, food composition by major taxa by age class, quarter for the total North Sea and the average stomach content weights per 1000 fish by age class of commercially exploited prey species by predator age class, quarter and year for the total North Sea. The latter represent tables represent the input required for MSVPA.

In addition a mean prey weight at age by prey age class was calculated for each predator age class by quarter over the full range of years over which data have been collected, including 1981. These are also used as input for MSVPA (see also section 4). For cod and whiting these tables were derived by dividing the total weights by the total numbers of prey after summing over the years. For saithe the average prey weights in each quarter will be calculated dynamically during MSVPA program execution. Therefore, the data presented here refer to the newly collected data set specifically.

5.1. Cod.

The cod samples collected in 1985, 1986 and 1987 have all been analysed and the complete set of data was available for further analysis. The total number of stomachs sampled per quarter varied between 2500 and 3800 (Table 1.1.1/3), so that the level of sampling intensity is comparable to the 1981 programme. There were no major gaps in areas sampled in any of the seasons. Food composition by major taxa is given in Tables 1.2.1/6 and MSVPA input data in Tables 1.3.1/6. Mean prey weights are given in Table 1.4.1/2

5.2. Whiting

Whiting stomachs were sampled in the first and third quarters of each year. All the 1985 samples have been analysed and the data processed using the suite of programs developed at IJmuiden. Only part (ca 25 %) of the 1986 samples have been analysed and processed. As all the 1986 whiting data presented in this report relate to samples collected from the northern and central parts of the North Sea (Table 2.1.1/2), they must be regarded as highly provisional. Food composition is given in Tables 2.2.1/4 and MSVPA input data in Tables 2.3.1/4. Mean prey weights are given in Table 2.4.1/2

5.3. Saithe.

No stomach samples were available from 1985 and 1986 quarter 1. In 1986 third quarter 258 samples containing a total of 2104 stomachs were collected by England, The Netherlands, Norway and Scotland (see Table 3.1). Among these, 1227 were classified as full, 247 as empty and 630 as regurgitated. Compared with 1981, when only 1338 stomachs were collected over the entire year, this is a most satisfying result. Samples are also available from 1987, quarters 1 and 3. These samples have all been analysed, but have not yet been processed.

Stomach content composition is given in Table 3.1, MSVPA input data in Table 3.2 and mean prey weights in Table 3.3.

5.4. Prey ALK's.

The age composition of the fish prey can only be accurately estimated if suitable prey ALKs are available. In most cases satisfactory keys were obtained, for each area, year and sampling period from the IYFS and various national surveys. However, there is still a problem with sprats and sandeels.

In the case of sprats, area ALKs for the first quarter were obtained from the 1985, 1986 and 1987 IYFS. No ALKs could be found for the third quarter of any of these years, so it was necessary to process the data by applying the 1981 third quarter ALK (Table 4.1) to all areas. This is obviously a very unsatisfactory solution.

The situation is not much better for sandeels. The Industrial Fish WG was rather critical of the keys used in the 1981 SSP, and suggested that area ALKS

would have been more appropriate, or at the very least a distinction should have been made between the northern and southern parts of the North Sea. In the present exercise, 'northern' and 'southern' ALKs were obtained from the Danish industrial fishery. The 'northern' key was applied to sampling areas 1, 2 and 3 and the 'southern' key to the remaining areas. However, it must be admitted that these ALKs are far from ideal and for lack of better data, in some instances area and quarter specific ALKs had to be used from other years as indicated in Table 4.2.

The group recommends that the Industrial Working Group look into this problem and strongly urges interested parties to provide better sprat and sandeel ALKs so that the quality of the output data can be enhanced.

6. FOOD CONSUMPTION.

6.1. Digestion experiments.

Peter Bromley reported on the gastric evacuation experiments on cod, whiting and turbot which have been undertaken at Lowestoft. By the nature of the design of gastric experiments a bias is introduced into the results as the percentage of fish with empty stomachs increases with time towards the end of an experiment. Since stomach content cannot fall below zero the variance of the stomach content is therefore censored at zero. The effect of this is to give the impression that gastric evacuation slows down at low levels of stomach fullness.

For whiting, a curved relationship observed between mean weight of stomach content plotted against time was consistent with, and could be predicted from, a linear evacuation model in which evacuation rate in gh^{-1} was constant and independent of meal size, time after feeding and the level of stomach content. In the case of 268g whiting fed meal sizes ranging from 1.9 to 9% of body weight at 10 °C, the evacuation rate averaged 0.31 gh^{-1} for sandeels. (This does not of course exclude the possibility that evacuation rate might decline somewhat when very small meals are consumed and the rate will also vary with size of predator and temperature).

Such findings considerably alter the view of how stomach content data from the field sampling programme should be used to calculate the feeding rate estimates to be used as input to MSVPA. Up to now it has been assumed that the gastric evacuation rate is proportional to the level of stomach fullness. Assuming that the evacuation rate for fish of a particular size is constant, regardless of the level of stomach fullness, the average evacuation rate of the population is dependent on the proportion of fish which have food in the stomach and the proportion which are empty (or which contain indigestible remains), since the latter will have a zero evacuation rate (Bromley, 1987).

Preliminary comparisons show that feeding rates calculated in this fashion are roughly two or three times higher than the feeding rate estimates currently used as input data for MSVPA. However, the results of the Lowestoft experiments give estimates of the maximal feeding rates which are likely to be observed, since the experimental temperature was towards the upper range of those normally encountered by cod and whiting in the North Sea. After correction for temperature and with more precise information on the proportion of fish containing only traces of food or indigestible remains, the discrepancy between the two estimates will be reduced. An appraisal of the feeding rate data used in the 1986 MSVPA (Bromley, 1986) indicated that the resulting food conversion efficiencies were within physiologically acceptable levels. The effect of increasing the feeding rate estimate is of course to reduce conversion efficiency. Resulting conversion efficiencies are still physiologically acceptable but whether they give better or worse estimates of food conversion efficiency between trophic levels remains uncertain.

The gross biochemical composition of the fish prey would also appear to be an important factor governing evacuation rate. In wet weight terms, cod evacuated small sandeels (1g) at twice the rate of large (20g) sprats. The sprats

contained high levels of lipid and when expressed in dry weight terms evacuation rates were similar for both prey types. When expressed in energy terms the evacuation rate of sprat was actually faster than for sandeel.

The idea that evacuation rate may depend on the gross biochemical composition of the prey receives some support from the results of recent digestion experiments on whiting at Aberdeen. At a temperature of 13 °C meals of sprats were eliminated from whiting stomachs in an average time of 59 h whereas similar sized meals of sandeels took 83 h to disappear (A.P.Robb, pers. comm.). At 7 °C elimination times were longer and were almost the same for both prey (sprats, 118 h, sandeel, 115). The sandeels in the Aberdeen experiments were larger, and the sprats smaller than those used at Lowestoft. It is known that the body composition, and in particular the fat content, of both species varies with size and season. It is therefore quite likely that the unit energy content of the prey items used in the Aberdeen experiments differed from that used in Lowestoft.

In addition to biochemical composition it has also been shown (Singh, pers. comm.) that different prey types can be evacuated at markedly different rates. Lugworm, for example, are evacuated from cod stomachs several times faster than are sandeels. This is possibly related to the auto-digestion of lugworm by its own powerful digestive enzymes. Shrimp on the other hand are evacuated more slowly than sandeels, probably due to the delay caused by the need for the digestive enzymes to rupture the exoskeleton before digestion of the flesh can begin.

Such large variations in the evacuation rates of different prey types, if not accounted for, could substantially distort estimates of feeding rates and of food composition derived from stomach content data. It is current practice not to make allowance for differences in evacuation rate between prey types when calculating feeding rates for MSVPA. This has been largely a consequence of the lack of supporting evidence from experimental studies on digestion and evacuation. This is beginning to be rectified, but there is still a need for a continued commitment to the experimental programme investigating gastric evacuation in commercially exploited fish species.

6.2. Variation in feeding level.

Tables 5.1/3 present the average stomach content weight in grams and Tables 6.1/3 the percentage of empty stomachs for cod, whiting and saithe in the different quarters and years. All data are presented by predator size classes, except for the stomach content weights of whiting where predator age classes had to be used because the 1981 data on size classes were not available at the meeting. Note that size classes in use have been different in different years and that the data are arranged according to the lower class limit.

For cod the average stomach content weights and the percentages of empty stomachs seem to have been quite stable in the last 20-year period. The variations are most pronounced in the smallest and largest size classes where the number of stomachs sampled is lowest. In the medium size classes the average stomach content weights normally vary with a factor of less than 2, while the percentages of empty stomachs vary with a factor of up to 3. There does not seem to be a marked trend in the variations. In 80 % of the cases where more than 25 stomachs have been sampled, the percentage of empty stomachs is between 5 and 15, on average 9.6.

Looking at the whiting data, there seem to be larger variations, both between different quarters within the same year and between the same quarters in different years. The stomach content weights are normally highest in the third quarter, and the differences are greatest in the youngest age groups where the average weights increased with a factor of 2-4 from the first to the third quarter. There has also been an increase in the stomach content weights from 1981 to 1985, and possibly a further increase from 1985 to 1986. However, the 1986 data are not complete and those stomachs that have been worked up come from areas where the stomach content weights are normally high and the percentage of empty

stomachs low (J. Hislop, pers. comm.). From 1981 to 1985 the average weights increased by a factor of about 1.5 - 2.

The percentage of empty whiting stomachs has decreased during the same period. In 1981 the percentage was quite stable for all size classes and quarters; on average 24.0 % of the stomachs were empty. In the first quarter of 1985 this percentage had dropped to 16.4, and in the third quarter to 5.8, on average 11.1 % for the whole year. In 1986 the figures were 4.4 % in the first quarter, 0.5 % in the third quarter and 2.5 % on average for the whole year. But again it should be noted that the 1986 data are preliminary.

The picture is least clear for saithe and here variations are largest but also the number of stomachs sampled lowest. There does not seem to be a clear trend in the variations within years or between years, neither for the average stomach content weights nor for the percentage of empty stomachs. Both parameters vary with a factor of up to 20 within the same size class.

According to the results of gastric evacuation experiments reported by Peter Bromley, the rate of evacuation was constant and independent of the level of stomach content. Thus the feeding level of a fish population is dependent on the proportion of fish which have food in the stomach, but not dependent on the actual amount of food in the stomachs. This should indicate that the feeding level for cod has been constant over the last 20 years. For whiting there might have been an increase in feeding level from 1981 to 1985/86 because the percentage of empty stomachs has decreased. For saithe there seem to be large variations in feeding level within each year, but no clear tendency between the different years.

6.3 Estimates of consumption

So far the experimental evidence on stomach evacuation rates does not allow firm conclusions to be drawn on the rates of food consumption in fish populations in the wild and the selection of values to be applied in MSVPA remains a very difficult problem. The data obtained so far indicate that stomach evacuation rate in terms of grams per hour is independent of meal size, which suggests that the proportion of empty stomachs might be a better measure of feeding level than the average stomach contents. However, although digestion rate might increase rapidly to a maximum at relatively low intensity of feeding, it would seem likely that there is also some minimum time required for digestion of any item after ingestion. The applicability of this model to the situation in the sea thus depends on the distribution pattern of individual stomach content weights among the fish sampled.

The data collected so far do not allow an evaluation of this distribution, because for logistic reasons the stomachs were grouped by size class before they were analyzed. Perhaps some carefully designed sampling programmes at a smaller scale could resolve these matters satisfactorily.

In multispecies assessment it seems prudent not to overestimate effects of predation, and rates of food consumption should remain on the conservative side. So for the time being there appears no reason to change the rates of food intake in the standard MSVPA, even if the experimental data suggest higher rather than lower food consumption. However, although the standard ration still is acceptable, it would seem unrealistic to continue to use half ration values as was done on earlier occasions by the Multispecies Assessment Working Group.

7. DATA BASE STOMACH CONTENTS.

7.1. Exchange data files.

The exchange format for stomach content data defined on an earlier occasion (Anonymus, 1984) is copied in Table 7 for convenience. This format has been applied effectively in the past to transfer data from one system to another and in fact copies of all data sets collected after 1981 were available at the meeting and

could be treated with one set of computer programs. For all practical purposes the problem of data exchange appears to be solved, but there is still a problem with the 1981 whiting data. These are presently maintained on an old machine, which is likely to be replaced shortly, in a format which cannot be immediately translated into exchange tape format. The group stressed the urgent need to address this problem, because otherwise the data might become lost for all other applications.

7.2. International data base.

Although data can be effectively exchanged, there is at present no complete international data base maintained anywhere and the species coordinators are still responsible for quality control and updating of data systems. The group felt that it is beyond the possibilities of any of the institutes involved to take on the responsibility of such a data base. On the other hand, the experience with the data base developed by ICES for the International Young Fish Surveys indicates that it would not be an easy matter for the computer section of ICES to take on this responsibility either. It would certainly be a costly and time consuming activity. Because of the progress that is being made among the various institutes in exchanging analysis programs, it might be more appropriate to follow these lines of standardization rather than to indulge in a major data base project. However, complete standardization in collection and processing of data must be ensured, before any new stomach sampling programme is started.

8. COOPERATIVE RESEARCH REPORT SSP 1981.

A draft has been prepared which includes a fairly detailed description of the aims, history and methodology of the project, some of the basic data (sampling intensity, predator and prey ALKs, prey weights at age etc.) and a selection of the many possible output tables. This draft will be sent to ICES before the 1988 Council Meeting. There is still some disagreement between the contributors over how much detailed information the Report should contain. In particular, some of the species coordinators favour the inclusion of a set of Tables giving the size distribution of each of the major commercial prey species within each predator age/sampling area/quarterly combination. As these Tables represent about 30% (by weight) of what is at the moment a formidably bulky document, the Group agreed that a decision on their inclusion should be left to the General Secretary of ICES.

9. SPECIAL ISSUE JOURNAL DU CONSEIL.

The 1981 SSP is probably the largest exercise of its kind that has ever been undertaken. The data have provided new insights into rates of natural mortality, which are being taken into account by Assessment Working Groups. However, the results of the project have not yet been formally published. Preliminary reports have been presented to ICES but in many cases these contain errors and/or are based on analytical procedures that have since been revised. Several years ago it was suggested that the results of the 1981 Project should be presented in a special issue of the Journal du Conseil. This procedure would ensure that the results of the Project, which were achieved at considerable expense to several national laboratories, became established in the scientific literature and would allow the Project to be viewed as an entity. The plan was to prepare an introductory section, outlining the aims and methodology, followed by rather brief summaries of the results obtained from each predator. A summing up section would deal with the application of the results to trials of MSVPA.

This plan has not yet been implemented. In an act of desperation some of the species coordinators have written up their work in a more elaborate form than had been originally proposed, with a view to publishing their results independently. If these papers are published there may be considerable repetition of the aims, methods and global results of the ISSP (although this could be kept to a minimum by referring to the proposed Cooperative Research Report). Although

this course of action is far from ideal, several members of the Group felt that as such a long time has elapsed since 1981, the submission for publication of self-contained species reports ought not to be discouraged. However, it was agreed that the special issue should be granted a stay of execution; if introductory and concluding sections could be sent to the Editor of the Journal du Conseil before the end of 1988, any individual contributions that had already been submitted could be appropriately modified.

10. FOLLOW UP.

A decision on whether the 1981 exercise should be repeated in 1991 has to await the results of the forthcoming meeting of the Multispecies Assessment Working Group. If a new sampling programme is proposed, it should be borne in mind that the present stomach sampling scheme has the following drawbacks with respect to estimating the average stomach content of the population:

- a) Only fish staying near the bottom are caught . This may be especially important for saithe which is known to perform vertical migrations.
- b) Sampling has not been at random throughout the 24 hours. Most samples have been obtained during daytime. This may bias the results.
- c) It is suspected that both the criteria for excluding prey items presumed to have been eaten in the trawl from the samples and the classification of regurgitated stomachs may have differed between countries and surveys. Better guidelines should be prepared.
- d) At present stomach contents within size classes are pooled and average weights of food are calculated. If some measure of the distribution of the stomach content weights among individual fish could be obtained, this might allow the application of more appropriate methods of estimating consumption rates.
- e) So far only 5 species of the 9 included in MSVPA have been investigated thoroughly in respect of food composition. Although the others are probably insignificant in respect of feeding on juveniles above age 1, predation on 0-group might be important. At present the 0-group phase is excluded from MSVPA, but it might be possible to include at least the second half of the first year of life. In that case, extension of the programme to include other species as well might be considered.

These problems deserve further consideration prior to a repetition of the 1981 exercise.

12. REFERENCES.

- Anonymus, 1984 - Report of the meeting of the Coordinators of the Stomach Sampling project 1981. ICES C.M. 1984/G:37.
- Bromley,P.J.,1986 - An appraisal of the MSVPA feeding data. Working paper MSVPA Working Group 1986.
- Bromley,P.J.,1987 - The effects of food type, meal size and body weight on digestion and gastric evacuation in turbot, *Scophthalmus maximus* L. J. Fish. Biol. 30, 501-512.
- Bromley,P.J.,1988 - Gastric digestion and evacuation in whiting (*Merlangius merlangus*) J. Fish. Biol. (In press).
- Gislason,H. and Sparre,P.,1987 - Some theoretical considerations on the implementation of Multispecies Virtual Population Analysis in ICES. ICES CM. 1987/G:52.

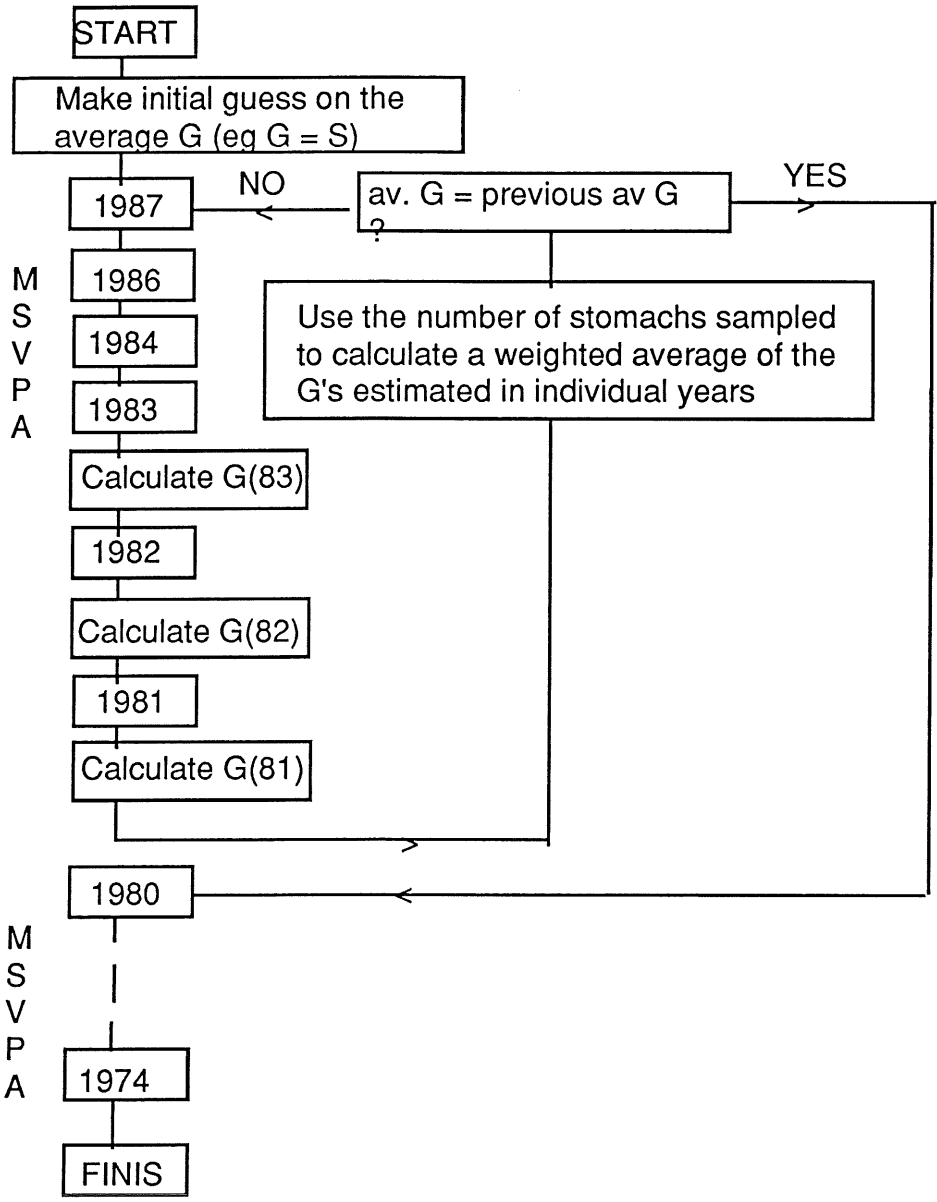


Fig. 1
The computational procedure for estimation of suitability coefficients based on a time series of food composition data.

Table 1.1.1
Number of stomachs sampled by size class of cod, area and quarter in 1985.

Size class	70	80	100	150	200	250	300	350	400	500	600	700	800	1000	Total	
Quarter 1																
Area 1				3	58	131	130	103	129	116	68	51	23	2	814	
Area 2				2	48	115	49	20	36	6	10	13	17	8	324	
Area 3			1	2	5	6	19	16	43	8	2	9	17		128	
Area 4				5	31	58	73	45	36	6	8	8	13	6	289	
Area 5				3	2	1	8	12	27	21	12	6	3	1	96	
Area 6				27	66	82	88	177	147	104	95	54	12	34	12	898
Area 7				13	10	28	50	28	10	3	1	3	6	3	1	156
Total				41	91	254	449	484	353	378	253	157	105	110	30	2705
Quarter 3																
Area 1			10		5	9	94	139	167	66	51	26	40	4	611	
Area 2					2	43	202	130	110	28	8	7	10	2	542	
Area 3					6	13	12	10	14	6	1		1	1	64	
Area 4				2	13	33	76	56	53	29	13	12	14		301	
Area 5				10	2		1	1			1				15	
Area 6	34			41	2	49	102	103	70	104	173	105	69	2	2	856
Area 7				9		16	16	40	15	36	9	7	6	12	6	172
Total	34		70	6	91	217	528	420	484	311	186	120	79	15	2561	

Table 1.1.2
Number of stomachs sampled by size class of cod, area and quarter in 1986.

Size class	70	80	100	150	200	250	300	350	400	500	600	700	800	1000	Total
Quarter 1															
Area 1				7	4	13	24	43	214	106	88	58	22	5	584
Area 2			95	127	29	3	11	36	33	10	3	2	40	18	407
Area 3			38	18	12	2	12	17	7	1	1	3	13	3	127
Area 4			37	148	68	23	7	9	20	4		38	38	16	408
Area 5			1	30	29	8	1	1	2	17	2	6	12	8	117
Area 6	2		247	265	144	139	27	6	18	53	147	60	20	12	1140
Area 7			54	44	25	6	11	16	21	7	3	4	1	2	194
Total	2		472	639	311	194	93	128	315	198	244	171	146	64	2977
Quarter 3															
Area 1	10		1	11	58	38	23	25	65	137	46	60	26	3	503
Area 2			10	82	277	229	124	54	71	59	28	9	34	9	986
Area 3				34	63	37	6	1	6	6	6	1	2	1	157
Area 4			1	36	143	164	101	42	23	13	15	5	4	2	549
Area 5				6	17	14	17	13				1			68
Area 6	3		9	22	206	334	287	162	55	3	6	1	1		1089
Area 7				53	101	90	58	27	15	14	13	7	3		381
Total	13		21	204	825	935	644	333	243	232	114	84	70	15	3733

Table 1.1.3
Number of stomachs sampled by size class of cod, area and quarter in 1987.

Size class	70	80	100	150	200	250	300	350	400	500	600	700	800	1000	Total
Quarter 1															
Area 1			4	4	24	100	130	90	76	18	30	20	7		503
Area 2			26	38	72	155	80	38	7	5		5	29	15	470
Area 3			2	34	22	26	66	24	10	1	2	3	4		194
Area 4			8	15	42	89	102	80	26	6	5	5	15	4	397
Area 5			1	5	25	14	16	25	27	19	1	3	5	1	142
Area 6			29	98	112	65	59	67	86	35	9	14	21	21	616
Area 7			19	15	17	34	33	33	14	1	6		3		175
Total			89	209	314	483	486	357	246	85	53	50	84	41	2497
Quarter 3															
Area 1				16	36	30	32	134	173	57	42	37	28	1	586
Area 2				48	123	95	122	123	152	28	8	13	11	7	730
Area 3			1		27	51	37	23	18	9	6	4	5	1	182
Area 4				1	51	85	120	153	99	22	6	1	5	1	544
Area 5					17	22	35	23	31	24	9	2			163
Area 6			2	12	122	244	248	168	123	56	13	1	1		990
Area 7				12	101	128	109	122	95	34	3	3	3	3	613
Total			3	89	477	655	703	746	691	230	87	61	53	13	3808

Table 1.2.1
Summary of stomach contents by predator by age class, area and quarter.

PREDATOR : COD	YEAR : 1985			QUARTER : I		ALL AREAS	
	0	1	2	3	4	5	6+
GENERAL RESULTS							
Nr of st. sampled	145	1870	346	211	55	78	
Nr of st. with food	132	1512	295	184	47	66	
Nr of regurgit. st.	6	174	17	4	1	7	
Nr of empty st.	9	184	31	23	6	6	
% empty st.	6.207	9.840	8.960	10.900	10.909	7.692	
Mean length	17.620	32.720	53.290	71.420	80.530	96.880	
Total wght all prey	1.015	8.947	43.257	95.384	112.997	166.168	
Total nr of prey items	3.141	5.146	12.997	13.715	10.869	7.608	
Average prey wght	0.323	1.739	3.328	6.955	10.396	21.840	
WEIGHT % BY MAJOR TAXA							
CNIDARIA	0.24	0.05	0.01	0.00	.00		
ANNELLIDA	20.77	4.08	1.34	1.40	1.58	1.28	
GASTROPODA	3.47	0.79	0.34	0.44	0.47	0.31	
BIVALVIA	5.42	5.32	2.45	1.47	1.00	0.11	
CEPHALOPODA		0.64	0.12	0.03	0.01	0.00	
CRUSTACEA	40.41	25.79	11.98	5.92	5.76	7.48	
MYSIDA	0.75	0.03	0.00	0.00	0.00		
VALVIFERA	0.05	0.08	0.03	0.02	0.01	0.00	
GAMMARIDEA	0.70	0.10	0.00	0.00			
EUPHAUSIACEA	0.00	0.06	0.01	0.00	0.00		
CARIDEA	30.34	11.87	3.12	0.71	0.38	0.07	
ASTACIDEA		1.48	1.45	1.45	1.33	1.51	
ANOMURA	5.01	5.36	2.13	0.76	0.42	0.05	
OXYRHYNCHA	0.15	1.47	1.44	0.57	0.39	0.15	
CANCRIDEA	0.06	0.44	0.83	0.86	1.43	3.32	
BRACHYRHYNCHA	3.31	4.91	2.95	1.54	1.80	2.37	
OTHER CRUST.**)	0.04	0.00	0.00	0.00	0.00	0.00	
ECHIURA	0.39	0.04	0.01	0.00			
ECHINODERMATA		0.18	0.03	0.01	0.00	0.00	
UROCHORDATA	0.75	0.09	0.16	0.29	0.20	0.01	
GNATHOSTOMATA I	28.51	62.92	83.50	90.43	90.96	90.81	
OTHER *)	0.04	0.10	0.05	0.00	0.00		
UNKNOWN		0.00	0.00				
WEIGHT % COMMERCIAL SPEC.							
G. morhua		0.39	0.98	1.01	1.26	1.77	
M. aeglefinus	0.55	7.08	7.89	10.87	10.98	5.40	
M. merlangus	5.00	4.40	9.00	7.97	7.95	13.13	
T. esmarkii	6.27	16.23	28.21	26.08	19.27	4.62	
C. harengus	0.22	12.99	15.44	20.76	23.16	17.22	
S. sprattus	1.16	1.30	1.26	1.28	1.26	0.71	
AMMODYTIDAE	0.13	4.74	4.05	2.33	1.43	0.14	
P. platessa		0.47	0.47	1.72	5.15	20.75	
S. solea	0.02	0.85	0.68	0.23	0.11	0.05	
L. limanda	0.7	3.26	5.19	7.02	9.29	17.77	
S. scomber				0.14	0.28	0.26	
N. norvegicus		1.41	1.43	1.45	1.33	1.51	
C. crangon	10.93	5.57	1.40	0.14	0.04	0.01	

*) Include PHAEOPHYTA, PORIFERA, CTENOPHORA, RHYNCHOCOELA, SCAPHOPODA, PYCNOGONIDA, SIPUNCULA, PRIAPULIDA, CEPHALOCHORDATA

**) Include CUMACEA, HYPERIIDAE, OXYSTOMATA

Table 1.2.2
Summary of stomach contents by predator by age class, area and quarter.

PREDATOR : COD	YEAR : 1985			QUARTER : 3		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+
GENERAL RESULTS							
Nr of st. sampled	106	356	1630	270	130	28	42
Nr of st. with food	100	273	1061	204	95	20	31
Nr of regurgit. st.	0	39	413	33	17	4	6
Nr of empty st.	6	46	157	34	17	3	4
% empty st.	5.660	12.921	9.632	12.593	13.077	10.714	9.524
Mean length	.180	26.170	39.160	63.450	77.880	90.400	96.590
Total wght all prey	0.125	2.189	12.891	59.672	103.408	152.646	200.950
Total nr of prey	1.610	3.939	4.811	5.957	7.388	9.262	10.725
Average prey wght	0.078	0.556	2.679	10.017	13.997	16.481	18.736
WEIGHT % BY MAJOR TAXA							
CNIDARIA		0.00	0.00	0.16	0.11	0.02	
ANNELLIDA	16.96	7.80	7.00	4.78	6.82	.57	4.83
GASTROPODA		2.92	0.65	0.06	0.00	0.00	0.00
BIVALVIA		3.51	1.52	0.21	0.20	0.18	0.10
CEPHALOPODA		0.01	1.45	7.55	2.42	0.80	0.41
CRUSTACEA	69.12	42.31	29.17	20.62	25.20	24.14	20.46
MYSIDA	0.20	0.19	0.04	0.00	0.00	0.00	
CUMACEA	0.85	0.01					
VALVIFERA		0.10	0.05	0.00	0.00	0.00	0.01
GAMMARIDEA	1.32	0.07	0.01	0.00	0.00	0.00	
EUPHAUSIACEA		0.56	0.11	0.00			
CARIDEA	42.20	2.58	0.73	0.13	0.11	0.09	0.05
ASTACIDEA		0.81	6.21	3.02	4.79	4.81	3.30
ANOMURA	1.49	15.41	5.35	1.38	1.01	0.39	0.17
OXYRHYNCHA	5.17	5.95	2.29	0.49	0.18	0.06	0.03
CANCRIDEA	5.25	4.16	7.08	10.31	15.06	16.04	15.29
BRACHYRHYNCHA	12.55	12.40	7.30	5.23	4.04	2.75	1.61
OTHER CRUST. **)		0.10	0.08	0.01	0.07	0.02	0.00
ECHIURA		0.23	0.04	0.00			
PRIAPULIDA		0.68	0.06	0.00			
ECHINODERMATA		0.14	0.46	0.19	0.02	0.00	0.00
GNATHOSTOMATA	13.92	42.32	59.60	66.40	65.21	68.29	74.19
OTHERS*)		0.06	0.05	0.02	0.01	0.01	0.00
UNKNOWN		0.02	0.00	0.00			
WEIGHT % COMMERCIAL SPEC.							
G. morhua		1.76	0.35	4.94	8.34	6.14	3.46
M. aeglefinus		7.75	8.64	11.38	6.00	5.87	7.40
M. merlangus		2.29	8.50	9.71	5.28	5.59	7.76
T. esmarkii	9.48	5.14	15.23	7.12	1.87	0.51	0.53
C. harengus		5.41	4.94	5.06	4.99	4.51	3.79
S sprattus		0.02	0.31	0.02			
AMMODYTIDAE		13.25	10.20	1.91	0.65	0.40	0.24
P. platessa		0.02	0.30	1.66	0.40	1.40	3.32
L. limanda		1.27	1.16	2.73	7.01	7.87	7.14
S. scomber				0.79	6.41	8.01	6.86
C. crangon	39.58	0.07	0.00	0.00	0.00	0.00	

*) Include PHAEOPHYTA, SCAPHOPODA, PYCNOGONIDA, ECTOPROCTA, UROCHORDATA, CEPHALOCHORDATA, AGNATHA

**) Include HYPERIIDEA, OXYSTOMATA

Table 1.2.3
Summary of stomach contents by predator by age class, area and quarter.

PREDATOR : COD	YEAR : 1986			QUARTER : 1		ALL AREAS	
	0	1	2	3	4	5	6+
GENERAL RESULTS							
Nr of st. sampled	1550	273	598	280	139	137	
Nr of st. with food	1082	210	487	242	116	105	
Nr of regurgit. st.	321	37	53	7	3	10	
Nr of empty st.	147	25	59	30	20	22	
% empty st.	9.484	9.158	9.866	10.714	14.388	16.058	
Mean length	19.010	33.950	49.110	64.920	80.150	93.580	
Total wght all prey	1.245	8.794	26.408	54.870	88.996	119.989	
Total nr of prey	2.557	3.832	5.718	6.738	6.055	6.612	
Average prey wght	0.487	2.295	4.619	8.144	14.697	18.147	
WEIGHT % BY MAJOR TAXA							
CNIDARIA		1.37	1.29	0.20	0.04	0.03	
ANNELLIDA	9.05	2.95	3.53	2.85	2.90	2.19	
GASTROPODA	1.62	1.31	1.26	0.77	0.31	0.11	
BIVALVIA	3.27	1.46	0.31	0.11	0.06	0.04	
CEPHALOPODA	0.45	0.74	0.53	0.43	0.17	0.05	
CRUSTACEA	39.61	14.83	9.31	9.27	7.93	7.51	
MYSIDA	0.37	0.01	0.00	0.00	0.00	0.00	
GAMMARIDEA	0.29	0.01	0.00	0.00	0.00	0.00	
EUPHAUSIACEA		0.40	0.10	0.00	0.00	0.00	
CARIDEA	27.72	6.48	2.24	1.41	0.65	0.26	
ASTACIDEA	0.02	0.48	1.14	1.67	2.10	2.84	
ANOMURA	7.80	4.68	2.19	2.17	1.35	1.20	
OXYRHYNCHA	0.22	0.92	0.56	0.18	0.07	0.03	
CANCRIDEA	0.09	0.27	0.53	0.72	0.63	0.36	
BRACHYRHYNCHA	3.08	1.53	2.51	3.10	3.13	2.82	
OTHER CRUST. **)	0.02	0.05	0.03	0.01	0.00	0.00	
ECHIURA	0.14	0.00	0.00	0.02	0.01	0.00	
ECHINODERMATA	0.04	0.20	0.33	0.21	0.42	0.30	
CEPHALOCHORDATA	0.08	0.00	0.00				
GNATHOSTOMATA I	45.73	77.11	83.42	86.12	88.13	89.75	
OTHERS *)	0.00	0.00	0.01	0.02	0.02	0.01	
WEIGHT % COMMERCIAL SPEC.							
G. morhua		0.15	2.63	3.51	4.38	2.81	
M. aeglefinus	1.09	14.77	11.04	7.70	10.10	7.28	
M. merlangus	0.77	6.70	9.28	10.71	10.42	8.50	
T. esmarkii	0.73	18.53	20.66	16.68	9.44	7.25	
C. harengus	2.62	6.31	13.26	21.12	30.24	32.21	
S. sprattus	1.11	2.09	4.26	2.68	0.65	0.17	
AMMODYTIDAE	19.02	16.09	6.56	1.73	0.44	0.27	
P. platessa		0.04	0.61	1.77	1.86	3.45	
S. solea	0.09	0.27	1.08	1.89	1.37	1.66	
L. limanda	0.51	0.32	3.76	7.31	8.17	12.01	
S. scomber			0.00	0.32	1.27	1.62	
C. crangon	9.79	2.32	0.87	0.72	0.29	0.09	

*) Include RHYNCHOCOELA, SCAPHOPODA, PRIAPULIDA, ECTOPROCTA, UROCHORDATA

**) Include CUMACEA, VALVIFERA, OXYSTOMATA

Table 1.2.4
Summary of stomach contents by predator by age class, area and quarter.

PREDATOR : COD	YEAR : 1986			QUARTER : 3		ALL AREAS	
	0	1	2	3	4	5	6+
GENERAL RESULTS							
Nr of st. sampled	34	3022	133	408	72	43	23
Nr of st. with food	26	2416	102	299	59	36	21
Nr of regurgit. st.	0	187	18	77	11	5	1
Nr of empty st.	8	421	11	31	3	2	0
% empty st.	23.529	13.931	8.271	7.598	4.167	4.651	0.00
Mean length	8.380	28.340	42.650	56.010	74.950	91.320	104.520
Total wght all prey	0.069	3.747	14.810	35.647	80.985	144.029	342.188
Total nr of prey	0.717	4.054	4.288	4.693	5.902	8.435	10.415
Average prey wght	0.096	0.924	3.454	7.596	13.721	17.076	32.855
WEIGHT % BY MAJOR TAXA							
CNIDARIA		0.08	0.02	0.00			
ANNELLIDA	1.12	5.73	4.53	6.77	4.23	2.18	1.91
GASTROPODA		0.31	0.40	0.13	0.18	0.37	0.05
BIVALVIA		6.05	2.52	0.54	0.02	0.02	0.00
CEPHALOPODA		0.04	0.04	0.18	0.05	0.01	0.00
CRUSTACEA	63.57	45.61	25.47	22.06	28.62	21.66	10.06
MYSIDA	1.79	0.04	0.00	0.00			
VALVIFERA		0.03	0.08	0.09	0.01	0.01	0.01
CARIDEA	55.00	5.27	2.27	0.94	0.51	0.08	0.05
ASTACIDEA		4.63	2.56	5.23	14.01	9.68	2.61
ANOMURA	1.72	12.40	3.80	1.81	0.27	0.14	0.02
OXYRHYNCHA		2.06	1.23	0.77	0.18	0.21	0.03
CANCRIDEA		2.98	3.75	3.93	4.50	5.05	5.14
BRACHYRHYNCHA	5.06	18.00	11.76	9.29	9.13	6.46	2.19
OTHER CRUST. **)		0.20	0.00	0.00	0.01	0.03	0.00
ECHIURA		0.15	0.12	0.04		0.00	
PRIAPULIDA		0.36	0.01				
ECHINODERMATA		0.32	0.21	0.26	0.03	0.01	0.00
UROCHORDATA		0.15	0.00				
GNATHOSTOMATA I	35.31	41.15	66.65	70.00	66.87	75.76	87.97
OTHERS*)		0.04	0.00	0.00		0.00	
UNKNOWN		0.01	0.03	0.01			
WEIGHT % COMMERCIAL SPEC.							
G. morhua	18.89	0.02	0.12	0.06	0.32	0.59	0.08
M. aeglefinus		1.95	6.25	6.90	3.44	4.45	6.23
M. merlangus		1.09	2.35	2.73	5.86	5.79	2.06
T. esmarkii		3.94	23.79	23.47	16.43	3.72	3.26
C. harengus		5.89	8.29	10.56	19.31	37.01	57.88
AMMODYTIDAE		16.66	6.81	2.07	2.62	5.30	0.69
P. platessa		0.18	0.37	0.27	0.38	2.25	6.58
S. solea		0.88	0.40	0.04			
M. kitt				0.08	1.76	4.20	2.24
L. limanda		1.57	4.94	7.99	4.16	1.94	1.88
N. norvegicus		0.05	0.00				
C. crangon		2.34	0.87	0.08			

*) Include RHYNCHOCOELA, SCAPHOPODA, PYCNOGONIDA, CEPHALOCHORDATA

**) Include CUMACEA, GAMMARIDEA, HYPERIIDEA, EUPHAUSIACEA, OXYSTOMATA

Table 1.2.5
Summary of stomach contents by predator by age class, area and quarter.

PREDATOR : COD	YEAR : 1987			QUARTER : 1		ALL AREAS	
	0	1	2	3	4	5	6+
GENERAL RESULTS							
Nr of st. sampled	607	1632	88	126	37	76	
Nr of st. with food	483	1233	67	101	30	55	
Nr of regurgit. st.	58	247	13	14	4	9	
Nr of empty st.	65	150	7	11	3	11	
% empty st.	10.708	9.191	7.955	8.730	8.108	14.474	
Mean length	20.200	33.660	43.700	70.710	81.450	98.230	
Total wght all prey	1.170	6.760	14.917	60.335	77.078	115.202	
Total nr of prey	3.296	3.593	4.161	5.564	5.648	5.219	
Average prey wght	0.355	1.881	3.585	10.843	13.646	22.074	
WEIGHT % BY MAJOR TAXA							
CNIDARIA		0.06	0.08	0.01	0.00		
ANNELLIDA	15.80	4.94	3.29	2.34	2.26	2.20	
GASTROPODA	0.52	0.75	0.92	0.74	0.60	0.17	
BIVALVIA	6.42	3.03	1.14	0.30	0.19	0.06	
CEPHALOPODA	0.17	0.43	0.51	0.69	0.59	0.14	
CRUSTACEA	38.88	23.34	18.53	7.44	6.69	3.81	
MYSIDA	0.20	0.01	0.00	0.00			
GAMMARIDEA	0.32	0.07	0.01	0.00			
EUPHAUSIACEA	2.20	1.02	0.23	0.00			
CARIDEA	22.45	7.00	4.91	0.88	0.47	0.17	
ASTACIDEA	0.00	1.55	3.55	3.41	2.72	1.13	
ANOMURA	7.34	6.77	4.86	0.65	0.36	0.22	
OXYRHYNCHA	1.87	1.08	0.42	0.01	0.00		
CANCRIDEA	0.43	0.67	0.40	0.15	0.16	0.21	
BRACHYRHYNCHA	4.00	5.16	4.14	2.33	2.99	2.08	
OTHER CRUST. **)	0.07	0.02	0.01	0.00			
ECHINODERMATA	0.03	0.06	0.02	0.00	0.00	0.00	
UROCHORDATA		0.09	0.09	0.00			
GNATHOSTOMATA	38.00	67.18	75.38	88.47	89.65	93.62	
OTHERS *)	0.06	0.05	0.01	0.00			
UNKNOWN	0.12	0.08	0.03	0.00			
WEIGHT % COMMERCIAL SPEC.							
G. adus morhua	0.15	1.23	1.93	8.48	10.81	17.25	
M. aeglefinus	2.62	8.46	8.16	13.85	13.08	4.74	
M. merlangus	2.71	10.62	18.78	15.22	9.61	11.73	
T. esmarkii	5.52	11.95	8.63	2.64	1.98	0.66	
C. harengus	5.49	9.35	9.79	12.27	14.52	9.48	
S. sprattus	0.06	0.19	0.24	0.02	0.00		
AMMODYTIDAE	11.67	10.92	6.45	1.07	0.57	0.18	
P. platessa		0.33	0.91	7.76	10.96	23.82	
S. solea	0.06	1.01	1.03	0.24	0.14	0.04	
L. limanda	0.12	2.10	8.31	17.05	18.24	19.31	
S. scomber		0.05	0.12	0.03	0.02	0.02	
C. crangon	4.83	1.42	1.02	0.21	0.10	0.02	

*) Include SCAPHOPODA, ECHIURA, PRIAPULIDA

**) Include VALVIFERA, OXYSTOMATA

Table 1.2.6
Summary of stomach contents by predator by age class, area and quarter.

PREDATOR : COD	YEAR : 1987			QUARTER : 3		ALL AREAS	
	0	1	2	3	4	5	6+
GENERAL RESULTS							
Nr of st. sampled	3	1762	1837	47	106	37	18
Nr of st. with food	2	1429	1363	35	79	28	14
Nr of regurgit. st.	64	205	6	12	4	2	
Nr of empty st.	1	269	267	7	16	3	2
% empty st.	33.333	15.267	14.535	14.894	15.094	8.108	11.111
Mean length							
Total wght all prey	0.085	3.671	12.349	43.169	92.196	167.863	255.689
Total nr of prey	0.743	4.665	4.767	5.063	5.690	9.205	11.240
Average prey wght	0.115	0.787	2.590	8.526	16.204	18.236	22.747
WEIGHT % BY MAJOR TAXA							
ANNELLIDA	5.80	10.01	7.37	4.98	4.96	5.56	1.42
GASTROPODA		0.34	0.27	0.09	0.00		
BIVALVIA	4.07	2.20	0.25	0.02	0.02	0.11	
CEPHALOPODA		0.02	0.03	0.00	0.02	0.04	0.01
PYCNOGONIDA		0.08	0.02				
CRUSTACEA	72.46	46.75	33.27	24.98	15.11	12.76	9.24
GAMMARIDEA		0.22	0.04	0.00	0.00		
CARIDEA	72.46	4.46	3.43	2.35	0.36	0.06	0.00
ASTACIDEA		1.73	1.85	2.72	4.27	3.28	3.64
ANOMURA		20.85	7.26	1.53	0.60	0.71	1.57
OXYRHYNCHA		2.41	1.24	1.31	0.71	0.33	0.06
CANCRIDEA		4.04	7.88	6.57	2.82	1.71	2.02
BRACHYRHYNCHA		12.91	11.54	10.50	6.35	6.67	1.95
OTHER CRUST.**)		0.13	0.03	0.00	0.00	0.00	0.00
ECHIURA	0.37	0.04	0.00	0.00			
PRIAPULIDA		0.31	0.03				
ECHINODERMATA		0.30	0.33	0.16	0.16	0.32	0.07
UROCHORDATA		0.02	0.04	0.00	0.00	0.03	0.19
AGNATHA		0.31	0.00				
GNATHOSTOMATA	21.74	37.24	56.36	69.52	79.72	81.29	88.95
OTHERS *)		0.03	0.00	0.01	0.00	0.00	
UNKNOWN		0.15	0.04				
WEIGHT % COMMERCIAL SPECIES							
G. morhua	0.00	0.02	1.95	7.80	12.19	20.41	
M. aeglefinus		2.59	3.86	7.99	12.94	5.80	9.70
M. merlangus		3.09	4.54	10.51	17.85	18.06	4.03
T. esmarkii		5.48	9.63	9.11	9.89	5.34	0.97
C. harengus		6.03	13.37	11.57	9.38	13.28	17.50
S. sprattus		0.01	0.09	0.17	0.08	0.01	
AMMODYTIDAE		12.45	7.67	3.73	2.35	4.71	12.97
P. platessa		0.09	0.32	1.55	0.67	0.07	
S. solea	0.12	0.08	0.05	0.00			
L. limanda		1.59	6.58	9.62	6.49	7.92	3.20
S. scomber				0.39	0.93	0.20	0.02
C. crangon		0.35	0.07				

*) Include CNIDARIA, SCAPHOPODA, CEPHALOCHORDATA

***) Include BALANIDAE, MYSIDA, VALVIFERA, OXYSTOMATA

Table 1.3.1
Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species by predator age class, area and quarter.

PREDATOR : COD		YEAR : 1985			QUARTER : 1		ALL AREAS
AGE CLASS	0	1	2	3	4	5	6+
Nr of st. with food		136	1527	293	162	53	65
Fraction empty		0.05	0.09	0.12	0.10	0.05	0.09
Mean length		17.37	33.07	53.83	71.49	79.01	95.09
PREY : ALL SPECIES							
All classes		975.	10983.	39432.	88869.	107687.	166507.
PREY : GADUS MORHUA							
Age class 1			22.	36.	38.	18.	88.
2			1.	83.	314.	580.	2342.
3					3.	8.	18.
TOTAL			23.	118.	355.	606.	2447.
PREY : MELANOGRAMMUS AEGLEFINUS							
Age class 1			474.	1184.	1538.	1600.	678.
2			88.	1423.	5992.	7678.	6310.
3			1.	37.	245.	460.	666.
4				4.	32.	60.	89.
5					1.	3.	5.
TOTAL			563.	2648.	7808.	9800.	7748.
PREY : MERLANGIUS MERLANGUS							
Age class 1		27.	270.	672.	490.	1147.	1589.
2			232.	1847.	1753.	4185.	14616.
3			21.	157.	604.	1335.	6304.
4			6.	17.	129.	270.	1969.
5			0.	2.	26.	56.	702.
6			0.	2.	31.	69.	542.
TOTAL		27.	528.	2698.	3033.	7061.	25722.
PREY : TRISOPTERUS ESMARKI							
Age class 0			1.	0.			
1			848.	7709.	17445.	14483.	8284.
2			290.	6089.	21446.	17079.	7066.
3			29.	379.	1533.	1176.	394.
4			3.	21.	79.	62.	21.
TOTAL		0.	1171.	14197.	40509.	32816.	15766.
PREY : CLUPEA HARENGUS							
Age class 1		1.	111.	62.			
2		3.	1258.	1738.	1424.	3275.	7257.
3			149.	3018.	9732.	11978.	10700.
4			26.	1071.	6216.	8729.	5848.
5			1.	153.	1438.	1765.	1354.
6			1.	69.	607.	1109.	607.
TOTAL		4.	1545.	6110.	19418.	26858.	25767.
PREY : CLUPEA SPRATTUS							
Age class 1		11.	52.	135.	200.	4.	6.
2		2.	69.	73.	79.	364.	812.
3			53.	188.	49.	149.	370.
4			7.	32.	6.	17.	43.
5			0.	1.	0.	1.	3.
6			0.	0.	0.	0.	0.
TOTAL		13.	182.	429.	335.	536.	1234.
PREY : AMMODYTIDAE							
Age class 1		27.	146.	389.	1316.	1074.	199.
2			376.	481.	1323.	1278.	153.
3			24.	62.	186.	165.	14.
4			1.	1.	2.	3.	0.
6			12.	162.	276.	235.	
TOTAL		28.	561.	1094.	3102.	2754.	366.
PREY : OTHER							
All classes		903.	6411.	12137.	14308.	27255.	87457.

Table 1.3.2

Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species by predator age class, area and quarter.

PREDATOR : COD	YEAR : 1985			QUARTER : 3		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+
Nr of st. with food	100	248	1237	101	52	16	27
Fraction empty	0.06	0.14	0.10	0.11	0.08	0.00	0.09
Mean length	7.11	26.55	39.24	62.26	76.68	83.49	94.59
PREY : ALL SPECIES							
All classes	56.	2172.	12460.	57787.	114724.	165076.	232403.
PREY : GADUS MORHUA							
Age class 0		12.	36.	36.	235.	185.	
1				164.	2033.	2262.	773.
2				618.	7749.	12446.	8432.
3				7.	70.	55.	
TOTAL		12.	36.	826.	10086.	14948.	9205.
PREY : MELANOGRAMMUS AEGLEFINUS							
Age class 0		57.	688.	771.	283.	189.	136.
1		0.	291.	2010.	3480.	1496.	1795.
2			149.	2495.	7091.	4466.	4269.
TOTAL		57.	1127.	5276.	10855.	6151.	6201.
PREY : MERLANGIUS MERLANGUS							
Age class 0		18.	203.	159.	43.	84.	56.
1			505.	1432.	3276.	3374.	3477.
2			262.	1559.	4854.	3413.	3533.
3			18.	218.	793.	272.	116.
4			4.	59.	271.	132.	26.
5				5.	49.	39.	
6				1.	11.	8.	
TOTAL		18.	992.	3433.	9298.	7323.	7208.
PREY : TRISOPTERUS ESMARKI							
Age class 0	0.	7.	136.	376.	304.	105.	16.
1		20.	1314.	5078.	1374.	682.	787.
2		6.	312.	821.	137.	106.	64.
3		0.	2.	5.	1.	1.	0.
TOTAL	0.	33.	1765.	6280.	1815.	893.	867.
PREY : CLUPEA HARENGUS							
Age class 1		212.	167.	92.	10.	0.	28.
2		3.	280.	1950.	2712.	1640.	2682.
3			65.	535.	506.	737.	537.
4			141.	770.	828.	1537.	1017.
5			1.	3.	3.	6.	4.
TOTAL		215.	654.	3349.	4058.	3919.	4268.
PREY : CLUPEA SPRATTUS							
Age class 1		0.	1.	0.			
2		3.	27.	5.			
3		0.	1.	0.			
TOTAL		3.	29.	5.			
PREY : AMMODYTIDAE							
Age class 0		177.	1009.	1436.	579.	214.	262.
1		5.	120.	84.	29.	9.	15.
2		9.	65.	11.	1.		1.
3		5.	28.	3.	0.		0.
4		0.	0.				
5		0.	12.	2.			
6		0.	0.				
TOTAL		196.	1235.	1536.	608.	224.	279.
PREY : OTHER							
All classes	55.	1639.	6623.	37082.	78004.	131618.	204375.

Table 1.3.3

Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species by predator age class, area and quarter.

PREDATOR : COD		YEAR : 1986			QUARTER : I		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+	
Nr of st. with food		1088	202	559	196	110	86	
Fraction empty		0.09	0.10	0.09	0.12	0.14	0.18	
Mean length		18.08	33.96	49.66	65.17	76.64	90.96	
PREY : ALL SPECIES								
All classes		1356.	9047.	29954.	44245.	68626.	94571.	
PREY : GADUS MORHUA								
Age class 1			46.	3008.	76.	385.	214.	
2			1.	207.	62.	721.	883.	
3					40.	387.	795.	
TOTAL			47.	3215.	178.	1492.	1891.	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class 1		13.	1268.	2808.	3181.	3872.	5297.	
2			25.	100.	1024.	3667.	4693.	
3				46.	369.	1398.	1929.	
TOTAL		13.	1293.	2955.	4574.	8937.	11919.	
PREY : MERLANGIUS MERLANGUS								
Age class 1		7.	933.	4769.	903.	1128.	1133.	
2			85.	586.	730.	1545.	2049.	
3			4.	351.	742.	965.	1285.	
4			0.	24.	127.	166.	202.	
5				2.	41.	57.	57.	
6				1.	28.	34.	20.	
TOTAL		7.	1022.	5733.	2571.	3895.	4745.	
PREY : TRISOPTERUS ESMARKI								
Age class 1			743.	2713.	10379.	11496.	14002.	
2			56.	445.	3173.	2988.	1207.	
3			1.	18.	143.	149.	45.	
4			0.	0.	3.	3.	1.	
TOTAL		0.	801.	3176.	13698.	14636.	15255.	
PREY : CLUPEA HARENGUS								
Age class 1		0.	2.	2.	0.	0.		
2		54.	621.	1199.	4251.	5465.	6018.	
3		0.	46.	841.	6187.	14104.	14874.	
4			112.	368.	1696.	3454.	3831.	
5			58.	84.	100.	177.	308.	
6			2.	5.	27.	56.	62.	
TOTAL		54.	840.	2499.	12262.	23255.	25092.	
PREY : CLUPEA SPRATTUS								
Age class 1		0.	2.	8.	1.	0.	0.	
2		6.	68.	346.	29.	12.	3.	
3		15.	218.	780.	55.	23.	8.	
4		4.	55.	196.	14.	6.	2.	
5		0.	3.	7.	0.	0.	0.	
6		0.	1.	3.	0.	0.	0.	
TOTAL		26.	346.	1340.	99.	41.	13.	
PREY : AMMODYTIDAE								
Age class 1		159.	1404.	2041.	936.	201.	119.	
2		12.	291.	198.	76.	65.	105.	
3				1.	0.	1.	4.	
4				0.	0.	0.	0.	
TOTAL		171.	1695.	2240.	1012.	266.	227.	
PREY : OTHER								
All classes		1085.	3003.	8795.	9850.	16103.	35427.	

Table 1.3.4

Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species by predator age class, area and quarter.

PREDATOR : COD	YEAR : 1986			QUARTER : 3		ALL AREAS	
	0	1	2	3	4	5	6+
AGE CLASS	0	1	2	3	4	5	6+
Nr of sto. with food	15	2372	119	324	60	35	23
Fraction empty	0.35	0.14	0.09	0.08	0.03	0.05	0.00
Mean length	6.34	28.31	42.25	55.57	75.49	87.53	93.21
PREY : ALL SPECIES							
All classes	94.	3635.	16130.	34279.	84012.	115730.	264964.
PREY : GADUS MORHUA							
Age class 0	0.		23.	7.	48.	10.	
1				8.	30.	382.	204.
TOTAL	0.	0.	25.	31.	79.	392.	204.
PREY : MELANOGRAMMUS AEGLEFINUS							
Age class 0		19.	1228.	880.	2080.	111.	8.
1		0.	397.	960.	3075.	6667.	7359.
2		0.	5.	10.	35.	98.	2923.
3			0.	1.	15.	40.	6678.
4							94.
TOTAL		19.	1630.	1851.	5207.	6916.	17062.
PREY : MERLANGIUS MERLANGUS							
Age class 0		28.	90.	251.	471.	110.	709.
1		1.	98.	602.	465.	1319.	759.
2				27.	1407.	3962.	3556.
3				14.	404.	1376.	2235.
4				0.	23.	53.	231.
5				0.	10.	24.	37.
TOTAL		29.	188.	894.	2781.	6844.	7527.
PREY : TRISOPTERUS ESMARKI							
Age class 0		19.	1191.	863.	2646.	2147.	3401.
1		5.	4145.	4487.	14341.	4910.	9437.
2		0.	188.	262.	1559.	807.	567.
3				49.	454.	662.	358.
TOTAL		24.	5523.	5661.	18999.	8526.	13763.
PREY : CLUPEA HARENGUS							
Age class 0		0.					
1		100.	228.	277.	69.	2.	26.
2		3.	380.	1243.	1868.	5485.	42066.
3		1.	220.	1297.	8092.	13246.	30677.
4		0.	26.	318.	837.	5846.	61033.
5			1.	35.	46.	583.	7593.
6					1377.	3561.	1925.
TOTAL		104.	854.	3171.	12290.	28730.	143312.
PREY : CLUPEA SPRATTUS							
PREY : AMMODYTIDAE							
Age class 0		204.	1104.	388.	299.	3035.	1620.
1		335.	500.	246.	41.	400.	235.
2		20.	30.	20.	3.	26.	18.
3		6.	8.	6.	0.		2.
4		0.	0.	0.	0.		0.
5				1.	0.		1.
TOTAL		565.	1643.	661.	344.	3460.	1876.
PREY : OTHER							
All classes	93.	2894.	6266.	22011.	44312.	60862.	81220.

Table 1.3.5
Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species
by predator age class, area and quarter.

PREDATOR : COD	YEAR : 1987			QUARTER : 1		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+
Nr of st. with food	0	466	1184	74	102	30	48
% empty stomachs	0.00	0.10	0.10	0.05	0.08	0.13	0.15
Mean length	0.00	20.35	34.22	48.49	71.53	77.98	95.68
PREY : ALL SPECIES							
All classes		1190.	6937.	21120.	67428.	65607	71388.
PREY : GADUS MORHUA							
Age class 1		2.	190.	46.	375.	165.	1008.
2				0.	3812.	3410.	5160.
3					101.	57.	153.
TOTAL		2.	190.	46.	4288.	3632.	6322.
PREY : MELANOGRAMMUS AEGLEFINUS							
Age class 1		45.	379.	3025.	2319.	5532.	3859.
2			1.	115.	5030.	10019.	4563.
3			0.	1.	134.	110.	80.
4					45.	12.	19.
TOTAL		45.	380.	3140.	7528.	15673.	8522.
PREY : MERLANGIUS MERLANGUS							
Age class 1		13.	787.	1901.	4450.	2688.	2015.
2		0.	8.	2462.	5215.	6836.	3318.
3			0.	479.	955.	2238.	1333.
4			0.	116.	218.	564.	706.
5						1.	23.
6							11.
TOTAL		13.	795.	4958.	10837.	12326.	7407.
PREY : TRISOPTERUS ESMARKI							
Age class 1		4.	294.	3219.	1246.	2662.	796.
2		0.	10.	779.	912.	171.	337.
3			0.	45.	131.	88.	204.
4			0.	2.	14.	12.	27.
5					57.	47.	112.
TOTAL		4.	304.	4046.	2362.	2982.	1478.
PREY : CLUPEA HARENGUS							
Age class 1			9.	1.	26.	6.	5.
2		58.	649.	1600.	5542.	4118.	5595.
3			20.	1438.	2181.	4595.	2668.
4			1.	134.	265.	964.	376.
5				0.	128.	508.	176.
6					92.	367.	126.
TOTAL		58.	679.	3174.	8234.	10559.	8946.
PREY : CLUPEA SPRATTUS							
Age class 1		1.	1.	0.			
2			1.	1.	0.		
3			5.	4.	6.		
4			2.	1.	2.		
5			0.	0.	0.		
6				0.	0.		
TOTAL		1.	9.	6.	9.		
PREY : AMMODYTIDAE							
Age class 1		13.	140.	135.	18.		
2		19.	478.	356.	15.		
3		0.	11.	8.	0.		
4			0.	0.	0.		
6			3.	22.	200.	50.	116.
TOTAL		32.	632.	521.	233.	51.	116.
PREY : OTHER							
All classes		1035.	3947.	5229.	33936.	20383.	38599.

Table 1.3.6
Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species
by predator age class, area and quarter.

PREDATOR : COD		YEAR : 1987			QUARTER : 3		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+	
Nr of stomachs with food	2	1423	1371	34	76	24	15	
% empty stomachs	0.00	0.15	0.14	0.17	0.14	0.10	0.06	
Mean length	7.35	28.24	39.74	63.19	71.29	83.58	91.74	
PREY : ALL SPECIES								
All classes	169.	3723.	12616.	53263.	90247.	147930.	235412.	
PREY : GADUS MORHUA								
Age class	0		3.	0.	0.			
	1			160.	4715.	2979.	1272.	
	2			314.	3292.	2392.	19396.	
TOTAL			3.	475.	8007.	5371.	20668.	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	12.	253.	769.	257.	76.	27.	
	1	1.	130.	4990.	8351.	7968.	3923.	
	2		0.	630.	2326.	2300.	9399.	
	3			85.	317.	315.	518.	
	4			6.	23.	23.	932.	
TOTAL		13.	384.	6480.	1274.	10683.	14798.	
PREY : MERLANGIUS MERLANGUS								
Age class	0	57.	300.	30.	258.	391.	517.	
	1	15.	237.	1984.	5651.	7578.	4242.	
	2	0.	31.	2191.	7015.	12147.	5908.	
	3		0.	331.	1322.	3815.	2052.	
	4			112.	386.	1423.	787.	
	5			20.	68.	250.	139.	
TOTAL		73.	568.	4669.	14700.	25604.	13645.	
PREY : TRISOPTERUS ESMARKI								
Age class	0	29.	396.	2383.	2260.	3962.	2093.	
	1	15.	437.	4008.	5939.	12159.	6512.	
	2	0.	16.	64.	391.	318.	135.	
	3		4.	4.	95.	23.		
TOTAL		44.	853.	6459.	8685.	16463.	8741.	
PREY : CLUPEA HARENGUS								
Age class	0	3.	1.					
	1	152.	1207.	256.	641.	345.	2669.	
	2	56.	968.	2711.	6036.	2704.	7187.	
	3	1.	137.	1239.	2980.	1741.	5181.	
	4	0.	31.	38.	491.	473.	1991.	
	5		7.	4.	105.	105.	442.	
TOTAL		213.	2349.	4248.	10253.	5367.	17469.	
PREY : CLUPEA SPRATTUS								
Age class	0	0.	0.					
	1	0.	0.	0.				
	2	2.	13.	11.				
	3	0.	0.	0.				
TOTAL		2.	13.	12.				
PREY : AMMODYTIDAE								
Age class	0	167.	449.	83.	703.	800.	4214.	
	1	54.	211.	22.	441.	441.	5983.	
	2	82.	466.	46.	258.	716.	3827.	
	3	3.	47.	3.	2.	22.	888.	
	4	1.	9.	1.	0.	5.	153.	
	5	0.	1.	0.	0.	1.	2.	
TOTAL		308.	1183.	154.	1404.	1986.	15068.	
PREY : OTHER								
All classes	169.	3070.	7263.	30767.	35923.	82457.	145024.	

Table 1.4.1

Average prey weight at time of ingestion (g) by age class of commercially exploited prey species by predator age class, nd quarter.

PREDATOR : COD	YEAR : 1981/85/86/87			QUARTER : 1		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+
PREY : ALL SPECIES							
All classes		0.80	3.36	10.42	23.66	30.56	38.24
PREY : GADUS MORHUA							
Age class 1		30.76	44.14	77.02	53.72	76.74	76.88
2			150.00	163.22	161.40	172.02	158.28
3					216.44	377.78	223.22
PREY : MELANOGRAMMUS AEGLEFINUS							
Age class 1		12.36	26.46	26.46	32.36	40.54	42.32
2			107.70	111.82	158.64	166.70	176.40
3			200.00	80.40	180.50	181.04	218.46
4				183.34	196.66	161.08	233.92
5					200.00	250.00	250.00
PREY : MERLANGIUS MERLANGUS							
Age class 1		10.00	23.47	41.36	45.28	42.90	35.16
2			77.36	103.51	124.33	130.52	78.86
3			149.15	156.01	164.30	160.60	150.74
4			276.96	234.36	215.60	189.98	219.58
5			250.00	256.26	249.04	242.78	260.52
6				225.00	257.54	237.26	263.52
PREY : TRISOPTERUS ESMARKI							
Age class 0			1.74				
1		11.22	11.84	13.40	14.76	15.52	14.84
2			22.16	27.84	31.06	30.64	29.62
3			52.64	45.36	42.72	42.76	54.68
4			60.00	50.00	45.94	45.42	72.06
5					150.00	149.20	149.34
PREY : CLUPEA HARENGUS							
Age class 1		4.00	4.64	10.38	26.50	36.54	39.90
2		5.28	11.54	23.46	35.22	36.94	24.54
3			39.90	35.96	68.40	72.70	76.58
4			84.76	88.14	92.36	97.64	89.20
5			99.16	121.86	138.42	135.10	110.40
6			120.00	112.12	136.08	149.98	109.20
PREY : CLUPEA SPRATTUS							
Age class 1		2.64	3.72	2.24	2.40	5.54	7.32
2		6.22	10.00	10.38	12.50	12.28	10.46
3		6.26	14.14	14.12	14.54	17.22	15.76
4		6.72	14.54	14.94	15.38	21.22	21.48
5			14.64	14.96		18.18	27.28
6			18.18	13.34			
PREY : AMMODYTIDAE							
Age class 1		1.68	3.46	3.92	5.46	6.48	4.52
2		5.00	5.78	9.94	13.04	12.72	10.24
3			15.94	29.00	22.84	19.26	21.68
4			27.46	32.76	30.84	29.78	
5			40.00	32.82	31.00	30.92	
6			64.44	42.94	52.02	43.16	60.00
PREY : OTHER							
All classes		0.70	2.14	4.96	13.60	17.00	34.00

Table 1.4.2
Average prey weight at time of ingestion (g) by age class of commercially exploited prey species by predator age class, nd quarter.

PREDATOR : COD	YEAR : 1981/85/86/87			QUARTER : 3		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+
PREY : ALL SPECIES							
All classes	0.22	1.32	4.66	8.82	22.0	30.16	52.48
PREY : GADUS MORHUA							
Age class 0		10.74	9.42	20.20	16.82	15.78	16.32
1			120.00	215.58	201.60	237.38	149.60
2				385.16	279.62	319.70	473.54
3				350.00	411.76	423.08	
PREY : MELANOGRAMMUS AEGLEFINUS							
Age class 0		4.80	10.64	13.30	11.90	12.06	8.32
1		20.00	67.24	85.78	120.72	134.42	150.34
2			150.00	308.70	255.78	289.36	530.34
3			250.00	335.48	276.88	341.02	541.02
4				400.00	436.36	430.76	1057.72
5							1789.28
PREY : MERLANGIUS MERLANGUS							
Age class 0	15.38	7.70	7.42	9.36	11.34	18.84	18.56
1		25.36	72.90	93.26	97.62	116.04	116.08
2			149.52	204.54	203.60	216.94	235.74
3			222.22	285.66	269.18	238.64	221.72
4			200.00	269.34	250.32	202.30	199.02
5				243.48	248.22	207.58	195.74
6				400.00	320.00	333.34	600.00
PREY : TRISOPTERUS ESMARKI							
Age class 0		3.34	7.32	15.90	20.16	20.48	17.92
1		28.68	29.44	34.22	40.08	33.74	36.14
2		41.38	43.38	52.50	60.62	62.44	74.00
3			66.66	156.76	131.74	120.14	121.56
PREY : CLUPEA HARENGUS							
Age class 0		5.30	22.26	17.36	20.00	24.00	
1		7.52	13.60	18.36	30.00	43.20	40.000
2		18.56	45.64	79.70	80.00	79.86	125.68
3		40.00	100.38	127.04	183.40	180.00	172.96
4			222.48	193.14	118.34	167.38	305.04
5			200.00	204.88	250.00	252.82	323.90
6					494.44	376.62	494.22
PREY : CLUPEA SPRATTUS							
Age class 0		4.00			4.20	14.40	4.08
1		12.86	22.26	10.48	5.26	150.0	
2		30.16	34.06	29.08			
3		33.34	46.16	16.66			
PREY : AMMODYTIDAE							
Age class 0	4.44	2.20	2.44	2.82	3.94	3.82	5.52
1		12.86	12.78	10.38	9.96	10.18	18.10
2		13.32	13.08	10.74	6.98	10.72	27.54
3		21.54	35.22	27.34	29.62	14.02	72.32
4		15.38	28.28	26.32	28.58	12.50	68.16
5			70.28	54.54		15.38	26.08
PREY : OTHER							
All classes	0.22	1.16	3.10	5.96	14.72	24.50	41.12

Table 2.1.1
Number of stomachs sampled by size class of whiting, area and quarter in 1985.

Size class	70	80	100	150	200	250	300	350	400	500	600	700	800	1000	Total
Quarter 1															
Area 1			116	84	311	380	294	203	56	1					1445
Area 2			182	255	294	174	46	6							957
Area 3			318	371	342	259	132	26	1						1449
Area 4			129	149	148	138	56	4							624
Area 5			59	97	138	128	58	36	20						536
Area 6	2		196	356	387	227	77	16	1						1262
Area 7			84	82	71	54	49	24	13						377
Total	2		1084	1394	1691	1360	712	315	91	1					6650
Quarter 3															
Area 1			49		121	310	333	159	31	1					1004
Area 2			3	19	372	402	193	20	8						1017
Area 3			120	248	414	294	197	36	6						1315
Area 4				94	241	226	91	3							655
Area 5				6	40	40	30	7							123
Area 6			43	250	475	459	212	61	18						1518
Area 7			38	116	142	152	57	3	4						512
Total			253	733	1805	1883	1113	289	67	1					6144

Table 2.1.2
Number of stomachs sampled by size class of whiting, area and quarter in 1986.

Size class	70	80	100	150	200	250	300	350	400	500	600	700	800	1000	Total
Quarter 1															
Area 1			72	77	310	310	247	41	16						1073
Area 2			258	233	47	16	2								556
Area 3			247	301	177	163	82	26							996
Area 4			8	16	10	24	5								63
Area 5															
Area 6			253	270	180	137	48	10	1						899
Area 7			10	20	17	10									57
Total			848	917	741	660	384	77	17						3644
Quarter 3															
Area 1			179	3	81	369	380	192	65						1269
Area 2			37	79	129	182	76	6							509
Area 3			122	130	208	171	71	11							713
Area 4				39	71	72	45	3							221
Area 5															
Area 6															
Area 7															
Total			338	242	489	794	572	212	65						2712

Table 2.2.1
Summary of stomach contents by predator by age class, area and quarter.

PREDATOR : WHITING	YEAR : 1985			QUARTER : 1		ALL AREAS		
	AGE CLASS	0	1	2	3	4	5	6+
GENERAL RESULTS								
Nr of st. sampled		2386	2600	871	463	156	174	
Nr of st. with food		1100	1096	374	210	74	83	
Nr of regurgit. st.		947	1074	333	169	54	58	
Nr of empty st.		339	428	163	85	28	32	
% empty stomachs		14.208	16.462	18.714	18.359	17.949	18.391	
Mean length								
Total wght all prey		0.411	1.847	3.663	5.110	5.650	5.442	
Total nr of prey		10.385	4.260	2.237	1.774	1.780	1.827	
Average prey weight		0.040	0.434	1.638	2.880	3.174	2.978	
WEIGHT % BY MAJOR TAXA								
RHYNCHOCOELA		0.15	0.32	0.08	0.02	0.01	0.01	
ANNELLIDA		18.27	7.63	2.33	1.47	1.20	1.22	
GASTROPODA		0.22	0.03	0.04	0.02	0.01	0.01	
BIVALVIA		3.11	3.86	1.49	0.53	0.34	0.39	
CEPHALOPODA		1.87	2.82	1.13	0.53	0.38	0.42	
CRUSTACEA		30.69	6.56	3.37	3.09	3.06	3.18	
MYSIDA		0.53	0.10	0.02	0.01	0.01	0.01	
FLABELLIFERA		0.09	0.22	0.17	0.20	0.21	0.22	
GAMMARIDEA		1.01	0.24	0.04	0.02	0.03	0.03	
HYPERIIDEA		1.49	0.12	0.02	0.00	0.00	0.00	
EUPHAUSIACEA		7.62	0.28	0.11	0.04	0.03	0.03	
CARIDEA		13.78	3.96	2.22	2.43	2.43	2.45	
ASTACIDEA		0.23	0.06	0.09	0.04	0.02	0.03	
ANOMURA		3.16	0.87	0.27	0.11	0.09	0.09	
BRACHYRHYNCHA		0.14	0.04	0.05	0.02	0.01	0.02	
OTHER CRUST. **)		0.12	0.03	0.01	0.00	0.00	0.00	
ECHIURA		3.21	0.96	0.30	0.20	0.18	0.17	
PRIAPULIDA		0.06	0.31	0.09	0.03	0.02	0.02	
UROCHORDATA		0.26	0.06	0.01	0.00	0.00	0.00	
GNATHOSTOMATA		41.73	77.11	91.00	94.02	94.72	94.50	
OTHERS *)		0.18	0.05	0.00	0.00	0.00	0.00	
UNKNOWN		0.26	0.30	0.15	0.09	0.08	0.07	
WEIGHT % COMMERCIAL SPEC.								
G. morhua			0.00	0.01	0.09	0.39	0.63	
M. aeglefinus			1.30	3.12	4.10	4.25	3.82	
M. merlangus		0.35	3.15	3.18	3.26	4.53	5.49	
T. esmarkii		5.83	28.89	38.88	41.45	41.28	40.89	
C. harengus		0.12	5.36	9.73	8.49	8.20	8.29	
S. sprattus		15.40	13.40	15.68	17.53	18.53	18.47	
AMMODYTIDAE		6.66	5.74	4.37	6.16	6.22	5.35	
N. norvegicus		0.23	0.06	0.09	0.04	0.02	0.03	
C. crangon		2.05	0.38	0.22	0.17	0.22	0.29	

*) Include CNIDARIA, ECHINODERMATA, CHAETOGNATHA

***) Include CALANOIDA, CUMACEA, CAPRELLIDEA, CANCRIDEA

Table 2.2.2
Summary of stomach contents by predator by age class, area and quarter.

PREDATOR : WHITING	YEAR : 1985			QUARTER : 3		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+
GENERAL RESULTS							
Nr of st. sampled	270	1986	2933	526	294	67	92
Nr of st. with food	118	704	1047	179	99	22	32
Nr of regurgit. st.	135	1139	1705	324	182	43	57
Nr of empty st.	17	144	182	24	12	2	4
% empty stomachs	6.296	7.251	6.205	4.563	4.082	2.985	4.348
Mean length							
Total wght all prey	0.131	1.750	2.930	4.956	5.841	8.971	10.176
Total nr of prey	14.341	21.343	18.060	27.254	29.474	38.930	35.619
Average prey wght	0.009	0.082	0.162	0.182	0.198	0.230	0.286
WEIGHT % BY MAJOR TAXA							
CNIDARIA		0.26	0.07	0.00			
RHYNCHOCOELA		1.00	6.38	4.15	3.66	1.71	2.20
ANNELLIDA	0.46	6.68	6.24	8.48	8.06	7.86	6.74
BIVALVIA	0.12	3.14	1.46	0.39	0.26	0.03	
CRUSTACEA	20.82	18.48	11.71	8.25	7.31	5.68	4.99
CALANOIDA	2.02	0.48	0.17	0.06	0.05	0.04	0.03
MYSIDA	0.16	0.03	0.01	0.00	0.00	0.00	0.00
HYPERIIDEA	0.08	0.61	0.36	0.19	0.15	0.09	0.06
EUPHAUSIACEA	0.03	0.50	0.38	0.30	0.26	0.20	0.16
CARIDEA	1.75	1.79	0.81	0.54	0.45	0.28	0.22
ANOMURA	11.19	6.76	4.89	3.28	2.80	1.84	1.54
CANCRIDEA		0.40	0.53	1.08	1.18	1.39	1.36
BRACHYRHYNCHA	0.10	1.58	1.21	0.80	0.73	0.76	0.74
OTHER CRUST. **)	0.00	0.12	0.06	0.03	0.03	0.02	0.02
ECHINODERMATA	0.86	1.06	0.29	0.01	0.01	0.00	
CHAETOGNATHA		0.82	0.41	0.26	0.23	0.17	0.14
GNATHOSTOMATA	77.71	68.42	73.36	78.33	80.34	84.42	85.84
OTHERS *)	0.00	0.08	0.06	0.13	0.12	0.12	0.09
UNKNOWN	0.03	0.05	0.02	0.01	0.01	0.00	0.00
WEIGHT % COMMERCIAL SPEC.							
G. morhua		0.21	0.19	0.10	0.07	0.03	0.02
M. aeglefinus	5.98	1.92	5.79	8.54	8.00	7.15	6.16
M. merlangus	39.79	8.36	5.67	4.54	4.49	3.60	3.67
T. esmarkii	2.25	0.42	1.71	4.28	7.09	11.27	13.80
C. harengus	0.00	3.42	9.50	17.84	20.76	28.60	30.24
S sprattus	4.95	6.49	6.89	5.39	4.58	3.38	2.81
AMMODYTIDAE	12.10	22.32	14.44	9.58	8.71	6.09	5.80
S. scomber	0.00	0.13	0.10	0.23	0.22	0.22	0.18
C. crangon	0.28	0.59	0.36	0.33	0.29	0.23	0.18

*) Include GASTROPODA, CEPHALOPODA, SIPUNCULA, ECHIURA, UROCHORDATA

***) Include CUMACEA, FLABELLIFERA, GAMMARIDEA, OXYRHYNCHA

Table 2.2.3
Summary of stomach contents by predator by ge class, area and quarter.

PREDATOR : WHITING	YEAR : 1986			QUARTER : 1		ALL AREAS	
	0	1	2	3	4	5	6+
GENERAL RESULTS							
Nr of st. sampled	1781	849	717	211	52	33	
Nr of st. with food	473	135	107	32	8	5	
Nr of regurgit. st.	1247	666	568	169	42	26	
Nr of empty stomachs	60	47	42	11	2	1	
% empty stomachs	3.369	5.536	5.858	5.213	3.846	3.030	
Mean length							
Total wght all prey	0.869	3.192	4.932	6.086	7.053	8.718	
Total nr of prey	3.702	1.665	1.710	1.820	1.916	2.068	
Average prey wght	0.235	1.917	2.884	3.345	3.682	4.215	
WEIGHT % BY MAJOR TAXA							
PHAEOPHYTA		0.00	0.01	0.07	0.11	0.15	
ANNELLIDA	4.62	1.88	2.16	1.52	1.06	0.52	
GASTROPODA	0.05	0.32	0.19	0.11	0.06	0.02	
BIVALVIA			0.20	0.09	0.01	0.00	
CEPHALOPODA	6.49	6.79	5.66	3.61	2.33	0.94	
CRUSTACEA	30.76	5.09	3.50	3.50	3.53	3.47	
MYSIDA	0.04	0.00	0.00	0.00			
FLABELLIFERA	0.08	0.01	0.16	0.28	0.32	0.30	
GAMMARIDEA	0.15	0.08	0.10	0.07	0.06	0.03	
HYPERIDEA	1.28	0.01	0.01	0.00	0.00	0.00	
EUPHAUSIACEA	3.25	0.19	0.07	0.04	0.02	0.01	
CARIDEA	22.08	3.32	1.83	2.24	2.57	2.90	
ANOMURA	2.28	0.54	0.61	0.41	0.27	0.11	
OXYRHYNCHA	0.00	0.10	0.15	0.09	0.06	0.01	
BRACHYRHYNCHA	0.14	0.02	0.02	0.01	0.01	0.00	
GNATHOSTOMATA	57.46	85.81	88.45	91.18	92.91	94.90	
OTHERS *)	0.02	0.00	0.01	0.00	0.00	0.00	
UNKNOWN	0.41	0.02	0.00	0.00			
WEIGHT % COMMERCIAL SPEC.							
G. mohua	0.48	1.16	0.18	0.08	0.06	0.06	
M. aeglefinus	0.31	4.74	5.63	3.67	2.39	1.02	
M. merlangus	11.08	8.40	7.21	6.25	5.78	5.33	
T. esmarkii	4.99	21.56	35.00	44.74	49.72	53.40	
C. harengus	4.56	5.15	2.07	1.24	0.85	0.46	
S. sprattus	0.86	1.67	1.13	0.65	0.37	0.10	
AMMODYTIDAE	27.69	14.45	11.38	9.29	7.69	5.38	
C. crangon	1.77	0.56	0.08	0.02	0.00	0.00	

*) Include CNIDARIA, ECHIURA

Table 2.2.4
Summary of stomach contents by predator by predator age class, area and quarter.

PREDATOR : WHITING		YEAR : 1985			QUARTER : 3		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+	
GENERAL RESULTS								
Nr of st. sampled	348	811	477	838	165	53	19	
Nr of st. with food	176	289	136	222	42	13	4	
Nr of regurgit. st.	171	511	341	613	123	39	14	
Nr of empty st.	1	11	1	1	0	0	0	
% empty stomachs	0.287	1.356	0.210	0.119	0.0	0.0	0.0	
Mean length								
Total wght all prey	0.315	2.167	3.483	4.792	7.386	8.540	7.674	
Total nr of prey	1.302	5.495	8.539	8.249	5.642	2.966	5.563	
Average prey wght	0.242	0.394	0.408	0.581	1.309	2.879	1.379	
WEIGHT % BY MAJOR TAXA								
PHAEOPHYTA		0.00	0.04	0.13	0.13	0.20	0.12	
ANNELLIDA	0.55	1.58	0.60	0.19	0.15	0.10	0.08	
GASTROPODA	0.43	0.04	0.27	0.53	0.48	0.66	0.45	
CEPHALOPODA		0.69	0.37	0.17	0.05	0.01	0.04	
CRUSTACEA	3.03	3.79	2.33	1.55	0.85	0.49	0.75	
GAMMARIDEA	0.02	0.21	0.13	0.09	0.07	0.10	0.12	
HYPERIIDEA	0.18	0.71	0.57	0.38	0.15	0.05	0.14	
EUPHAUSIACEA	1.18	2.32	0.77	0.33	0.09	0.01	0.09	
CARIDEA	0.20	0.35	0.41	0.37	0.20	0.16	0.19	
ANOMURA	1.40	0.10	0.04	0.05	0.22	0.15	0.09	
BRACHYRHYNCHA		0.10	0.42	0.34	0.13	0.02	0.13	
GNATHOSTOMATA I	95.97	93.87	96.39	97.44	98.33	98.55	98.55	
UNKNOWN	0.02	0.03	0.00	0.00				
WEIGHT % COMMERCIAL SPEC.								
G. morhua		0.41	0.14	0.03				
M. aeglefinus	5.90	1.29	5.21	7.05	6.01	6.65	5.36	
M. merlangus	0.33	5.17	10.19	8.32	4.41	1.95	3.65	
T. esmarkii	0.57	14.59	27.12	39.83	58.87	64.15	59.30	
C. harengus	2.96	12.99	14.78	13.73	11.10	9.94	8.78	
S. sprattus			2.25	0.78	0.16			
AMMODYTIDAE	24.09	49.09	23.55	14.66	7.42	5.89	7.38	

Table 2.3.1
Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species
by predator age class, area and quarter.

PREDATOR : WHITING		YEAR : 1985			QUARTER : 1		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+	
Nr of st. with food	0	990	1220	379	199	71	78	
% empty stomachs	0.00	0.13	0.17	0.19	0.18	0.15	0.17	
Mean length	0.00	15.38	22.99	28.48	32.40	34.46	34.83	
PREY : ALL SPECIES								
All classes		415.	1715.	4004.	5287.	5718.	5697.	
PREY : GADUS MORHUA								
Age class 1				0.	1.	3.	10.	
TOTAL				0.	1.	3.	10.	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class 1			16.	158.	132.	169.	221.	
2			0.	1.	0.	0.	1.	
TOTAL			17.	158.	133.	169.	222.	
PREY : MERLANGIUS MERLANGUS								
Age class 1		1.	71.	110.	79.	95.	146.	
2			1.	6.	48.	195.	286.	
3				0.	1.	3.	5.	
TOTAL		1.	72.	116.	127.	293.	436.	
PREY : TRISOPTERUS ESMARKI								
Age class 0			0.	1.	0.	0.	0.	
1		14.	251.	1489.	2221.	2622.	2123.	
2		0.	71.	513.	725.	912.	799.	
3		0.	1.	11.	12.	14.	8.	
4		0.	0.	0.	1.	1.	0.	
TOTAL		14.	324.	2015.	2959.	3549.	2931.	
PREY : CLUPEA HARENGUS								
Age class 1		0.	1.	1.	1.	0.	0.	
2		0.	69.	238.	306.	252.	416.	
3			0.	5.	14.	16.	30.	
4			0.	0.	0.	0.	0.	
TOTAL		0.	70.	244.	321.	269.	447.	
PREY : CLUPEA SPRATTUS								
Age class 1		44.	93.	108.	42.	34.	77.	
2		24.	163.	259.	421.	167.	337.	
3		1.	35.	70.	117.	63.	139.	
4		0.	5.	12.	23.	12.	28.	
5		0.	1.	2.	6.	3.	7.	
6		0.	0.	0.	2.	1.	2.	
TOTAL		69.	297.	451.	612.	279.	590.	
PREY : AMMODYTIDAE								
Age class 1		26.	52.	143.	251.	284.	181.	
2		8.	44.	65.	198.	246.	159.	
3		0.	4.	4.	19.	25.	15.	
4		0.	0.	0.	0.	0.	0.	
TOTAL		34.	99.	212.	468.	555.	355.	
PREY : OTHER								
All classes		295.	835.	809.	667.	600.	706.	

Table 2.3.2

Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species by predator age class, area and quarter.

PREDATOR : WHITING		YEAR : 1985			QUARTER : 3		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+	
Nr of stomachs sampled	254	2162	2586	687	280	85	96	
Nr of regurgit. st.	135	1301	1417	434	173	58	62	
% empty sto.	0.06	0.07	0.07	0.05	0.05	0.02	0.02	
Mean length	5.39	21.82	25.92	30.67	32.52	34.81	35.49	
PREY : ALL SPECIES								
All classes	161.	1773.	2604.	5461.	7878.	12077.	13201.	
PREY : GADUS MORHUA								
Age class 0		3.	5.	3.	5.	1.		
TOTAL		3.	5.	3.	5.	1.		
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class 0	10.	59.	82.	530.	658.	1715.	1410.	
1			0.	0.	0.	0.	0.	
TOTAL	10.	59.	82.	530.	658.	1716.	1411.	
PREY : MERLANGIUS MERLANGUS								
Age class 0	58.	172.	60.	309.	360.	477.	365.	
TOTAL	58.	172.	60.	309.	360.	477.	365.	
PREY : TRISOPTERUS ESMARKI								
Age class 0	0.	10.	4.	64.	103.	232.	174.	
1			8.	427.	1032.	2397.	2415.	
2			0.	28.	58.	130.	128.	
3			0.	0.	0.	0.	0.	
TOTAL	0.	10.	13.	519.	1193.	2758.	2717.	
PREY : CLUPEA HARENGUS								
Age class 0		3.	15.	32.	30.	11.	26.	
1		49.	222.	730.	1018.	1870.	1675.	
2			42.	185.	464.	981.	1432.	
4				0.	0.		0.	
TOTAL		52.	279.	947.	1513.	2863.	3133.	
PREY : CLUPEA SPRATTUS								
Age class 0	11.	87.	134.	140.	109.	262.	246.	
1		1.	2.	4.	4.	8.	7.	
2		23.	75.	115.	114.	236.	204.	
3		1.	2.	4.	4.	8.	7.	
TOTAL	11.	112.	213.	263.	230.	513.	462.	
PREY : AMMODYTIDAE								
Age class 0	26.	288.	176.	201.	222.	331.	359.	
1	0.	47.	73.	138.	191.	303.	535.	
2		24.	45.	71.	96.	70.	157.	
3		1.	11.	28.	29.	18.	46.	
4			1.	2.	3.	2.	4.	
5			1.	1.	2.	1.	2.	
6			0.	1.	1.	1.	1.	
TOTAL	26.	361.	307.	444.	544.	725.	1104.	
PREY : OTHER								
All classes	57.	1003.	1646.	2446.	3375.	3024.	4010.	

Table 2.3.3

Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species by predator age class, area and quarter.

PREDATOR : WHITING		YEAR : 1986			QUARTER : 1		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+	
Nr of stomachs with food	0	455	146	114	29	8	4	
% empty stomachs	0.00	0.04	0.04	0.06	0.05	0.02	0.00	
Mean length	0.00	14.81	23.34	26.20	29.98	31.42	31.23	
PREY : ALL SPECIES								
All classes		694.	2833.	4659.	7165.	8147.	8993.	
PREY : GADUS MORHUA								
Age class 1		16.	52.	17.	6.	4.	3.	
TOTAL		16.	52.	17.	6.	4.	3.	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class 1		4.	31.	197.	243.	84.	98.	
TOTAL		4.	31.	197.	243.	84.	98.	
PREY : MERLANGIUS MERLANGUS								
Age class 1		71.	359.	530.	397.	448.	505.	
TOTAL		71.	359.	530.	397.	448.	505.	
PREY : TRISOPTERUS ESMARKI								
Age class 0		8.	0.					
1		2.	225.	1218.	3451.	4198.	4761.	
2		0.	6.	105.	348.	484.	745.	
3			1.	20.	21.	34.	67.	
4			0.	1.	1.	1.	2.	
TOTAL		11.	233.	1344.	3821.	4717.	5575.	
PREY : CLUPEA HARENGUS								
Age class 1		6.	104.	17.	3.	2.		
2		32.	141.	184.	54.	82.	2.	
3		0.	1.	0.	0.	0.	0.	
TOTAL		38.	246.	202.	57.	83.	2.	
PREY : CLUPEA SPRATTUS								
Age class 1		3.						
2		9.	72.	81.	11.	15.		
3		1.	8.	8.	1.	1.		
4			0.	1.	0.	0.		
TOTAL		13.	80.	90.	13.	16.		
PREY : AMMODYTIDAE								
Age class 1		213.	367.	394.	372.	189.	276.	
2		8.	13.	48.	48.	28.	30.	
TOTAL		221.	381.	442.	419.	218.	306.	
PREY : OTHER								
All classes		320.	1451.	1837.	2208.	2577.	2503.	

Table 2.3.4

Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species by predator age class, area and quarter.

PREDATOR : WHITING		YEAR : 1986			QUARTER : 3		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+	
Nr of st. with food	171	282	217	160	34	8	7	
% empty stomachs	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
Mean length	0.94	10.75	9.86	7.76	26.66	24.81	21.71	
PREY : ALL SPECIES								
All classes	21.	1147.	1763.	1658.	7074.	6079.	7110.	
PREY : GADUS MORHUA								
TOTAL		1.	0.	0.				
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class 0	3.	17.	71.	84.	185.	216.	1546.	
1		0.	0.	0.	0.	0.	0.	
TOTAL	3.	17.	71.	84.	185.	216.	1546.	
PREY : MERLANGIUS MERLANGUS								
Age class 0	0.	46.	171.	51.	120.	122.	704.	
1			0.	0.	2.	4.		
TOTAL	0.	46.	171.	51.	121.	126.	704.	
PREY : TRISOPTERUS ESMARKI								
Age class 0	4.	155.	176.	467.	2495.	1893.	2464.	
1		3.	45.	210.	2190.	1719.	1053.	
2			0.	0.	24.	26.	16.	
TOTAL	4.	158.	221.	678.	4709.	3639.	3533.	
PREY : CLUPEA HARENGUS								
Age class 0	2	27.	33.	19.	17.	50.		
1		161.	585.	391.	778.	929.	403.	
TOTAL	2.	188.	618.	410.	796.	979.	403.	
PREY : CLUPEA SPRATTUS								
Age class 0		7.	2.	0.				
TOTAL		7.	2.	0.				
PREY : AMMODYTIDAE								
Age class 0	3.	448.	275.	152.	322.	316.	243.	
1	0.	26.	223.	118.	137.	1.		
2		1.	12.	7.	8.			
3		0.	4.	2.	2.			
4		0.	0.	0.	0.			
TOTAL	3.	475.	514.	278.	469.	317.	243.	
PREY : OTHER								
All classes	8.	254.	167.	157.	793.	802.	683.	

Table 2.4.1

Average prey weight at time of ingestion (g) by age class of commercially exploited prey species by predator age class, nad quarter.

PREDATOR : WHITING		YEAR : 1981/85/86			QUARTER : 1		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+	
PREY : ALL SPECIES								
All classes		0.20	1.43	2.10	2.97	3.82	4.24	
PREY : GADUS MORHUA								
Age class 1		7.89	17.52	17.58	17.50	25.45	87.759	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class 1		5.85	19.45	26.09	24.13	18.95	18.85	
2			36.00	35.10	38.82	39.71	41.37	
3			20.73					
PREY : MERLANGIUS MERLANGUS								
Age class 1		9.12	24.05	23.79	32.57	33.44	43.72	
2			51.50	80.88	96.15	106.60	111.10	
3					120.00	120.00	125.00	
PREY : TRISOPTERUS ESMARKI								
Age class 0		1.44	0.02	0.23				
1		4.69	10.30	13.27	15.06	15.66	16.39	
2		10.76	20.22	19.80	20.81	21.39	22.04	
3			24.32	36.63	39.12	41.02	43.86	
4				33.33	80.00	57.14	44.44	
PREY : CLUPEA HARENGUS								
Age class 1		4.41	8.02	7.37	5.85	11.57	4.22	
2		6.65	9.71	14.55	20.18	23.42	30.75	
3			9.09	34.48	65.12	57.14	64.52	
PREY : CLUPEA SPRATTUS								
Age class 1		1.34	1.83	1.72	1.82	1.73	1.96	
2		5.01	6.53	7.01	6.93	7.18	6.94	
3		10.26	13.15	15.03	12.03	11.87	14.43	
4		10.00	12.07	16.83	13.13	12.59	16.52	
5			25.00	23.53	35.29	27.27	37.84	
6					57.14	66.67		
PREY : AMMODYTIDAE								
Age class 1		1.78	2.79	5.99	5.57	5.78	5.19	
2		5.80	8.72	8.26	9.65	10.16	8.87	
3			20.14	24.44	18.61	19.53	20.28	
4			20.00	36.71	36.88	38.29	38.55	
5			26.00	41.75	40.09	40.05	39.55	
6			28.00	40.00	39.92	40.37	40.24	
PREY : OTHER								
All classes		0.12	0.65	0.78	0.86	1.14	1.23	

Table 2.4.2

Average prey weight at time of ingestion (g) by age class of commercially exploited prey species by predator age class, nad quarter.

PREDATOR : WHITING		YEAR : 1981/85/86			QUARTER : 3		ALL AREAS	
AGE CLASS	0	1	2	3	4	5	6+	
PREY : ALL SPECIES								
All classes	0.02	0.36	0.56	0.73	1.02	2.87	2.88	
PREY : GADUS MORHUA								
Age class 0		4.17	6.77	7.28	8.77	12.50		
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class 0	4.24	4.85	6.64	5.10	5.60	6.62	6.90	
1			15.93	15.74	15.73	14.90	14.34	
PREY : MERLANGIUS MERLANGUS								
Age class 0	4.10	4.88	4.00	4.00	4.00	4.00	0.837	
1					57.14	53.33		
PREY : TRISOPTERUS ESMARKI								
Age class 0	2.02	2.57	2.34	2.63	5.51	5.51	5.80	
1		10.17	16.76	29.77	30.33	32.12	30.96	
2			20.00	31.77	35.47	35.92	37.78	
PREY : CLUPEA HARENGUS								
Age class 0	3.20	6.36	9.56	9.69	8.40	9.73	7.09	
1		12.09	7.55	11.55	17.76	21.98	20.22	
2			14.53	25.78	51.27	50.29	52.95	
PREY : CLUPEA SPRATTUS								
Age class 0	4.28	9.50	8.23	7.24	6.63	5.92	6.30	
1		10.00	12.16	13.58	14.64	14.64	14.76	
2		10.00	14.71	17.76	16.79	17.34	17.87	
3		10.10	13.32	18.39	16.98	17.23	17.87	
PREY : AMMODYTIDAE								
Age class 0	1.00	1.82	1.99	1.83	1.98	1.96	1.79	
1		11.89	14.95	17.98	17.69	26.68	28.81	
2		12.00	12.54	16.25	14.92	19.51	21.35	
3		15.00	19.94	18.83	22.66	24.86	25.75	
4		18.00	18.66	18.40	22.90	25.54	23.57	
5			66.67	20.00	36.36	28.57	23.53	
6				40.00	33.33	50.00	20.00	
PREY : OTHER								
All classes	0.01	0.17	0.19	0.28	0.32	1.36	1.10	

Table 3.1
Summary of stomach contents by predator by age class, area and quarter.

PREDATOR : SAITHE	YEAR : 1985			QUARTER : 3		ALL AREAS	
	3	4	5	6	7	8	9+
GENERAL RESULTS							
Nr of st. sampled	193	1500	281	30	73	11	14
Nr of st. with food	118	885	145	16	46	7	9
Nr of regurgit. st.	53	439	101	11	20	3	4
Nr of empty st.	22	176	36	4	8	1	1
% empty stomachs	11.378	11.717	12.746	12.533	10.314	10.323	7.329
Mean length							
Total wght all prey	8.152	9.061	15.413	17.469	61.093	60.418	77.987
WEIGHT % BY MAJOR TAXA							
Crustacea	35.78	32.77	21.77	19.74	5.78	5.84	4.94
Euphausiacea	34.48	30.95	17.85	15.57	2.19	2.25	2.59
Caridea	1.30	1.82	3.92	4.17	3.59	3.59	2.35
Gnathostomata	64.22	67.23	78.23	80.26	94.22	94.16	94.06
WEIGHT % COMMERCIAL SPEC.							
G. morhua	0.01	0.08	0.36	0.38	0.00	0.00	
M. aeglefinus	9.73	8.85	7.66	7.60	5.61	5.62	3.67
M. merlangus	0.67	0.63	0.34	0.29	0.00	0.00	19.18
T. esmarkii	32.51	38.12	57.56	58.82	36.42	36.52	23.78
C. harengus			0.03	1.64	35.92	35.77	37.76
AMMODYTIDAE	11.16	9.35	1.41	0.36	1.69	1.69	1.11
Pandalus spec.	1.30	1.82	3.92	4.17	3.59	3.59	2.35

Table 3.2
Average stomach content weight (g) per 1000 fish by age class of commercially exploited prey species by predator age class, area and quarter.

Predator: SAITHE	Year: 1986		Quarter: 3		Total North Sea		
Age class	3	4	5	6	7	8	9+
Nr of st. with food	193	1500	281	30	73	11	14
% empty stomachs	0.11	0.12	0.13	0.13	0.10	0.10	0.07
Prey: ALL SPECIES							
All classes	8152	9061	15413	17469	61093	60418	77987
Prey: Gadus morhua							
Age class: 0	1	7	56	67	1	2	
Prey: Melanogrammus aeglefinus							
Age class: 0	793	802	1181	1328	3425	3392	2859
1					3	3	2
TOTAL	793	802	1181	1328	3428	3395	2861
Prey: Merlangius merlangus							
Age class: 0	55	57	53	50	1	2	
1							758
2							9791
3							3798
4							480
5							130
6							
TOTAL	55	57	53	50	1	2	14957
Prey: Trisopterus esmarkii							
Age class: 0	2079	2235	2893	3026	4788	4761	3979
1	557	11780	5753	6970	16486	16339	13752
2	14	39	226	280	973	963	814
TOTAL	2650	3454	8872	10276	22247	22063	18545
Prey: Clupea harengus							
Age class: 2				10	753	751	1195
3			2	144	11032	10863	17951
4			1	54	4164	4100	5267
5							
6			1	78	5988	5896	5032
TOTAL			4	286	21947	21610	29445
Prey: Ammodytidae							
Age class: 0	894	833	215	62	952	939	800
1	16	14	3	1	82	81	69
TOTAL	910	847	218	63	1034	1020	869
Prey: OTHER							
All classes	3743	3892	5029	5398	12435	12327	11312

Table 4.2 ctd

Age class	0	1	2	3	4	5	6+
Year: 1986							
Area: North Quarter: 1							
Size class	<=80	100.00					
	100	92.14	7.86				
	150	52.94	47.06				
	>=200						100.0
Area: South Quarter: 1 [No information: ALK 1985/1 South used]							
Area: North Quarter: 3							
Size class	<=80	100.0					
	100	92.06	7.94				
	150		87.10	12.90			
	200 *)		36.36	36.36	18.18		9.09
	>=250 *)						100.0
Area: South Quarter: 3							
Size class	<=70	100.0					
	80	99.20	0.80				
	100	26.70	70.71	2.59			
	150		91.29	6.26	2.36	0.09	
	200		36.36	36.36	18.18		9.09
	>=250						100.0
*) copied from 1986/3 area south!							
Year: 1987							
Area: North Quarter: 1							
Size class	<=70	100.0					
	80	67.11	32.89				
	100	15.71	84.29				
	150		82.37	12.78	0.75		
	200		33.33	33.33	33.33		
	>=250						100.0
Area: South Quarter: 1 [No information: ALK 1985/1 South used]							
Area: North Quarter: 1 [No information: ALK 1986/3 North used]							
Area: South Quarter: 1							
Size class	<=70	100.0					
	80	99.20	0.80				
	100	26.70	70.71	2.59			
	150		91.29	6.26	2.36	0.09	
	200		36.36	36.36	18.18		9.09
	>=250						100.0

Table 5.1 Average stomach content weight (g) by predator size class, quarter and year.*)

Predator: Cod															
Size class:	50	70	100	150	200	250	300	350	400	500	600	700	800	900	1000
1966 - 1972															
Quarter 1	0.18		0.58		1.82		6.90		13.3	18.8	43.3	70.6	98.6	126	153
" 2	-		0.63		1.99		7.99		17.9	33.7	66.8	-	107.	-	-
" 3	0.17		0.42		1.76		4.89		11.3	25.3	44.3	64.3	77.6	-	-
" 4	0.18		0.46		2.12		4.04		15.9	32.3	66.7	167	105	140	-
1981															
Quarter 1		(0.00)	0.38	0.64	1.06	2.04	5.21		14.45	37.14		83.84			164.71
" 2		-	0.29	0.76	1.29	3.13	8.15		14.86	37.03		111.68			(189.01)
" 3		(0.09)	0.33	0.90	1.44	2.35	6.55		17.01	38.84		137.84			376.46
" 4		(0.23)	0.25	0.63	1.34	2.63	5.80		13.37	30.23		104.14			148.34
1985															
Quarter 1		-	0.40	0.67	2.27	2.42	5.81	12.67	22.35	39.17	70.46	117.26	112.99		250.24
" 3		0.19	0.33	(0.26)	1.16	2.06	4.66	9.67	18.24	30.87	76.60	67.51	138.02		(324.18)
1986															
Quarter 1		(0.06)	0.36	0.86	1.98	3.90	7.31	8.80	19.57	35.44	44.13	86.54	107.42		159.31
" 3		(0.13)	(0.23)	0.55	1.34	2.97	5.10	8.42	14.94	33.03	50.67	71.69	127.39		(443.14)
1987															
Quarter 1		-	0.27	0.57	1.24	3.14	5.27	9.02	15.02	17.53	48.31	83.36	81.46		151.49
" 3		-	(0.17)	0.27	1.58	2.91	5.79	8.08	17.08	31.45	54.27	91.94	171.03		(291.99)

*) When based on less than 25 stomachs figures are in brackets

Table 5.2 Average stomach content weight (g) by predator size class, quarter and year.*)

Predator : Whiting						
Age class :	1	2	3	4	5	6+
1981						
Quarter 1	0.44	0.91	1.87	2.91	3.57	4.77
" 2	0.71	1.68	3.06	2.68	2.74	3.90
" 3	0.91	2.44	3.71	4.53	5.57	4.79
" 4	1.06	1.82	2.85	3.60	4.83	4.96
1985						
Quarter 1	0.41	1.85	3.66	5.11	5.65	5.42
" 3	1.75	2.93	4.96	5.84	8.97	10.18
1986						
Quarter 1	0.87	3.19	4.93	6.09	7.05	8.72
" 2	2.17	3.48	4.79	7.39	8.54	7.67

Table 5.3 Average stomach content weight (g) by predator size class, quarter and year.*)

Predator : Saithe						
Size class :	250	300	400	500	700	1000
1980						
Quarter 1	-	-	(15.70)	34.49	45.17	(74.64)
" 3	(5.80)	(7.04)	(14.37)	(28.78)	138.14	(129.17)
1981						
Quarter 1	-	-	(13.20)	23.52	50.07	(119.71)
" 2	-	(6.70)	(20.09)	37.59	51.83	(89.45)
" 3	-	4.17	7.21	9.68	33.22	(44.33)
" 4	-	-	9.81	10.25	17.43	25.15
1982						
Quarter 1	(4.70)	3.89	6.98	2.55	7.00	(0.00)
" 3	-	2.03	11.65	14.55	31.33	(41.25)
" 4	-	(5.68)	(18.40)	28.81	62.59	(80.60)
1983						
Quarter 1	(19.65)	21.41	29.40	20.95	41.29	-
1984						
Quarter 1	-	-	(0.00)	(3.72)	(16.90)	-
" 3	-	6.65	9.97	39.40	124.37	-
1986						
Quarter 3	(2.35)	6.56	8.32	16.89	61.19	(154.07)

*) When based on less than 25 stomachs figures are in brackets.

Table 6.1 Percentage of empty stomachs by predator size class, quarter and year.*)

Predator: Cod															
Size class:	50	70	100	150	200	250	300	350	400	500	600	700	800	900	1000
1966 - 1972															
Quarter 1	-		7.7		8.7		7.1		9.5	14.2	14.0	10.9	7.7	12.9	
" 2	-		12.3		11.9		13.8		15.0	12.1	11.4	(20.0)	2.9	(25.0)	
" 3	-		16.4		15.7		10.8		13.1	12.5	13.2	7.7	18.2	(15.8)	
" 4	8.0		7.3		8.8		7.0		2.4	5.0	10.0	7.3	1.9	4.9	
1981															
Quarter 1		(100.00)	12.39	11.16	11.30	12.15	9.68		10.11	17.63		15.35			16.24
" 2		-	11.11	15.34	15.55	11.08	9.29		9.46	5.61		1.11			(0.00)
" 3		22.22	12.96	9.48	24.14	15.68	13.78		16.62	17.44		13.23			38.78
" 4		(0.00)	20.63	12.56	13.57	12.45	9.91		8.91	6.84		3.08			7.41
1985															
Quarter 1		-	4.88	4.40	12.60	11.58	10.95	6.80	8.47	5.14	16.56	9.52	8.18		6.67
" 3		2.94	7.14	(0.00)	14.29	13.36	11.15	6.91	8.88	11.90	12.37	15.83	11.39		(6.67)
1986															
Quarter 1		(0.00)	9.75	10.33	8.68	6.19	8.60	10.94	12.06	6.06	8.20	14.62	17.12		15.63
" 3		(53.85)	4.76	19.12	16.61	12.62	13.98	8.71	9.02	7.33	9.65	2.38	4.29		(0.00)
1987															
Quarter 1		-	15.73	10.65	9.60	7.90	12.02	9.49	6.25	5.88	7.27	10.00	11.49		19.05
" 3		-	(33.33)	17.98	19.92	13.44	11.95	15.42	14.76	15.65	12.64	19.67	9.26		(7.69)

*) When based on less than 25 stomachs figures are in brackets

Table 6.2 Percentage of empty stomachs by predator size class, quarter and year.*)

Predator: Whiting								
Size class:	100	150	200	250	300	350	400	500
1981								
Quarter 1	18.49	27.56	27.54	28.77	28.24		27.84	(0.00)
" 2	16.12	23.54	24.41	21.79	19.37		26.42	-
" 3	22.51	25.86	27.40	26.61	26.36		26.38	(33.33)
" 4	22.52	18.50	24.14	20.95	21.22		6.36	(0.00)
1985								
Quarter 1	15.31	13.13	16.08	17.72	21.35	14.92	16.48	(100.00)
" 3	5.53	8.05	6.87	6.74	4.40	1.73	7.46	(0.00)
1986								
Quarter 1	4.25	2.40	5.53	6.52	5.21	2.60	(0.00)	-
" 3	0.30	1.24	2.04	0.00	0.17	0.00	0.00	-

Table 6.3 Percentage of empty stomachs by predator size class, quarter and year.*)

Predator: Saithe							
Size class:	250	300	400	500	700	1000	
1980							
Quarter 1	-	-	(0.00)	16.28	24.00	(31.25)	
" 3	(0.00)	(0.00)	(0.00)	(60.00)	8.57	(0.00)	
1981							
Quarter 1	-	-	(33.33)	22.02	15.87	(25.00)	
" 2	-	(14.29)	(14.29)	0.00	4.42	(0.00)	
" 3	-	28.89	12.28	41.32	18.52	(0.00)	
" 4	-	-	0.00	13.41	25.64	26.01	
1982							
Quarter 1	(0.00)	6.67	15.63	25.71	64.00	(100.00)	
" 3	-	26.42	5.95	9.00	8.82	(0.00)	
" 4	-	(0.00)	(18.75)	5.56	2.90	(0.00)	
1983							
Quarter 1	(0.00)	33.33	(11.76)	30.43	34.15	-	
1984							
Quarter 1	-	-	(100.00)	(20.00)	(0.00)	-	
" 3	-	0.00	3.17	6.92	0.00	-	
1986							
Quarter 3	(0.00)	10.73	12.25	12.80	10.31	(0.00)	

*) When based on less than 25 stomachs figures are in brackets.

Table 7
Specification of record format for exchange of stomach content data

Position	Name	Type)	M/O)	Range	Comments
1-2	Record type	2 A	M		Fixed value SS
3	Quarter	1 N	M	1 to 4	
4- 6	Country	3 A	M		ICES alpha code ***); default XXX
7- 9	Ship	3 A	M		ICES alpha code ***); default XXX
10-12	Gear	3 A	M		ICES alpha code ***); default XXX
13-14	Year	2 N	M	65 to 99	Not known 99
15-16	Month	2 N	M	1 to 12, 99	Not known 99
17-18	Day	2 N	O	1 to 31, 99	Not known 99
19-22	Time hauled	4 N	M	0 to 2400, 9999	In GMT, not known 9999
23-25	Fishing depth	3 N	O	0 to 500, 999	In metre, not known 999
26-29	Square	4 AN	M		ICES Statistical rectangle
30-39	Predator code	10 N	M		NODC 10 digit code
40-44	Predator size code	5 N	M	-1 to 99999	See ANONYMUS, 1984, Appendix I
45-51	Number per hour fishing	7 N	O		Not known: zero filled
52-54	Number with food	3 N	M		
55-57	Number regurgitated	3 N	M		
58-60	Number empty	3 N	M		
61-70	Prey species code	10 N	M		NODC 10 digit code
71-77	Prey size code	7 N	M	-1 to 99999	See ANONYMUS, 1984, Appendix I
78-85	Prey weight	8 N	M		In mg
86-91	Number of prey	6 N	O		No information: space filled
92-100	Paddingfield	9 N			Space filled

*) All numeric fields (N) right justified, zero filled, unless otherwise indicated; All alpha (A) and mixed alpha/numeric fields (AN) left justified, space filled.

**) M : mandatory; O : optional.

***) see ICES IYFS exchange tape specifications.