

**REPORT OF THE
AD HOC MEETING OF THE COORDINATORS OF THE
1991 STOMACH SAMPLING DATABASE**

IJmuiden, The Netherlands

18–23 April 1996

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International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

Palægade 2–4 DK-1261 Copenhagen K Denmark

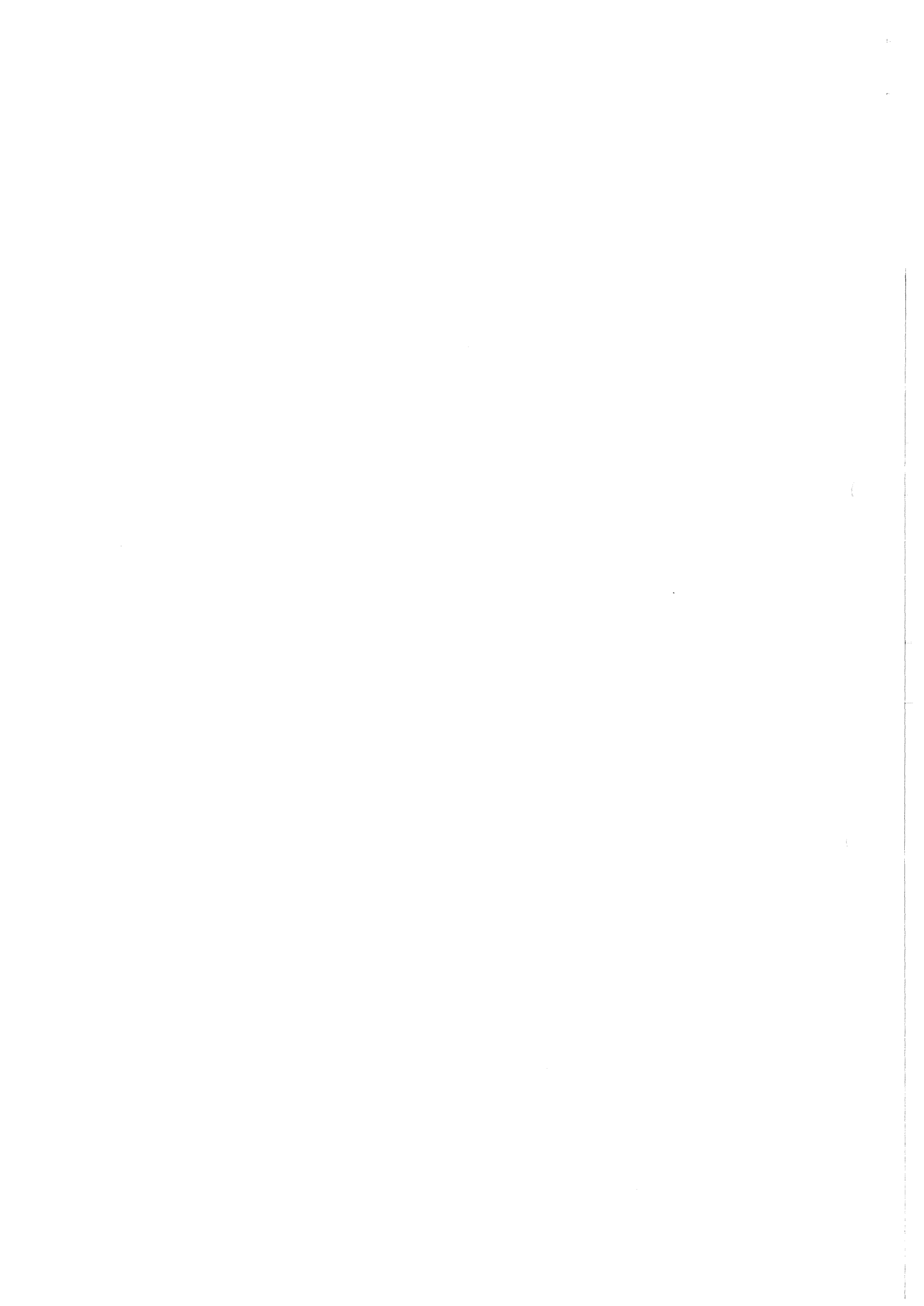


Table of Contents

Section	Page
1 TERMS OF REFERENCE	1
2 PARTICIPANTS	1
3 A HISTORY OF THE STOMACH CONTENTS DATA SETS, WITH REFERENCE TO MSVPA	1
3.1 Feeding Data Collected in 1981	1
3.2 Feeding Data Collected in 1985–1987	3
3.3 Feeding Data Collected in 1991	3
4 ALLOCATING PARTIALLY IDENTIFIED PREY TO SPECIES	4
5 THE MEAN WEIGHTS AT AGE OF MSVPA PREY SPECIES	5
5.1 Background	5
5.2 The Current Method	6
5.3 Refining the Current Method	7
5.4 New Raising Factors Used to Prepare MSVPA Input Files	9
5.5 Averaging Over Years	9
6 CONSUMPTION RATES	9
6.1 Comparing Original and Modified Prey Compositions by Predator Age Class	11
7 NEW KEY RUNS OF MSVPA	12
8 SUMMARY AND DISCUSSION	13
9 REFERENCES	13
Tables 5.4.1 a–6.1	15
Figures 5.3.1–6.2 d	32
Appendix 1	45
Appendix 2	94

1. TERMS OF REFERENCE

The Terms of Reference for the meeting (C.Res. 1995/2:36) were:

- a) To prepare the data needed for an update of the North Sea Multispecies VPA with particular reference to the mean weights at age of prey species in the stomachs in the 1981 and 1991 data.
- b) To report to the Multispecies Assessment Working Group and to the Advisory Committee on Fishery Management.

2. PARTICIPANTS

The meeting of the Coordinators of the stomach sampling project in the North Sea in 1991 took place in IJmuiden, from 18 to 23 April 1996. The participants were:

S Adlerstein	Germany
N Daan	The Netherlands
J Hislop	UK (Scotland) (Chairman)
N Mergardt	Germany
A Robb	UK (Scotland)
K Stokes	UK (England)
D Skagen	Norway
A Temming	Germany
H Welleman	The Netherlands

3. A HISTORY OF THE STOMACH CONTENTS DATA SETS, WITH REFERENCE TO MSVPA

Since 1984, when the first trial runs of the North Sea MSVPA were conducted (Anonymous, 1994), using feeding data from the stomachs sampled in 1981, various changes have been made to the input data. Corrections have been made to the original stomach contents data and to the auxiliary data (age length keys, survey data), additional stomachs have been sampled and there have been changes in the methods used to process the stomach data into the form required as input to MSVPA. Because these changes affect the results of the MSVPA in various ways, it is important that they should be documented.

3.1 Feeding Data Collected in 1981

1981 was the first "Year of the Stomach" in the North Sea. A full description of this project is given in Daan, 1989, but some of the same ground must be covered again here.

The stomachs of cod, haddock, whiting, saithe and mackerel were sampled in each quarter of the year. A coordinator was appointed for each species. The coordinators were responsible for analysing the stomach contents of individual species, to ensure homogeneity within data sets, and assembling the data in the form required by MSVPA, namely arrays containing the average weights and numbers, as well as the weights at ingestion, of each prey age class in the stomach of each predator age class, averaged over the whole North Sea.

Although the 1981 stomach sampling project had a clearly defined goal, there was no predetermined agreement between the species coordinators as to how this goal was to be achieved, and four independent methods were applied to the five species:

Cod and haddock: the stomach data were processed using a suite of PASCAL programs developed by N Daan at RIVO (the ISR programs).

Whiting: a program was written in BASIC by D Armstrong at Aberdeen. The final outputs from this program were identical in format to those from the ISR programs, but different pathways were followed to reach them. Unfortunately the computerised data were held in virtual files which could not be accessed when the Marine Laboratory adopted a new operating system.

Cod, haddock and whiting are widely distributed throughout the North Sea, and they are sampled effectively by bottom trawl surveys. For these three species, it was possible to work up the data using age length keys based on Roundfish Reporting Areas and to use trawl survey data to weight the mean stomach contents within each statistical rectangle by indices of local abundance (trawl catch rates).

Saithe: the data collected in 1981 were rather sparse and were supplemented by additional material collected in 1980 and 1982. The data were processed using programs written by H Gislason in Copenhagen (Gislason, 1983).

Mackerel: as for saithe, a rather small number of stomachs was sampled in 1981 and these were supplemented with material from 1980, 1982 and 1983. The data were processed using FORTRAN programs developed in Bergen by Westgard (Westgard, 1982).

The methods used to process the saithe and mackerel data differed from those applied to cod haddock and whiting. It was necessary to use age length keys for much larger areas, and survey catch rates could not be used as sample weighting factors.

The 1981 feeding data for cod, whiting, saithe and mackerel were used for the first trials of the North Sea MSVPA in 1984 (Anonymous, 1984). The haddock data became available in 1985 (Anonymous, 1986).

These original input data have been used in all key runs of MSVPA up to and including 1995 (Anonymous, 1996). To the best of our knowledge, the only alterations are undocumented *ad hoc* changes to the assumed mean weights of prey at the time of ingestion and changes to some of the age length keys used to determine the age composition of the prey which were made by the MSVPA WG for various reasons (see Section 3).

However, since the 1995 meeting of the MSVPA WG, the 1981 input data for whiting have been altered. As mentioned previously, the original computerised whiting stomach contents data for 1981 could not be retrieved and the only records of the processed data, as supplied to the MSVPA WG, are the summary tables given in an *ICES Cooperative Research Report* (Daan, 1989). In order to make the complete set of whiting data generally available it was necessary to go back to the original paper records, which were still held in Aberdeen, and to re-enter all the basic stomach contents data into the computer. In the interests of conformity, it was decided that the data should be computerised and processed using the (current) version of the ISR programs. Because there are some fundamental differences between these programs and those originally used to process the data in Aberdeen, the

"new" 1981 whiting MSVPA input data are by no means identical to those used in previous runs of MSVPA.

The 1981 mackerel data were originally processed rather differently from the other species. Because this is a migratory species, a partition of the North Sea into three areas was used instead of the roundfish sampling areas. Due to the coarse length sampling strata used in 1981, most of the adult mackerel are included in the 30-39 cm length class and the remainder in the 40+ length class. When the data were processed, only three age groups were used (ages 0, 1-2, and 3+). All stomach samples were given equal weight, since the catch rate with a demersal trawl is a rather poor indicator of the abundance of this species, and some of the mackerel were sampled with other gears, mostly from the commercial fishery. The data were stored in a database in Bergen. A set of the data, in the exchange tape format, was provided for the present meeting, in the hope that the mackerel data could be brought into the ISR fold. However, the data could not be processed during the meeting. This was partly because it was not clear which age length keys had been and should be applied, and partly because the data set contains stomachs collected outside the North Sea, notably north of 62°N. It is not clear how these data were used in previous data compilations, and the value of using data from this area to represent the North Sea is questionable. The mackerel data will be examined in Bergen.

3.2 Feeding Data Collected in 1985-1987

Stomachs of cod and whiting were sampled during the first and third quarters of 1985, 1986 and 1987. Saithe stomachs were sampled in the third quarter of 1986 and the first and third quarters of 1987 (Anonymous, 1988a). All these stomach contents data were processed using the ISR programs. These ISR programs were virtually identical to as those used to process the 1981 cod and haddock data. The only significant modification was that some extra predator and prey size classes had been introduced to allow a more precise conversion of size classes to age classes. The new stomach contents data entered MSVPA in piecemeal manner, as they became available. Thus the cod and saithe data, together with the whiting data for 1985, were used during the 1988 meeting of the MSVPA WG (Anonymous, 1988b) whereas the complete set of whiting data was not available until 1990 (Anonymous, 1991).

No modifications have been made to the basic input data since they were first included in MSVPA in 1985, apart from adjustments made by the MSVPA WG to some of the mean weights at ingestion.

3.3 Feeding Data Collected in 1991

1991 was the second "Year of the Stomach". Cod, haddock, whiting, saithe and mackerel were sampled in each quarter of the year.

All the 1991 data were processed using the ISR programs. A number of modifications had been made to these programs since they were used to process the 1985-87 data, including provision for yet more predator and prey size classes.

The 1991 stomach contents data were used for the first time during the 1993 meeting of the MSVPA WG (Anonymous, 1994), when they were included in new key runs of MSVPA. However, after that meeting it became obvious that there was a bug in the modified ISR programs and some of the input data used during the 1993 meeting were incorrect. The programs were modified and revised input data (still based on the original 1991 stomach

contents data files) were made available to the 1995 meeting of the MSVPA WG (Anonymous, 1996). A comparison of the outputs generated from the "old" and "new" 1991 input data revealed that they differed, but not sufficiently to invalidate the conclusions reached in 1993.

Since 1995 there have been further developments. In the first place, the 1991 stomach contents data base has been thoroughly checked and a small number of data entry errors have been corrected.

In the second place, an error was found in one of the sets of trawl survey data for the second quarter of 1991. The catch rates as originally submitted to ICES had not been standardised to numbers per hour fishing. Trawl surveys provide information on abundance and predator size compositions which plays a key role in processing the stomach contents data and the inclusion of incorrect data will have introduced errors into the MSVPA input data for cod, haddock, whiting and mackerel in that quarter. The survey data were corrected during the present meeting.

In the third place, a shortcoming in all former versions of the ISR programs was identified in 1995. This concerns the way in which partly identified MSVPA prey are handled. During the analysis of stomach contents, it is not unusual to encounter prey which are digested to such an extent that identification to species level is impossible. In such cases, the analyst may make an on-the-spot decision to assign the item to a species, using cues such as the contents of other stomachs from the same haul, or the composition of trawl hauls. Alternatively, the item can be assigned to a family (Clupeidae, Gadidae etc.), or recorded as "unidentified fish". The stomach contents data sets contain a number of such records of partially identified/unidentified fish. However, the ISR programs used between 1981 and 1995 did not make use of these records when calculating the contribution made by each MSVPA species to the total stomach contents. Only those prey which had been identified to species level were included in the analysis. Although this procedure may be academically sound, a more pragmatic approach is needed to make the best estimate of the relative importance of each prey species to the diet of each predator for the purpose of MSVPA. Accordingly, algorithms have been developed to distribute fish which had been identified to family level over MSVPA species. The details of this procedure are given in Section 4.

It should be noted that this modification has produced some changes in **all** the input data to MSVPA which were originally processed with the ISR programs. The changes are trivial in the case of cod, because the stomach analysts assigned virtually all fish prey to a species, but less so for some of the other MSVPA predators, such as whiting.

An improvement has been made to the procedure for transferring feeding data to the customer. Programs now exist to read the output files generated by the ISR programs and to convert them to MSVPA input files. Previously, these data had to be entered manually. This process was very laborious and provided ample opportunity for transcription errors.

4. ALLOCATING PARTIALLY IDENTIFIED PREY TO SPECIES

As mentioned in Section 3.3, the stomach data sets include a number of prey items which are identified only to family level. The ISR programs did not make use of these records. In order to obtain a more precise estimate of the contribution of MSVPA species, and four

important flatfish species, to the total stomach contents, prey identified as Clupeidae, Gadidae, Pleuronectidae and Soleidae were redistributed within their family as follows:

Gadidae → cod, haddock, Norway pout, saithe, whiting, non-commercial Gadidae (grouped)
 Clupeidae → herring, sprat, non-commercial Clupeidae (grouped)
 Pleuronectidae → plaice, dab, lemon sole, non-commercial Pleuronectidae (grouped)
 Soleidae → sole, non-commercial Soleidae (usually only solenette)

If the prey item (eg Clupeidae) had been measured and assigned to a particular size class (I), the redistribution was made over all family members in this size class (eg Herring [i], Sprat[i]), for weights and numbers separately:

$$\text{Her}[i]=\text{Her}[i]+(\text{Clu}*(\text{Her}[i]/(\text{Her}[i]+\text{Spr}[i])))$$

If the prey item was well digested and the size classified as unknown (u), it was distributed over all recorded size classes of the species in the family:

for I = 1 to n: $\text{Her}[i]= \text{Her}[i]+(\text{Clu}*(\text{Her}[i..n]/(\text{Her}[i..n]+\text{Spr}[i..n])))$

The redistribution is done for predator size classes. Prey are redistributed first at statistical rectangle level. The algorithm is then deployed at roundfish sampling area level to distribute prey which could not be distributed at rectangle level.

The algorithms have allocated to species level a large proportion of the prey which had originally been identified only to family level. It may be possible to allocate most of any remaining "Gadidae" and "Clupeidae" to species on the basis of their size, and when and where they were eaten, in relation to the corresponding survey catches. This should be done at the haul level, rather than on the basis of a sophisticated algorithm. No attempt was made to redistribute prey in the category "unidentified fish". However, it should be noted that the exclusion of these items does not influence the outcome of MSVPA, which is dependent on the proportional contribution to the diet made by each MSVPA prey. The only logical method of handling unidentified fish is to distribute them *pro rata* over all identified species. This procedure would increase the weights of each MSVPA species in the stomach contents but it would not alter the proportions.

5. THE MEAN WEIGHTS AT AGE OF MSVPA PREY SPECIES

5.1 Background

In the MSVPA it is necessary to convert the weights (of each prey age class) consumed by each predator age class into the numbers of prey consumed. This is done by dividing the weights of each age class of each prey species consumed by their estimated mean "live" weights. These weights are often referred to as the mean weights at the time of ingestion.

The weights at the time of ingestion have a direct bearing on the outcome of MSVPA and must therefore be reliable. The use of unrealistically low mean weights results in an overestimation of the numbers of prey consumed, and predation will be overestimated. Conversely, if the weights are fixed at too high a level, consumption and predation mortality

will be underestimated. The effects of changing mean weights on estimated stock sizes and predation mortality are almost *pro rata*.

However, it is difficult to determine the appropriate prey weights-at-age in each predator/prey age class combination. In general, it is not realistic to use the mean weights of each prey age class in the sea (stock weights at age), because each prey cohort tends to be exploited more or less selectively by each predator age class. Thus although an old (large) predator might prey on the entire length range of a prey cohort, in which case it would be appropriate to assume that the mean weight of the prey ingested corresponded to the stock weight, a younger (smaller) individual may only be capable of eating the smaller individuals of the cohort.

In theory, the necessary information on prey weight can be obtained directly from the stomach contents, by measuring and weighing intact prey. However, most prey are digested to the extent that their weights are substantially reduced. An alternative approach is to measure the prey and to apply weight/length relationships. Again, the advanced state of digestion of many of the prey makes it impossible to measure them with sufficient accuracy. Furthermore, the fact that prey were grouped by size classes during the analysis of the stomach contents makes it difficult to make full use of such information.

5.2 The Current Method

The information on mean weight at age currently used as input to MSVPA is initially derived directly from the stomach contents. The stomach data processing programs provide estimates of the weight and the number of each age class of each MSVPA species in the stomach of an average predator in each age class. Dividing the weights by the numbers gives the mean weight of each prey species in the stomach. Up to now, it has been assumed that, on average, all prey were "half digested" and the mean weight at ingestion, as supplied to the MSVPA WG, has been estimated by multiplying the mean weight in the stomach by a factor of two.

This method is not ideal. It may be appropriate for prey species/age classes which occur frequently in the stomachs, when the mean weights are based on large samples. However, the estimated mean weights at ingestion are sometimes based on small numbers of prey, or even individual fish. In cases where these scarce prey chance to be almost completely digested, or hardly digested at all, doubling the weight in the stomach can give misleading answers.

Ever since the 1981 stomach contents data were used for the first trials of North Sea MSVPA, it has been apparent that the mean weights derived from the stomach contents are not entirely satisfactory and it proved necessary to smooth obvious outliers. For example, on one occasion MSVPA failed to converge because the very small weights at age of some of the 0-group MSVPA prey in the stomachs of whiting generated extremely high numbers, and the mean weights had to be adjusted. A checking routine was developed which gave a warning message if the weights in the stomach were less than an arbitrary value (1/100 of the stock weight) and in such cases the stomach value is set to 1/100 of the stock weight (Anonymous, 1986). In some cases, problems were resolved by adjusting the ALKs used to distribute the prey across age classes, so that outliers were assigned to another age class. In consequence, the mean weights at ingestion now used by MSVPA often differ considerably from the original data. However, no detailed record has been kept of what was

done, when it was done and why it was done. The criteria were based more on expert judgement than on reproducible algorithms.

During the present meeting considerable attention was paid to the problem of mean weights at age, with a view to determining whether more reliable information on prey weights could be derived from the stomach contents.

5.3 Refining the Current Method

In 1991, the prey items in stomach samples were assigned to digestion stages 0, 1 and 2, where 0 indicates "pristine" prey (completely undigested items), 1 indicates partially digested (readily assignable to size class) and 2 indicates identifiable parts. The pristine prey data are the only source of information on actual weights of prey at ingestion.

The algorithm applied by the ISR program is such that the easiest option for raising observed mean weights in the stomach lies at the final processing stage. This is after age length conversions and area aggregations have taken place. For this reason, a simple approach to calculating raising factors, based on mean weights at age at different digestion stages, has been adopted. It is important to realise that any factors applied at this stage of processing will not necessarily relate directly to the expected level of digestion being one half. Rather, the factors are pragmatic scalings, accounting for sampling, analysis and processing biases.

For each predator species, the mean weight at age of all digestion stages (following processing by the ISR program) was divided into the mean weight at age for all pristine items in stomachs (also following processing by the ISR program). The average ratio for each predator, across all MSVPA fish prey and quarters was calculated (QALL UNWTD). The averages were also calculated with prey-specific ratios weighted by their inverse variance (QALL WTD), as well as the unweighted average for each quarter (Q* UNWTD). The results are given in the following text table:

	PREDATOR				
	COD	WHI	SAI	MAC	HAD
Q1 UNWTD	1.73	1.77	1.48	1.65	1.22
Q2 UNWTD	1.68	4.25	1.48	0.64	1.36
Q3 UNWTD	1.50	1.31	5.55	1.26	0.67
Q4 UNWTD	1.51	3.27	1.80	1.19	1.44
QALL UNWTD	1.62	2.04	1.55	0.83	1.07
QALL WTD	1.38	1.53	1.29	0.99	0.95

In addition to the simple age based calculations (based on processed data), size based statistical analyses (based on raw stomach data) were conducted. The results from these analyses would need to be implemented at an early stage in the data processing and have implications for the complete processing algorithm. They have been conducted, therefore, primarily as a first step in a fuller analysis and to provide a basis for comparison with the age based results. Generalised linear models were fitted. It is clear that further, detailed statistical analyses of the raw, size based data would be worthwhile.

If the size and age based analyses result in similar raising factors, confidence is built in the age based approach. The detailed size based analyses also reveal the dependencies of the raising factor calculations on particular data (or lack thereof, particularly of pristine digestion records). Raising factors derived from the size based analyses are shown in the text table below, which can be compared to the last two rows of the previous text table. Results were not obtained for all species as predators, due to time constraints.

	COD	WHI	SAI	HAD
QALL UNWTD	1.59	1.13	1.16	
QALL WTD	1.38	1.12	1.31	1.05*

*This figure is for haddock preying on sandeel only. There are no significant differences between digestion stages (see Fig. 5.3.1). The equivalent figure based on the age based calculation is 0.95.

The summary plots (Figs 5.3.1-5.3.4) show, for each predator, the influence of the factors; average prey length, predator length, quarter, MSVPA fish prey species and digestion stage (always the bottom panel) on the average prey weight. In each plot, the effects are seen with all other factors accounted for. A detailed description of all plots is beyond the scope of this discussion. A number of clear features are, however, important.

Figure 5.3.1 (haddock preying on sandeel) reveals that there is little information regarding pristine prey, or digestion stage 2 prey. There are no significant differences between digestion stages and the calculated raising factor is therefore unity. The raising factor for haddock, calculated in the age based analysis is heavily dependent on the sandeel (and similar Norway pout) result. The herring-specific ratio is close to 1.7 but is weighted out. Figure 5.3.2 (saithe preying on MSVPA fish species) reveals clear digestion stage differences. Figure 5.3.3 (whiting preying on MSVPA fish species) reveals that there are significant differences between digestion stages. Figure 5.3.4 (cod preying on MSVPA fish species) reveals that there are significant digestion stages differences and sufficient data for each digestion level to support the raising factor derived. The results for the roundfish species suggest that it may be appropriate to investigate not just predator raising factors, but prey specific raising factors.

With respect to mean weights of prey, across predators (haddock, cod, whiting and saithe), there is no systematic significant difference in mean prey weight at length with predator length, which implies that each prey length class is not exploited selectively by each predator length class. In other words, a 5-6 cm prey in the stomach of a 40 cm cod weighs the same as a prey in the same length class in the stomach of a 70 cm cod, when digestion stage, quarter and species differences have been taken into account. Such results warrant further analysis.

In all of the plots, the majority of samples are coded as digestion stage 1. Usually, the mean weight of stage 1 prey is lower than stage 0 prey. The unweighted raising factors based on size based analyses are lower than those from the age based approach. Nevertheless the weighted estimates, except for the whiting factor, are similar. The differences are presumably caused by the assumptions made in the processing leading to the age based estimates. This reinforces the statement at the beginning of this section - that the raising

factors should not be interpreted as having a clear biological relationship to the average stage of digestion observed in stomach samples.

5.4 New Raising Factors Used to Prepare MSVPA Input Files

The raising factors for cod are consistent across quarters and prey types. The overall, unweighted mean of 1.62 is supported both by age and size based analyses. The factors for saithe and whiting vary from quarter to quarter (and from prey to prey type) but the unweighted, age based estimates are higher than their size based equivalents. The calculated raising factors for haddock are very dependent on prey and quarter. The calculated raising factors for mackerel vary considerably from quarter to quarter. They are also very prey specific (varying between just under 1 to almost 2). In the absence of a good estimate, the parsimonious approach is to assume that the raising factor is the same as for the roundfish species (1.6). The coordinators decided, therefore, to adopt a single raising factor based on that calculated for cod, namely, 1.6 for all prey types in all quarters.

A complete set of revised MSVPA input data, in which weights of prey now include previously unallocated unidentified prey and mean weights at ingestion are based on the revised raising factor, are given in Appendices I and II.

The common raising factor of 1.6 is clearly something that might be examined further at a later stage. The effect of this change on the MSVPA output was examined by running MSVPA with the input files as used by the Multispecies Assessment WG in 1995, but with the mean digested weights raised by a factor of 1.6 instead of the "old" factor of 2. The results are presented in Figure 5.4 in which the effects on F, N, numbers eaten and M2 are expressed as changes relative to the baseline (ie with the original factor of 2).

The overall result is a general increase in M2 which is roughly inversely proportional to the change in scaling factor.

5.5 Averaging Over Years

The stomach contents data can be smoothed by averaging the quarterly data over years. It might be argued that data from different years should be kept separate, because there may be year-to-year changes in mean weights at age in the sea. However, in the context of the North Sea ecosystem such changes are likely to be small.

Tables 5.4.1-5.4.4 give the average quarterly estimates of the mean weights of prey at the time of ingestion by cod, haddock, whiting and saithe (the mackerel data cannot be averaged until the revised 1981 data are available). These averages were calculated by summing the annual weights of prey in the stomachs observed in 1981 and 1991 and, in some cases, in 1985, 1986 and 1987, multiplying the total by 1.6 and dividing the product by the sum of the annual numbers of prey in the stomachs.

6. CONSUMPTION RATES

The consumption rates (rations) of the individual predators are "plugged in" to the MSVPA model. Even though rations have a direct bearing on the outcome of the analysis, the responsibility for ensuring that realistic consumption rates are adopted seems to lie midway between the MSVPA WG and the coordinators of the stomach sampling programme.

Advice on consumption rates was outwith the terms of reference of the present meeting. However, an alternative approach to estimating the composition of the diet of the MSVPA predators, using prey-specific and size- and temperature-dependent evacuation rates, was evaluated.

In the MSVPA model it is assumed that all prey are evacuated at the same rate. This implies that the relative stomach content distributions reflect the relative consumption of the different prey. However, recent work on gastric evacuation in cod (Andersen *et al.*, 1995; dos Santos and Jobling, 1995) has revealed that the evacuation rates of different prey do vary. For example, Norway pout is evacuated on average 1.8 times faster than sprat. The present version of MSVPA cannot, however, deal with prey-specific consumption rates.

During the meeting an attempt was made to evaluate the impact of differential evacuation rates of prey, outside the MSVPA model. For this purpose the basic stomach contents data were modified to take into account the relative differences in evacuation rates of the nine MSVPA species. The prey weights of these species were simply scaled up or down according to the relative difference in evacuation rates, so that the relationship between prey weights reflects the relative consumption of these species. Rapidly evacuated prey were scaled up, slowly evacuated prey were scaled down. The scaling factors are listed in the table below.

Species/Species group	Scaling factor
Cod	1.18
Haddock	1.18
Whiting	1.18
Norway pout	1.30
Mixed gadoids	1.24
Herring	0.83
Sprat	0.74
Mixed clupeoids	0.79
Sandeels	0.87

It is known from work on other species that very small items like copepods or mysids are evacuated much faster from fish stomachs than prey items of the size of, say, a 4 cm *Crangon*. This may lead to a rather biased picture of the food composition for the smaller predator size classes. This effect was accounted for by applying a scaling function that scales up the contribution of small prey. Based on gastric evacuation data in Temming (1995) for herring feeding on copepods and whiting feeding on *Crangon*, an arbitrary range for the scaling factors was derived by comparing the evacuation rates at 12°C of 100 g predators with a mean stomach content weight of 0.5 g (which is typical of herring of that size feeding on copepods). It turns out that the evacuation rate of copepods is faster by a factor of 4 compared with the evacuation of *Crangon* (0.21 g/g v 0.05 g/h). The scaling function was adjusted to produce a factor of 1 for a prey size of 40 mm (*Crangon*) and a factor of four for a prey size of 1 mm:

$$\text{size scaling factor} = 3.4 * \exp(-0.09 * \text{prey length}) + 1.0$$

The scaling factor was applied to all prey sizes of all prey species. However, measurable changes will only occur for size classes <40 mm.

Evacuation rates are exponentially related to temperature (eg dos Santos and Jobling, 1995). This effect is presently accounted for in MSVPA in the consumption rates (by predator age class) which are calculated for the four quarters independently, using a predator-specific mean temperature (T mean) for the whole North Sea. This mean temperature is a guesstimate that tries to take into account the distributions of both the temperature and the predator in that quarter.

However, temperature may also bias the relationship between the observed prey composition in the stomachs and the real composition of the food. If some species (X) is eaten mainly in an area warmer than average (eg the southern North Sea in Quarter 3) and another prey (Y) is mainly eaten in a colder part of the North Sea (eg northern North Sea in Quarter 3) then the consumption of species X is under- and that of species Y overestimated from the aggregated North Sea stomach contents data. In order to test the importance of this effect another scaling factor was applied to the prey weights (by statistical rectangle) that accounts for the difference between the mean temperature (by predator and quarter) and the actual temperature in the respective rectangle.

$$\text{temperature scaling factor} = \exp(0.1*(T \text{ rectangle} - T \text{ mean}))$$

The exponential coefficient (0.1) is identical to the one that was used to account for temperature effects on consumption for the preparation of the input data presently used in MSVPA (0.096) and is also in line with the results for cod given by dos Santos and Jobling (1992). The temperatures used were the averages by rectangle in the respective years and quarters, as provided by the ICES Hydrographic Service.

This modified data set (with all three weighting factors applied to prey weights and prey numbers) was then fed into the ISR program to produce a revised estimate of the total prey composition of MSVPA species by predator and prey age class. These data files were then compared with the equivalent ISR output files which were based on the standard stomach data files.

6.1 Comparing Original and Modified Prey Compositions by Predator Age Class

Figures 6.1-6.4 summarise the relative species composition based on original and modified stomach content data for selected predator age classes (1, 3 and 6) and quarters (1 and 3) in whiting and cod. One set of results was produced assuming that the gastric evacuation rate is the same for all prey (original), the other set was derived on the assumption that evacuation rates vary with species, temperature and size. Correction factors have been applied to the prey weights and prey numbers in the disaggregated data which are input to the ISR programs. It is, however, difficult to predict the effects of these modifications on the prey composition of the different predator age classes, since the ISR program combines the spatially disaggregated data to estimate diet over the total North Sea using catch rates as weighting factors.

The overall impression from the pie charts (Figs 6.1-6.4) is that the original data and the modified data give similar patterns of the species composition. In most cases the effects of the species factors are still visible in the ISR output data, eg the sprat share is usually slightly decreased, while the Norway pout share is raised in the modified data. However,

the interpretation of the pie charts may be misleading in some situations, because they represent relative compositions. If in a particular age class, for instance, all important prey fractions are raised (or lowered) by some factor, the change would not be visible. Furthermore there is a number of exceptions from the overall impression of similarity and the important ones are listed in Table 6.1. The factors presented in the table are based on a comparison of the total prey weights (modified/original). Changes in the expected range of less than approximately 20% are not listed. These would mainly correspond to a typical species effect.

In 28 cases the factors are larger than 1.2. Most of these cases refer to the prey categories Norway pout, whiting and other food. In these cases the effect of the species factors are reinforced by the temperature factor. An overall factor of 1.5 results for example, if the species factor for Norway pout is combined with the effect of a temperature difference of 2°. This would reflect a situation where the majority of Norway pout were taken by this particular predator age class from rectangles with above average temperatures. The strong effects in the other food component are most likely a combination of the size effect and the temperature effect, since no species factors were applied to other food species. A significant size effect implies that food items were very small, with a prey length well below 4 cm. It is therefore not surprising, that large changes in the share of other food are mainly observed in age class 1.

A result that could not be explained during the meeting, refers to the large increase (factor 4) of the Norway pout share in the diet of whiting, age 6 in quarter 1, 1991. An inspection of the size distribution of the combined factors (temperature x species x size), that were applied to the disaggregated data revealed that these combined factors were below 1.8. It is therefore not immediately obvious, how the share of Norway pout could have been raised by a factor of 4.

7. NEW KEY RUNS OF MSVPA

It had been hoped to make a new key during the meeting and to compare the outputs obtained using the "definitive" stomach contents data with those obtained previously. However, this was not possible. Although the revised ISR programs were run on the corrected stomach contents data to generate new MSVPA input data, there was still a problem with the mean weights at age of the MSVPA prey. The new MSVPA input files include revised data on weights at age that were obtained by applying a different raising factor to the observed stomach contents data (Section 5.4). It was therefore possible to compare outputs obtained using the new factor (1.6) with those using the old one (2.0) (Fig. 5.4). However, past experience has shown that using unsmoothed weights at age, derived directly from the stomach contents, can result in some unlikely outputs from MSVPA. It therefore seemed unwise to make the definitive key run before the raw data had been smoothed, but this could not be done during the meeting. It would have been possible to use the revised data on the percentage contribution of each MSVPA species to the diet of each predator together with the old data on mean weights at age. However, it was felt that such a compromise might only serve to confuse the issue.

8. SUMMARY AND DISCUSSION

There has been substantial progress in improving the quality of the North Sea feeding data available to the MSVPA WG. All major errors in the basic data, and in the ancillary data needed to process them, have been rectified. Making the 1981 whiting data available in the standard exchange tape format has been a major step forward. The methods used to process the data for MSVPA have been improved by including in the ISR programs algorithms to distribute partially identified MSVPA prey to species and by automating the process by which outputs from the ISR programs are transferred to the MSVPA input files.

Some problems remain. For example, at some stage the 1981 mackerel data should be standardised, although this cannot be done until the data set held in Bergen has been examined carefully to ensure that stomachs collected from outside the North Sea are excluded.

Another outstanding problem is the provision of reliable mean weights at ingestion for each prey age class/predator age class combination. This was one of the terms of reference of the meeting. The mean weights at ingestion used in MSVPA are based on the stomach contents data. The analyses performed during the meeting indicate that the raising factor of 2.0 which has hitherto been used to convert mean weights at age in the stomach contents to mean weights at the time of ingestion is too high. A raising factor of 1.6 is recommended. The effect of this change is to increase the estimated numbers of prey eaten by the MSVPA predators, which in turn leads to an increase in stock size and a decrease in fishing mortality (Fig. 5.4).

However, adjusting the overall raising factor does not in itself overcome all difficulties. There are still outliers in the "raw" prey weights at age derived from the stomach contents, even when the data have been averaged over years (Tables 5.4.1-5.4.4), but the coordinators were unable to devise a satisfactory way of smoothing the predator age/prey age matrices.

In MSVPA the proportional contribution of each prey to the diet of each predator is based on the composition of the stomach contents, averaged over the whole North Sea. However, it is known that predators digest different kinds of prey at different rates, and therefore the composition of the stomach contents may not represent the rates at which individual prey are consumed. During the meeting a first attempt was made to evaluate the effects of applying prey-specific and temperature-dependent evacuation rates to the stomach contents to estimate the relative quantities of different prey consumed by the predators, on a North Sea basis. The results of these trials suggest that this approach warrants further study.

9. REFERENCES

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Table 5.4.1a. Cod - mean weights of prey at ingestion of Quarter 1. Averages of feeding data collected in 1981, 1985, 1986, 1987 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species All size classes	0.00	0.67	2.90	8.70	20.16	26.17	31.50
<i>Gadus morhua</i>							
1	0.00	24.62	35.19	49.33	44.61	60.96	64.63
2	0.00	0.00	248.00	129.47	146.32	128.99	128.16
3	0.00	0.00	0.00	426.67	261.05	334.18	185.11
Total	0.00	24.62	37.65	58.06	98.18	98.45	108.12
<i>Melanogrammus aeglefinus</i>							
1	0.00	7.99	18.90	21.20	27.02	32.57	33.94
2	0.00	0.00	86.49	90.65	125.35	126.79	128.15
3	0.00	0.00	160.00	101.89	135.29	139.82	173.36
4	0.00	0.00	0.00	146.67	180.92	290.37	309.61
5	0.00	0.00	0.00	0.00	377.14	424.93	457.50
6	0.00	0.00	0.00	0.00	373.33	426.67	459.02
Total	0.00	7.99	19.55	26.62	56.59	69.37	67.03
<i>Merlangius merlangus</i>							
1	0.00	4.51	18.16	30.84	33.70	29.04	25.63
2	0.00	0.00	62.11	77.52	97.70	96.06	64.67
3	0.00	0.00	99.78	109.37	125.15	122.01	120.83
4	0.00	0.00	168.42	173.86	163.37	147.64	170.11
5	0.00	0.00	480.00	175.48	179.62	172.29	190.79
6	0.00	0.00	0.00	200.85	188.04	170.82	185.64
Total	0.00	4.44	20.92	46.38	69.91	66.30	55.77
<i>Trisopterus esmarki</i>							
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	8.65	9.07	10.09	12.16	12.77	12.31
2	0.00	0.00	19.13	23.29	24.67	24.68	24.17
3	0.00	0.00	38.84	35.79	33.73	35.61	45.77
4	0.00	0.00	40.00	44.34	36.63	39.21	63.78
5	0.00	0.00	0.00	0.00	118.71	119.30	119.60
Total	0.00	2.97	9.97	12.94	16.28	16.53	14.95
<i>Clupea harengus</i>							
1	0.00	1.30	5.50	17.23	34.53	22.60	25.25
2	0.00	3.70	8.89	21.02	30.80	30.40	20.39
3	0.00	0.00	31.76	53.46	54.05	59.86	60.96
4	0.00	0.00	50.71	66.13	74.17	82.58	75.13
5	0.00	0.00	73.19	97.91	102.88	113.74	99.10
6	0.00	0.00	64.00	88.63	108.54	117.12	84.49
Total	0.00	3.50	9.17	31.58	45.22	49.85	35.73
<i>Sprattus sprattus</i>							
1	0.00	3.47	3.19	2.03	2.41	4.77	6.17
2	0.00	4.69	8.03	8.48	9.96	9.90	8.37
3	0.00	3.29	10.17	11.08	11.23	13.54	12.61
4	0.00	3.64	9.54	12.29	11.43	15.19	17.01
5	0.00	0.00	10.91	10.16	11.71	13.06	18.82
6	0.00	0.00	0.00	8.00	20.00	0.00	0.00
Total	0.00	3.65	6.58	6.56	5.95	9.19	8.12
<i>Ammodytidae</i>							
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	1.70	2.71	3.04	4.24	4.83	3.26
2	0.00	6.23	4.81	7.78	10.42	10.12	8.46
3	0.00	10.00	13.18	22.71	18.02	14.42	11.45
4	0.00	17.78	21.18	26.18	24.52	22.46	8.42
5	0.00	0.00	28.24	26.28	24.40	20.20	9.41
6	0.00	0.00	32.34	35.82	40.58	35.93	73.92
Total	0.00	1.90	3.27	4.97	6.91	7.43	4.95
Other All size classes	0.00	0.57	1.85	4.76	12.30	17.21	28.24

Table 5.4.1b. Cod - mean weights of prey at ingestion of Quarter 2. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.04	0.37	1.31	3.17	4.00	4.93	11.58
<i>Gadus morhua</i>							
0	0.00	0.72	1.14	1.87	2.11	0.46	0.00
1	0.00	4.64	31.62	42.44	43.56	50.56	44.22
2	0.00	0.00	160.00	124.67	143.86	518.86	998.11
3	0.00	0.00	0.00	185.88	258.77	861.20	1380.52
4	0.00	0.00	0.00	0.00	53.33	1470.97	1662.86
Total	0.00	0.81	2.34	17.47	55.64	148.23	413.08
<i>Melanogrammus aeglefinus</i>							
0	0.00	1.63	4.99	9.23	8.11	8.10	8.05
1	0.00	18.32	27.26	57.20	91.13	116.82	104.46
2	0.00	0.00	52.13	83.70	122.32	128.87	95.03
3	0.00	0.00	0.00	240.00	270.70	292.54	289.27
4	0.00	0.00	0.00	160.00	320.00	305.64	306.55
5	0.00	0.00	0.00	320.00	311.11	307.05	305.56
6	0.00	0.00	0.00	0.00	280.00	310.59	307.69
Total	0.00	6.78	23.46	60.01	87.93	117.26	105.04
<i>Merlangius merlangus</i>							
0	0.00	0.41	1.76	1.71	4.14	4.43	4.47
1	0.00	27.08	29.28	27.39	60.55	84.71	106.62
2	0.00	0.00	78.46	68.75	89.72	91.64	128.97
3	0.00	0.00	86.67	91.46	135.97	159.04	158.28
4	0.00	0.00	91.43	123.24	192.99	192.99	173.93
5	0.00	0.00	80.00	164.95	222.77	258.56	210.40
6	0.00	0.00	160.00	148.84	182.07	241.63	178.67
Total	0.00	4.26	29.32	40.70	78.81	93.25	131.60
<i>Trisopterus esmarki</i>							
0	0.00	0.00	1.44	1.06	1.69	2.83	1.79
1	0.00	15.46	17.51	23.27	26.45	28.14	28.84
2	0.00	20.00	22.15	38.53	42.18	45.85	42.82
3	0.00	0.00	53.85	55.07	52.21	48.52	48.51
4	0.00	0.00	40.44	48.75	46.67	48.32	48.89
Total	0.00	15.59	18.91	21.44	27.05	32.31	28.42
<i>Clupea harengus</i>							
0	0.00	2.91	3.62	19.69	24.27	23.87	23.95
1	0.00	0.53	22.28	26.38	39.92	59.04	55.40
2	0.00	32.00	60.00	75.50	88.50	125.22	126.13
3	0.00	0.00	150.24	101.32	113.61	103.23	122.97
4	0.00	0.00	210.91	139.21	134.70	94.37	126.01
5	0.00	0.00	224.00	164.91	142.00	92.86	129.82
Total	0.00	0.74	27.95	69.13	79.33	105.61	107.04
<i>Sprattus sprattus</i>							
0	0.00	0.68	5.45	1.55	10.16	12.87	12.06
1	0.00	5.17	12.66	14.76	16.10	12.37	15.15
2	0.00	14.30	19.44	22.87	24.61	22.83	20.58
3	0.00	17.78	22.76	25.67	27.12	26.82	21.78
4	0.00	0.00	0.00	0.00	22.86	0.00	0.00
5	0.00	0.00	0.00	0.00	22.86	0.00	0.00
Total	0.00	2.25	14.16	19.81	21.39	17.02	17.47
<i>Ammodytidae</i>							
0	0.07	0.64	0.71	0.68	0.71	0.87	1.07
1	0.00	4.04	2.98	3.31	2.34	2.86	3.51
2	0.00	6.88	11.97	12.81	5.20	22.26	4.03
3	0.00	9.59	19.40	20.76	9.53	33.47	8.40
4	0.00	9.34	19.71	21.34	9.08	30.03	5.11
5	0.00	10.49	22.71	25.28	14.84	38.39	13.63
6	0.00	11.43	23.46	25.75	20.33	38.02	20.32
Total	0.07	2.08	1.63	1.85	2.00	3.11	3.95
Other							
All size classes	0.04	0.31	0.96	2.24	2.53	2.96	7.33

Table 5.4.1c. Cod - mean weights of prey at ingestion of Quarter 3. Averages of feeding data collected in 1981, 1985, 1986, 1987 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.10	1.18	4.27	7.41	17.81	23.63	40.24
<i>Gadus morhua</i>							
0	1.23	5.33	6.96	9.61	12.28	11.85	11.91
1	0.00	0.00	26.15	84.73	154.83	194.59	99.66
2	0.00	0.00	0.00	123.82	141.19	101.32	290.02
3	0.00	0.00	0.00	0.59	0.94	0.22	3.60
4	0.00	0.00	0.00	0.00	0.00	0.00	41.85
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.23	7.66	12.73	21.95	101.03	163.54	149.59
<i>Melanogrammus aeglefinus</i>							
0	0.00	5.91	12.16	15.21	14.16	21.30	19.41
1	0.00	17.78	66.74	83.15	120.83	135.14	148.60
2	0.00	0.00	2.03	19.37	63.68	75.44	239.60
3	0.00	0.00	160.00	473.60	494.74	1091.76	771.64
4	0.00	0.00	0.00	0.15	54.31	440.00	1724.57
5	0.00	0.00	0.00	0.00	0.00	0.00	114.19
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	5.95	15.39	35.41	83.21	133.92	464.35
<i>Merlangius merlangus</i>							
0	1.37	15.19	13.33	10.57	12.36	29.15	16.48
1	0.00	36.17	89.94	71.43	66.21	80.63	84.37
2	0.00	0.00	2.78	59.62	139.81	145.54	169.84
3	0.00	0.00	171.03	143.46	210.17	210.10	233.15
4	0.00	0.00	0.03	0.34	1.14	1.28	0.97
5	0.00	0.00	0.13	0.71	3.56	5.98	2.46
6	0.00	0.00	0.00	0.13	0.28	0.39	0.05
Total	1.37	15.08	9.76	11.60	25.92	32.22	29.36
<i>Trisopterus esmarki</i>							
0	1.76	4.53	7.32	16.96	27.37	36.78	41.20
1	0.00	19.48	25.59	29.57	34.48	29.08	38.09
2	0.00	28.57	54.71	108.47	107.49	145.59	297.84
3	0.00	0.00	3.68	5.71	7.00	9.99	8.01
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.76	5.18	13.96	26.36	33.88	36.40	44.37
<i>Clupea harengus</i>							
0	0.00	4.91	71.20	26.43	30.66	640.00	0.00
1	0.00	5.80	15.52	26.79	28.99	48.28	23.98
2	0.00	3.63	29.73	66.97	82.19	68.23	96.00
3	0.00	32.00	153.72	178.31	181.71	123.39	151.21
4	0.00	0.00	0.90	5.13	20.60	41.31	174.99
5	0.00	0.00	31.89	142.14	149.35	70.33	131.29
6	0.00	0.00	0.00	0.00	211.86	323.70	323.40
Total	0.00	6.22	26.96	72.89	99.77	81.75	118.36
<i>Sprattus sprattus</i>							
0	0.00	0.09	0.00	0.00	0.01	0.03	0.02
1	0.00	59.78	45.00	32.18	0.00	0.00	0.00
2	0.00	0.01	0.08	0.04	0.00	0.00	0.00
3	0.00	0.00	34.70	29.31	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	36.04	40.57	31.24	0.00	0.00	0.00
<i>Ammodytidae</i>							
0	80.00	1.17	2.26	2.69	3.98	3.29	4.73
1	0.00	10.05	11.53	6.99	7.28	8.16	14.57
2	0.00	11.01	14.40	12.62	7.67	8.65	22.12
3	0.00	12.50	33.82	13.26	24.62	10.81	57.95
4	0.00	9.73	33.64	10.91	24.22	10.83	54.66
5	0.00	8.51	35.56	9.02	24.07	10.32	20.43
6	0.00	8.59	38.73	10.26	23.65	0.00	0.00
Total	80.00	1.51	3.15	3.19	4.53	3.97	9.12
Other							
All size classes	0.12	1.30	5.44	12.81	20.65	23.91	33.20

Table 5.4.1d. Cod - mean weights of prey at ingestion of Quarter 4. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.59	2.49	5.92	11.63	17.48	28.11	36.97
<i>Gadus morhua</i>							
0	20.00	3.37	8.42	21.08	39.51	53.41	64.35
1	0.00	0.00	388.57	377.30	377.39	292.06	358.92
2	0.00	0.00	693.33	608.69	565.15	584.70	618.25
3	0.00	0.00	0.00	627.69	589.80	599.52	612.17
Total	20.00	3.37	8.20	104.67	248.33	320.29	189.71
<i>Melanogrammus aeglefinus</i>							
0	0.00	14.22	14.05	15.71	17.71	19.38	29.29
1	0.00	64.00	49.81	145.55	169.91	146.96	142.44
2	0.00	0.00	373.33	304.12	257.72	262.44	271.26
3	0.00	0.00	0.00	355.00	290.00	299.19	277.18
4	0.00	0.00	0.00	0.00	120.00	160.00	160.00
5	0.00	0.00	0.00	0.00	160.00	160.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	14.14	13.87	19.38	29.90	34.33	87.03
<i>Merlangius merlangus</i>							
0	0.00	21.83	34.52	28.53	44.05	38.25	49.66
1	0.00	51.73	84.94	108.76	115.66	120.53	117.37
2	0.00	62.50	93.93	156.42	155.30	168.90	126.61
3	0.00	100.34	99.67	206.20	181.10	224.39	148.86
4	0.00	100.57	99.72	228.09	204.36	291.85	338.53
5	0.00	96.00	98.88	240.00	181.96	336.00	320.00
6	0.00	101.82	100.30	360.00	209.84	344.62	320.00
Total	0.00	32.04	59.25	98.86	126.77	134.27	118.38
<i>Trisopterus esmarki</i>							
0	6.61	6.62	8.20	8.80	8.64	8.80	9.17
1	0.00	13.71	21.13	27.47	30.05	30.66	40.13
2	0.00	40.00	35.80	40.00	47.85	49.91	48.81
3	0.00	0.00	53.33	50.00	53.33	50.29	48.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	6.61	6.40	9.47	11.57	12.18	11.07	10.70
<i>Clupea harengus</i>							
0	0.00	15.90	17.45	13.78	24.62	64.00	38.72
1	0.00	37.33	39.23	60.97	47.92	142.61	142.77
2	0.00	40.00	50.63	66.28	45.30	96.75	115.31
3	0.00	0.00	57.60	42.45	52.13	144.25	147.57
4	0.00	0.00	43.64	32.82	45.13	142.22	160.00
5	0.00	0.00	53.33	28.44	41.29	152.00	133.33
6	0.00	0.00	80.00	205.93	214.22	214.98	214.10
Total	0.00	17.94	23.95	32.11	55.84	139.46	129.73
<i>Sprattus sprattus</i>							
0	5.52	5.65	5.55	5.19	5.99	8.29	7.33
1	0.00	9.85	6.88	12.87	16.80	15.22	11.70
2	0.00	18.73	14.32	15.05	16.91	15.48	16.82
3	0.00	26.33	19.20	17.25	17.07	17.78	16.30
4	0.00	0.00	20.00	18.82	16.72	17.78	17.78
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	4.85	9.16	7.85	9.23	16.39	13.01	8.93
<i>Ammodytidae</i>							
0	0.85	3.16	2.31	3.54	4.49	5.33	3.79
1	0.00	8.63	12.28	12.79	14.40	14.41	19.63
2	0.00	8.01	12.07	14.78	15.10	15.09	20.51
3	0.00	10.99	12.56	18.14	24.55	24.55	31.82
4	0.00	10.38	16.21	30.00	30.26	30.25	37.99
5	0.00	14.81	15.03	34.73	35.32	35.35	43.16
6	0.00	13.56	15.33	35.68	35.59	35.96	43.27
Total	1.11	4.09	3.11	5.53	6.81	11.51	11.28
Other							
All size classes	0.59	1.98	4.33	8.73	11.52	18.84	30.62

Table 5.4.2a. Haddock - mean weights of prey at ingestion of Quarter 1. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.00	0.10	0.28	0.53	0.69	0.87	0.86
<i>Gadus morhua</i>							
<i>Melanogrammus aeglefinus</i>							
<i>Merlangius merlangus</i>							
<i>Trisopterus esmarki</i>							
0	0.00	0.00	0.00	0.00	1.60	1.60	1.60
1	0.00	0.00	1.70	1.71	1.77	1.72	1.74
2	0.00	0.00	1.57	1.97	1.64	1.63	1.63
Total	0.00	0.00	1.70	1.73	1.74	1.70	1.73
<i>Clupea harengus</i>							
1	0.00	0.00	0.00	3.11	1.60	5.05	2.65
2	0.00	0.00	0.00	67.37	1.60	34.07	21.13
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	13.01	1.60	16.56	7.59
<i>Sprattus sprattus</i>							
1	0.00	1.60	1.60	1.60	1.60	1.60	1.60
2	0.00	0.00	1.60	1.60	1.60	1.60	1.60
3	0.00	0.00	0.00	0.00	0.00	0.00	1.60
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	1.60	1.60	1.60	1.60	1.60	1.60
<i>Ammodytidae</i>							
1	0.00	1.62	1.60	1.61	1.58	1.58	1.59
2	0.00	0.00	1.60	1.60	1.60	1.60	1.60
3	0.00	0.00	0.00	1.60	1.60	1.60	0.00
4	0.00	0.00	0.00	1.60	1.60	1.60	0.00
5	0.00	0.00	0.00	1.60	1.60	0.00	0.00
6	0.00	0.00	0.00	1.60	1.60	0.00	0.00
Total	0.00	1.62	1.60	1.60	1.59	1.59	1.60
Other							
All size classes	0.00	0.10	0.23	0.35	0.42	0.61	0.64

Table 5.4.2b. Haddock - mean weights of prey at ingestion of Quarter 2. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.04	0.02	0.02	0.06	0.11	0.14	0.24
<i>Gadus morhua</i>							
<i>Melanogrammus aeglefinus</i>							
<i>Merlangius merlangus</i>							
<i>Trisopterus esmarki</i>							
1	0.00	0.00	12.31	13.49	20.03	21.04	21.60
2	0.00	0.00	0.00	15.24	20.68	20.79	22.33
Total	0.00	0.00	2.25	13.56	20.06	21.03	21.45
<i>Clupea harengus</i>	0.00	0.00	0.00	0.00	0.00	22.86	24.12
<i>Sprattus sprattus</i>							
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	16.00	22.86	9.41	9.70
2	0.00	0.00	0.00	0.00	0.00	14.55	15.24
Total	0.00	0.00	0.00	9.41	13.33	11.64	11.85
<i>Ammodytidae</i>							
0	0.16	0.51	0.57	0.67	1.11	0.95	0.88
1	0.00	1.65	4.92	7.78	7.97	7.75	8.38
2	0.00	9.41	10.51	12.05	11.81	12.19	12.15
3	0.00	0.00	12.55	14.06	13.87	13.94	13.42
4	0.00	0.00	11.03	13.31	13.24	13.36	13.22
5	0.00	0.00	29.09	17.36	15.61	15.44	14.36
6	0.00	0.00	0.00	19.05	16.41	15.88	14.12
Total	0.16	0.53	1.05	2.68	4.23	2.99	4.60
Other							
All size classes	0.03	0.01	0.02	0.03	0.04	0.05	0.05

Table 5.4.2c. Haddock - mean weights of prey at ingestion of Quarter 3. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.02	0.07	0.15	0.51	0.69	1.27	0.83
<i>Gadus morhua</i>							
0	0.00	0.00	0.00	0.00	1.50	1.56	1.60
Total	0.00	0.00	0.00	0.00	1.50	1.56	1.60
<i>Melanogrammus aeglefinus</i>							
0	0.00	7.06	6.37	15.48	19.45	19.92	24.89
1	0.00	0.00	0.00	26.27	25.40	24.15	25.37
Total	0.00	7.06	6.37	16.56	20.15	20.34	24.98
<i>Merlangius merlangus</i>							
0	0.00	0.00	0.00	14.55	12.31	0.00	0.00
Total	0.00	0.00	0.00	14.55	12.31	0.00	0.00
<i>Trisopterus esmarki</i>							
0	2.01	4.30	3.10	3.28	7.78	20.41	21.27
1	0.00	0.00	0.00	45.71	46.92	40.13	31.70
2	0.00	0.00	0.00	58.18	57.78	51.83	0.00
Total	2.01	4.30	3.11	3.39	8.24	21.18	27.15
<i>Clupea harengus</i>							
<i>Sprattus sprattus</i>							
0	0.00	0.00	0.00	2.91	1.74	1.68	0.00
1	0.00	40.00	22.86	24.62	19.59	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	40.00	21.33	4.64	5.47	1.68	0.00
<i>Ammodytidae</i>							
0	1.62	2.22	2.07	2.10	1.97	2.38	1.63
1	0.00	3.39	5.47	4.41	4.28	4.34	3.56
2	0.00	2.22	2.86	3.54	5.87	7.22	3.40
3	0.00	1.54	17.14	12.93	14.18	10.16	0.00
4	0.00	1.70	13.91	16.55	18.11	15.48	0.00
5	0.00	2.50	21.33	18.82	19.39	18.82	0.00
6	0.00	2.13	17.78	20.00	20.51	16.00	0.00
Total	0.04	0.21	1.02	2.14	1.99	2.40	1.63
Other							
All size classes	0.02	0.05	0.09	0.24	0.33	0.64	0.42

Table 5.4.2d. Haddock - mean weights of prey at ingestion of Quarter 4. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.04	0.22	0.28	0.49	0.72	1.11	0.86
<i>Gadus morhua</i>							
<i>Melanogrammus aeglefinus</i>							
0	0.00	16.12	16.09	35.12	35.11	35.23	35.21
Total	0.00	16.12	16.09	35.12	35.11	35.23	35.21
<i>Merlangius merlangus</i>							
0	0.00	0.00	6.15	5.61	0.00	0.00	8.92
Total	0.00	0.00	6.15	5.61	0.00	0.00	8.92
<i>Trisopterus esmarki</i>							
0	1.69	7.72	10.45	11.08	10.67	8.92	7.87
1	0.00	13.08	14.83	20.28	18.94	18.03	23.62
2	0.00	0.00	0.00	20.00	14.55	17.78	26.67
Total	1.69	7.89	10.66	11.57	11.07	9.37	8.19
<i>Clupea harengus</i>							
0	0.00	0.00	0.00	13.82	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	27.96	65.75	65.54	65.61
<i>Sprattus sprattus</i>							
<i>Ammodytidae</i>							
0	1.61	2.26	3.08	2.79	2.70	3.28	2.80
1	0.00	4.97	4.48	3.63	3.36	3.60	3.83
2	0.00	11.43	5.08	3.40	7.62	4.44	0.00
3	0.00	0.00	4.92	8.00	7.87	7.11	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.61	2.35	3.13	2.80	2.71	3.29	2.79
Other							
All size classes	0.04	0.17	0.18	0.33	0.49	0.76	0.56

Table 5.4.3a. Whiting - mean weights of prey at ingestion of Quarter 1. Averages of feeding data collected in 1981, 1985, 1986, 1987 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.00	0.06	0.42	0.87	0.77	0.78	1.46
<i>Gadus morhua</i>							
1	0.00	2.91	13.00	7.76	6.80	9.65	32.36
2	0.00	0.00	0.00	0.00	0.00	0.00	85.04
Total	0.00	2.91	13.00	7.76	6.80	9.65	76.88
<i>Melanogrammus aeglefinus</i>							
1	0.00	10.20	13.51	13.31	13.71	16.40	16.92
2	0.00	0.00	0.00	14.55	12.97	11.35	9.47
Total	0.00	10.20	13.50	13.32	13.70	16.33	16.60
<i>Merlangius merlangus</i>							
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	6.20	12.14	12.46	12.00	13.70	13.44
2	0.00	0.00	53.33	21.18	23.65	54.74	61.70
3	0.00	0.00	0.00	0.00	0.00	120.00	80.00
Total	0.00	6.20	12.18	12.59	12.46	15.28	15.83
<i>Trisopterus esmarki</i>							
0	0.00	3.27	0.00	2.81	0.00	0.00	0.00
1	0.00	6.61	8.66	9.96	10.30	10.61	12.02
2	0.00	6.40	13.71	14.59	15.06	15.64	16.54
3	0.00	0.00	20.65	23.46	24.66	26.45	28.87
4	0.00	0.00	0.00	0.00	26.67	40.00	20.00
Total	0.00	6.40	8.90	10.43	10.90	11.30	12.74
<i>Clupea harengus</i>							
1	0.00	1.97	8.34	8.18	8.10	12.35	12.50
2	0.00	4.61	6.10	11.23	14.41	16.97	19.13
3	0.00	0.00	20.00	32.85	29.56	27.30	27.09
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	3.94	6.47	10.78	13.34	17.27	19.11
<i>Sprattus sprattus</i>							
1	0.00	1.66	3.16	4.60	4.13	4.12	2.40
2	0.00	3.62	5.70	6.95	6.59	7.20	5.34
3	0.00	10.87	13.97	13.73	10.98	10.87	11.76
4	0.00	16.00	14.55	15.62	13.96	14.23	11.61
5	0.00	0.00	8.89	19.65	20.87	15.14	21.73
6	0.00	0.00	0.00	32.00	33.68	16.00	29.09
Total	0.00	2.06	4.48	6.49	6.68	6.67	5.15
<i>Ammodytidae</i>							
0	0.00	0.00	0.00	1.40	0.00	0.00	0.00
1	0.00	1.68	2.31	2.60	2.90	3.54	3.91
2	0.00	3.10	5.16	6.16	7.25	8.06	8.83
3	0.00	0.00	14.72	14.76	14.57	15.38	15.55
4	0.00	0.00	20.00	26.67	29.44	31.64	27.89
5	0.00	0.00	11.43	17.14	21.69	30.00	30.97
6	0.00	0.00	32.00	28.80	30.42	32.36	32.82
Total	0.00	1.73	2.69	3.12	3.90	4.65	4.85
Other							
All size classes	0.00	0.03	0.14	0.20	0.17	0.14	0.25

Table 5.4.3b. Whiting - mean weights of prey at ingestion of Quarter 2. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.00	0.01	0.03	0.04	0.04	0.06	0.05
<i>Gadus morhua</i>							
0	0.00	0.69	0.86	1.16	0.80	1.30	1.10
Total	0.00	0.69	0.86	1.16	0.80	1.30	1.17
<i>Melanogrammus aeglefinus</i>							
0	0.00	1.43	1.35	1.79	2.36	2.65	3.43
1	0.00	0.00	7.89	14.98	19.06	19.06	18.05
2	0.00	0.00	9.41	17.88	32.00	28.00	25.81
Total	0.00	1.43	1.72	3.50	4.89	5.82	9.02
<i>Merlangius merlangus</i>							
0	0.00	0.24	0.27	0.31	1.24	1.47	1.66
1	0.00	21.33	8.96	8.26	11.51	12.83	10.60
Total	0.00	0.72	4.15	6.42	8.86	8.88	7.91
<i>Trisopterus esmarki</i>							
0	0.00	1.17	1.28	1.35	1.39	1.95	2.94
1	0.00	4.71	7.72	8.37	8.82	9.92	10.70
2	0.00	0.00	10.18	12.86	17.16	18.27	16.53
3	0.00	0.00	0.00	9.41	24.62	21.33	22.86
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	1.56	3.94	7.90	8.75	10.05	10.91
<i>Clupea harengus</i>							
0	0.00	7.27	7.22	7.32	7.51	7.67	11.74
1	0.00	0.92	1.83	4.76	6.10	18.91	17.06
2	0.00	0.00	0.00	0.00	0.00	26.67	0.00
Total	0.00	0.91	2.72	6.17	6.72	14.66	16.57
<i>Sprattus sprattus</i>							
0	0.00	2.78	5.13	5.55	6.98	7.45	6.77
1	0.00	4.94	5.63	6.42	6.86	6.75	6.29
2	0.00	15.24	11.69	10.59	11.41	11.76	12.86
3	0.00	17.78	14.93	13.71	15.71	16.73	18.43
4	0.00	0.00	22.86	0.00	20.00	17.78	11.43
5	0.00	0.00	22.86	0.00	20.00	16.00	10.67
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	5.06	6.05	6.73	7.37	7.37	7.00
<i>Ammodytidae</i>							
0	0.00	0.50	0.46	0.47	0.63	0.73	0.65
1	0.00	2.97	3.52	3.40	4.35	4.00	3.91
2	0.00	7.28	7.73	9.72	10.99	9.72	9.51
3	0.00	11.43	12.77	15.03	16.17	15.19	15.16
4	0.00	11.85	10.97	14.12	15.56	14.48	13.94
5	0.00	20.00	15.06	16.67	17.78	17.14	18.33
6	0.00	22.86	18.06	17.78	19.70	19.14	18.92
Total	0.00	0.70	0.85	0.95	1.48	1.60	1.40
Other							
All size classes	0.00	0.01	0.01	0.01	0.01	0.03	0.01

Table 5.4.3c. Whiting - mean weights of prey at ingestion of Quarter 3. Averages of feeding data collected in 1981, 1985, 1986, 1987 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.02	0.10	0.35	0.53	0.59	1.26	1.14
<i>Gadus morhua</i>							
0	0.00	3.43	4.23	4.01	4.90	4.99	6.83
Total	0.00	3.27	4.21	4.00	4.90	4.99	6.83
<i>Melanogrammus aeglefinus</i>							
0	2.17	4.47	5.48	6.12	5.73	5.95	5.75
1	0.00	0.00	33.68	46.06	59.76	54.40	11.85
Total	2.17	4.47	5.50	6.18	5.85	6.03	5.76
<i>Merlangius merlangus</i>							
0	2.02	3.42	1.59	0.45	0.75	0.39	0.54
1	0.00	0.00	22.86	15.00	18.46	12.55	26.67
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.02	3.42	1.60	0.45	0.76	0.39	0.55
<i>Trisopterus esmarki</i>							
0	1.86	2.67	3.86	4.74	5.31	6.01	5.94
1	0.00	4.46	16.92	22.78	22.47	23.59	23.70
2	0.00	0.00	25.26	29.45	27.28	25.57	27.38
3	0.00	0.00	22.86	13.33	17.30	16.49	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.86	2.71	4.51	7.13	8.54	11.44	12.38
<i>Clupea harengus</i>							
0	0.00	5.46	11.95	13.85	14.74	18.24	15.54
1	2.86	5.69	9.31	15.18	15.10	17.72	21.59
2	0.00	0.00	26.23	31.34	36.60	37.65	33.72
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.86	5.63	11.03	15.19	16.77	20.52	21.71
<i>Sprattus sprattus</i>							
0	3.02	5.10	4.46	4.97	5.21	6.10	5.75
1	0.00	5.91	9.38	10.95	13.46	12.98	15.95
2	0.00	6.09	10.65	13.79	15.12	17.51	16.19
3	0.00	5.61	12.47	15.42	16.19	18.72	16.68
4	0.00	0.00	0.00	13.33	22.86	16.00	13.33
5	0.00	0.00	0.00	13.33	22.86	16.00	12.31
Total	3.02	5.59	6.99	8.51	10.53	10.28	10.56
<i>Ammodytidae</i>							
0	0.74	2.03	2.69	2.83	2.40	2.21	2.43
1	0.00	8.98	10.39	11.36	12.02	13.63	16.14
2	0.00	8.19	10.24	11.05	10.81	11.23	13.25
3	0.00	12.48	15.17	14.64	17.04	15.55	17.80
4	0.00	18.82	17.86	17.18	19.41	17.32	17.58
5	0.00	0.00	14.55	17.27	19.70	17.56	19.34
6	0.00	22.86	21.17	20.91	21.24	19.33	18.72
Total	0.74	2.51	3.77	4.31	4.01	4.03	3.57
Other							
All size classes	0.01	0.04	0.11	0.14	0.15	0.25	0.17

Table 5.4.3d. Whiting - mean weights of prey at ingestion of Quarter 4. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.06	0.14	0.20	0.37	0.47	0.61	0.53
<i>Gadus morhua</i>							
0	0.00	6.25	7.53	7.82	7.17	7.60	8.39
Total	0.00	6.25	7.53	7.82	7.17	7.60	8.39
<i>Melanogrammus aeglefinus</i>							
0	9.55	10.40	11.07	11.24	10.31	12.40	12.06
1	0.00	10.67	12.80	19.05	28.72	26.67	27.83
Total	9.55	10.40	11.12	11.31	10.53	12.70	12.41
<i>Merlangius merlangus</i>							
0	1.27	8.44	11.26	11.57	11.48	13.12	13.90
Total	1.08	8.44	11.25	11.57	11.47	13.12	13.90
<i>Trisopterus esmarki</i>							
0	3.72	5.56	5.84	6.04	6.24	6.12	6.07
1	0.00	11.21	18.02	16.42	20.91	21.88	23.27
2	0.00	0.00	35.16	34.78	45.71	14.55	13.66
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	3.72	5.65	6.22	6.43	7.23	6.85	7.39
<i>Clupea harengus</i>							
0	6.34	8.08	9.28	10.17	12.86	14.85	35.91
1	0.00	25.26	25.81	30.00	50.45	54.51	59.89
	0.00	0.00	0.00	0.00	53.33	53.33	60.95
Total	6.34	8.34	9.55	10.28	14.42	17.40	41.04
<i>Sprattus sprattus</i>							
0	2.57	3.52	4.38	5.14	4.58	4.69	4.42
1	4.37	6.52	6.49	8.59	8.97	9.21	9.90
2	4.42	7.23	5.70	7.98	8.52	13.38	14.21
3	0.00	6.58	5.30	9.20	10.07	17.45	16.20
4	0.00	6.67	5.42	5.93	7.44	11.43	16.00
Total	3.11	5.31	5.41	6.98	6.32	6.54	6.33
<i>Ammodytidae</i>							
0	1.47	2.69	2.66	1.98	2.61	3.02	2.50
1	5.13	15.86	19.06	24.41	20.33	15.11	21.21
2	6.67	23.70	23.98	21.99	22.98	15.52	21.59
3	12.31	19.20	17.05	19.95	16.20	15.19	21.23
4	0.00	25.95	25.69	30.38	24.62	17.94	26.07
5	0.00	29.71	28.41	34.95	28.37	24.62	32.73
6	0.00	31.02	30.48	34.85	29.02	26.15	33.02
Total	1.69	3.37	4.50	5.23	6.00	6.45	6.14
Other							
All size classes	0.05	0.05	0.06	0.08	0.15	0.23	0.21

Table 5.4.4a. Saithe - mean weights of prey at ingestion of Quarter 1. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.26	1.31	3.15	4.29	5.27	6.09	17.28
<i>Gadus morhua</i>							
<i>Melanogrammus aeglefinus</i>							
1	0.00	0.82	0.96	1.85	36.01	28.45	27.44
2	0.00	0.00	26.67	40.00	59.47	105.37	118.71
3	0.00	0.00	0.00	0.00	0.00	160.00	160.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.82	0.98	1.93	37.12	30.41	29.49
<i>Merlangius merlangus</i>							
1	0.00	0.00	0.00	0.00	53.33	46.73	46.74
2	0.00	0.00	0.00	0.00	114.29	112.27	112.94
3	0.00	0.00	0.00	0.00	160.00	115.20	113.68
4	0.00	0.00	0.00	0.00	0.00	0.00	80.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	75.29	77.78	79.02
<i>Trisopterus esmarki</i>							
0	0.00	0.00	0.00	0.00	0.00	1.34	1.55
1	6.29	7.03	6.75	9.89	11.58	13.60	14.34
2	9.57	15.40	22.40	26.21	25.19	22.63	21.41
3	7.30	16.81	30.38	39.42	53.54	68.97	71.01
4	0.00	0.00	37.70	36.83	38.20	42.24	47.13
Total	6.98	8.93	15.24	21.75	20.21	19.34	18.16
<i>Clupea harengus</i>							
1	2.81	2.25	2.70	3.71	5.25	13.59	56.79
2	60.69	51.42	45.95	36.28	34.59	32.46	70.69
3	62.86	53.59	53.38	46.08	54.58	65.95	76.72
4	53.33	53.93	56.98	58.14	70.73	79.04	98.06
5	0.00	53.33	114.29	124.77	115.89	95.64	116.36
Total	24.41	43.44	34.21	26.58	32.82	38.22	81.70
<i>Sprattus sprattus</i>							
1	0.00	0.00	13.33	14.00	17.78	0.00	0.00
2	0.00	0.00	14.40	14.41	14.49	19.68	19.50
3	0.00	0.00	14.39	14.41	14.78	18.82	20.36
4	0.00	0.00	20.00	11.85	0.00	0.00	0.00
Total	0.00	0.00	14.40	14.40	14.52	19.65	19.70
<i>Ammodytidae</i>							
1	1.38	2.41	2.36	2.51	1.91	3.09	3.09
2	0.00	5.00	5.42	5.82	6.53	4.00	3.90
3	0.00	0.00	0.00	0.00	0.00	0.00	4.10
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.37	2.53	2.51	2.72	2.20	3.12	3.11
Other							
All size classes	0.10	0.73	1.22	1.39	1.14	1.40	2.01

Table 5.4.4b. Saithe - mean weights of prey at ingestion of Quarter 2. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	0.26	0.39	0.69	0.93	1.18	1.39	2.17
<i>Gadus morhua</i>							
0	0.00	2.43	2.22	1.06	0.83	0.86	0.93
Total	0.00	2.43	2.22	1.06	0.83	0.86	0.93
<i>Melanogrammus aeglefinus</i>							
0	0.00	0.00	3.05	2.76	2.47	1.18	0.94
1	35.56	31.04	30.85	39.21	132.97	139.04	97.39
2	0.00	0.00	0.00	0.00	253.11	253.23	240.09
3	0.00	0.00	0.00	0.00	256.84	258.82	256.47
Total	35.56	31.04	25.51	9.18	33.32	12.11	19.48
<i>Merlangius merlangus</i>							
1	0.00	0.00	0.00	0.00	80.44	80.54	130.10
2	0.00	0.00	17.78	16.18	115.55	119.72	127.42
3	0.00	0.00	14.55	17.43	91.12	94.33	116.72
4	0.00	0.00	0.00	14.55	69.97	71.11	100.00
5	0.00	0.00	0.00	0.00	47.92	48.09	75.68
6	0.00	0.00	0.00	0.00	55.00	54.98	93.31
Total	0.00	0.00	15.24	17.34	94.47	97.18	120.89
<i>Trisopterus esmarki</i>							
0	0.15	0.39	0.13	0.07	0.90	0.48	0.54
1	2.04	3.08	15.12	20.50	21.44	20.26	22.87
2	15.97	18.36	24.38	27.28	33.69	34.60	38.45
3	47.50	25.14	25.62	27.97	34.96	35.37	40.06
4	43.64	25.45	25.60	31.41	35.06	35.10	35.56
Total	0.79	2.82	10.49	18.05	23.64	21.48	25.15
<i>Clupea harengus</i>							
1	0.00	22.86	64.86	67.76	81.17	69.04	66.54
2	0.00	33.03	71.36	88.72	80.33	36.36	33.70
3	0.00	41.97	97.79	140.70	122.65	86.58	78.40
4	0.00	45.71	118.46	163.92	112.31	74.93	63.59
5	0.00	56.00	124.44	169.00	172.40	146.61	125.46
Total	0.00	37.98	85.68	121.38	105.10	50.19	44.09
<i>Sprattus sprattus</i>							
0	0.00	0.97	0.97	0.96	0.00	0.00	0.00
1	0.00	0.83	0.94	1.36	0.00	0.00	0.00
Total	0.00	0.96	0.97	0.99	0.00	0.00	0.00
<i>Ammodytidae</i>							
0	1.21	1.86	1.46	1.46	1.17	0.87	0.82
1	2.61	3.44	3.03	2.80	2.20	1.93	1.91
2	15.83	20.76	20.00	18.50	10.19	5.39	5.55
3	19.22	23.80	22.44	20.65	14.46	5.52	0.00
4	19.44	23.01	22.40	21.23	13.33	5.52	0.00
5	24.62	24.69	23.46	22.49	16.00	0.00	0.00
6	23.83	26.11	23.81	23.23	21.33	0.00	0.00
Total	2.31	4.58	2.28	1.95	1.42	1.33	1.27
Other							
All size classes	0.23	0.26	0.35	0.54	0.69	0.66	0.58

Table 5.4.4c. Saithe - mean weights of prey at ingestion of Quarter 3. Averages of feeding data collected in 1981, 1986 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species							
All size classes	2.27	0.43	0.72	1.22	5.89	4.75	4.83
<i>Gadus morhua</i>							
0	0.00	0.00	0.00	2.35	2.35	2.36	2.45
Total	0.00	14.55	15.42	11.06	2.35	2.45	2.45
<i>Melanogrammus aeglefinus</i>							
0	14.49	8.11	7.08	8.48	22.63	14.00	7.61
1	0.00	0.00	0.00	36.48	36.55	37.27	40.52
2	0.00	0.00	0.00	0.00	160.00	112.00	115.20
Total	11.76	7.55	6.60	6.93	20.11	14.31	8.95
<i>Merlangius merlangus</i>							
0	6.27	6.50	5.56	5.27	16.32	25.48	21.62
1	0.00	0.00	0.00	24.62	24.40	24.45	24.62
Total	6.27	6.51	5.71	5.80	17.16	24.90	240.69
<i>Trisopterus esmarki</i>							
0	4.20	2.80	2.85	2.51	6.11	8.15	9.94
1	26.77	15.88	15.87	20.65	29.54	29.31	30.68
2	30.23	15.76	20.41	38.41	43.70	43.16	40.40
3	28.57	15.50	20.36	38.50	43.49	44.00	40.85
Total	5.27	4.85	7.91	14.52	21.41	22.78	22.72
<i>Clupea harengus</i>							
0	0.00	0.00	1.36	1.37	1.43	13.66	13.78
1	0.00	0.00	20.77	19.41	46.47	53.41	61.59
2	80.00	107.32	32.47	27.24	147.02	190.27	188.39
3	80.00	108.15	47.94	38.56	175.47	207.94	215.93
4	96.00	108.00	69.34	56.20	200.71	221.89	238.48
5	128.00	108.14	75.41	61.67	228.52	248.71	266.33
Total	102.86	108.22	33.82	30.33	171.95	200.54	207.72
<i>Sprattus sprattus</i>							
0	5.71	6.21	0.00	0.00	0.00	0.00	0.00
Total	5.71	6.21	0.00	0.00	0.00	0.00	0.00
<i>Ammodytidae</i>							
0	1.55	1.17	1.14	1.09	2.37	2.81	3.14
1	0.00	0.00	0.00	0.00	4.35	4.38	4.41
Total	5.52	1.86	1.45	1.06	3.91	4.26	4.39
Other							
All size classes	1.00	0.14	0.29	0.34	1.46	1.28	1.13

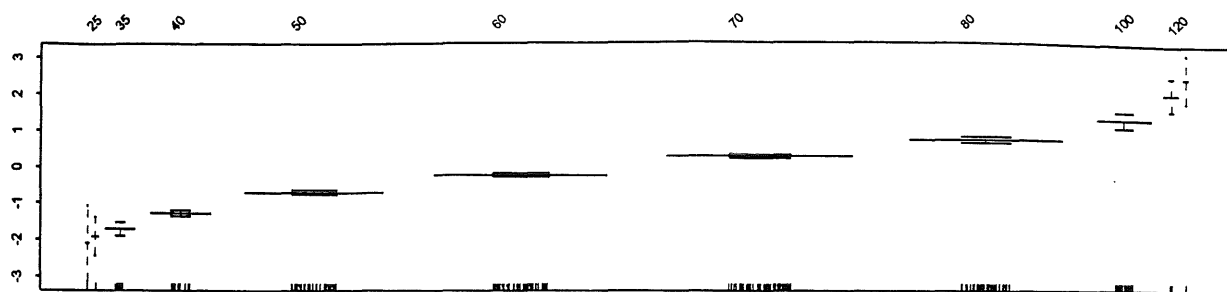
Table 5.4.4d. Saithe - mean weights of prey at ingestion of Quarter 4. Averages of feeding data collected in 1981 and 1991

	Age class						
	0	1	2	3	4	5	6+
Prey: All species All size classes	6.21	1.90	2.67	3.62	19.16	17.69	11.76
<i>Gadus morhua</i>							
<i>Melanogrammus aeglefinus</i>							
0	17.99	22.57	22.50	20.61	28.42	28.60	23.60
1	0.00	0.00	35.56	26.67	0.00	0.00	24.11
2	0.00	0.00	0.00	0.00	0.00	0.00	32.00
Total	17.99	22.57	22.51	20.61	28.42	28.60	23.61
<i>Merlangius merlangus</i>							
0	17.32	16.14	15.25	17.82	16.05	10.55	9.89
1	0.00	0.00	0.00	0.00	0.00	0.00	14.04
2	0.00	0.00	0.00	0.00	0.00	0.00	9.41
Total	17.32	16.14	15.25	17.82	16.05	10.55	9.93
<i>Trisopterus esmarki</i>							
0	7.02	7.47	8.16	9.05	9.01	8.06	9.17
1	24.52	39.26	38.34	38.72	35.82	20.70	18.88
2	30.68	44.17	42.44	42.76	38.28	29.80	29.68
3	40.00	46.67	43.64	50.67	66.67	53.33	0.00
Total	7.28	9.11	12.46	15.01	13.63	10.00	11.83
<i>Clupea harengus</i>							
0	0.00	0.90	4.81	16.85	19.12	19.03	36.65
1	12.80	16.62	33.13	38.41	39.02	39.44	45.66
2	16.27	22.53	44.45	51.93	53.47	52.98	54.21
3	19.65	38.34	76.75	102.87	102.55	95.11	93.55
4	20.18	38.19	76.74	102.87	102.56	95.11	93.55
5	21.67	38.27	76.74	102.87	102.56	95.11	93.55
Total	17.25	27.56	56.37	69.65	52.97	58.48	65.95
<i>Sprattus sprattus</i>							
1	0.00	0.00	0.00	0.00	17.78	16.67	15.74
2	0.00	0.00	0.00	0.00	13.33	15.48	15.79
3	0.00	0.00	0.00	0.00	0.00	0.00	12.31
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	14.55	15.44	15.66
<i>Ammodytidae</i>							
0	1.03	1.80	3.20	0.00	2.78	2.78	2.79
Total	1.03	1.80	3.20	0.00	2.78	2.78	2.79
Other All size classes	1.38	0.57	0.64	0.70	2.42	1.46	1.90

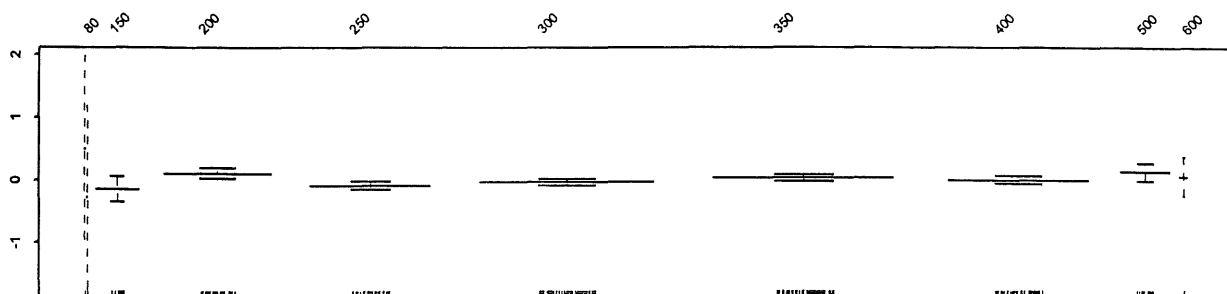
Table 6.1

Comparison of original and modified prey compositions - major changes (>20%).

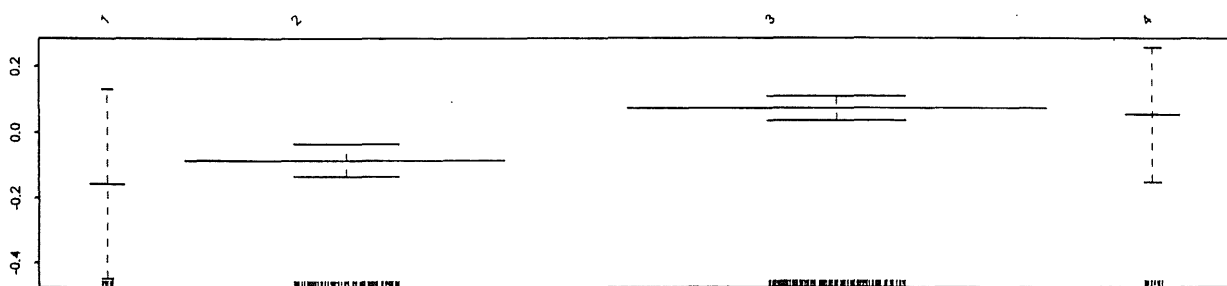
Predator	Year	Quarter	Age class	Prey species	Factor
Whiting	1981	1	1	Other food	1.30
Whiting	1981	1	3	Other food Sprat Norway pout Herring	1.30 0.73 1.53 0.79
Whiting	1981	1	6	Other food Norway pout	1.25 1.50
Whiting	1981	3	1	Other food Sprat	1.82 2.00
Whiting	1981	3	3	Norway Pout Herring	1.36 0.78
Whiting	1981	3	6	Other food Norway pout Whiting	1.58 1.39 1.32
Cod	1981	1	1	Sprat	0.63
Cod	1981	1	1	Norway pout Herring	1.59 1.34
Cod	1981	1	6	Norway pout	1.62
Cod	1981	3	1	Cod Other food Whiting	1.40 2.40 1.55
Whiting	1991	1	3	Norway pout	1.53
Whiting	1991	1	6	Norway pout	4.12
Whiting	1991	3	1	Other food	2.00
Whiting	1991	3	3	Other food	1.55
Cod	1991	1	1	Sprat	0.45
Cod	1991	1	3	Norway pout Herring Whiting	1.53 1.39 1.52
Cod	1991	1	6	Norway pout	1.50
Cod	1991	3	1	Other food Sandeel Whiting	1.50 1.11 1.88
Cod	1991	3	3	Sprat Herring	1.34 0.77



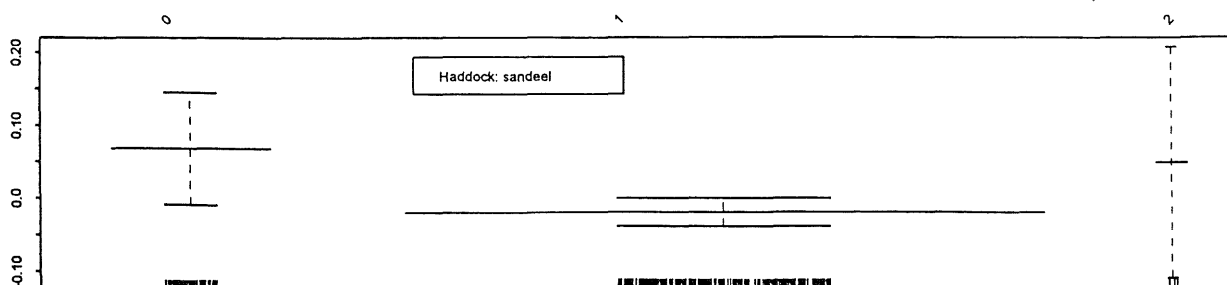
a) Prey length



b) Predator length



c) Quarter



d) Digestion state

Figure 5.3.1 Haddock. The influence of the factors average prey length (a), predator length (b), quarter (c) and digestion state (d) on the average prey weight. In each case, the effect is seen with all other factors accounted for.

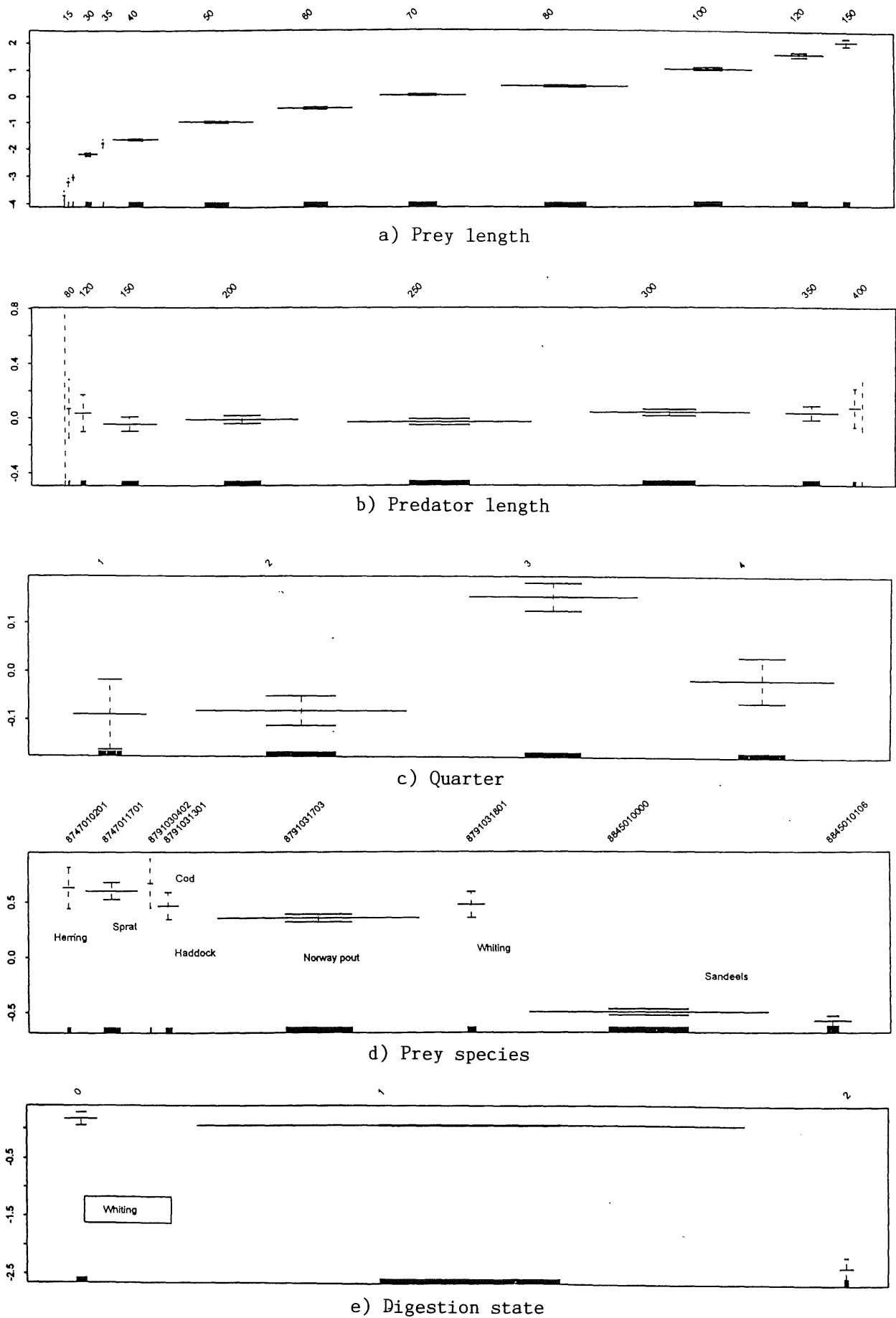


Figure 5.3.3 Whiting. The influence of the factors average prey length (a), predator length (b), quarter (c), prey species (d) and digestion state (e) on the average prey weight. In each case, the effect is seen with all other factors accounted for.

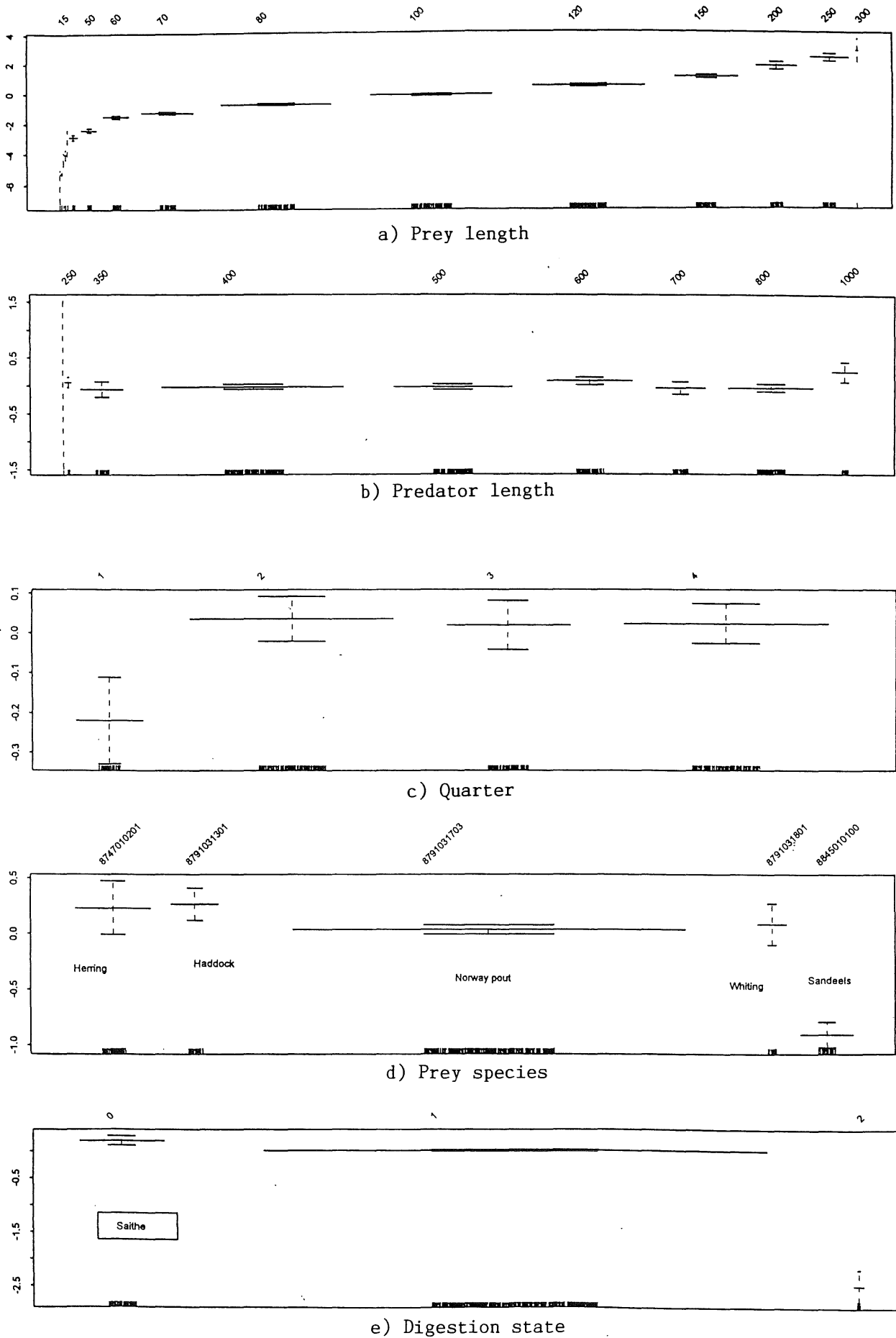


Figure 5.3.2 Saithe. The influence of the factors average prey length (a), predator length (b), quarter (c), prey species (d) and digestion state (e) on the average prey weight. In each case, the effect is seen with all other factors accounted for.

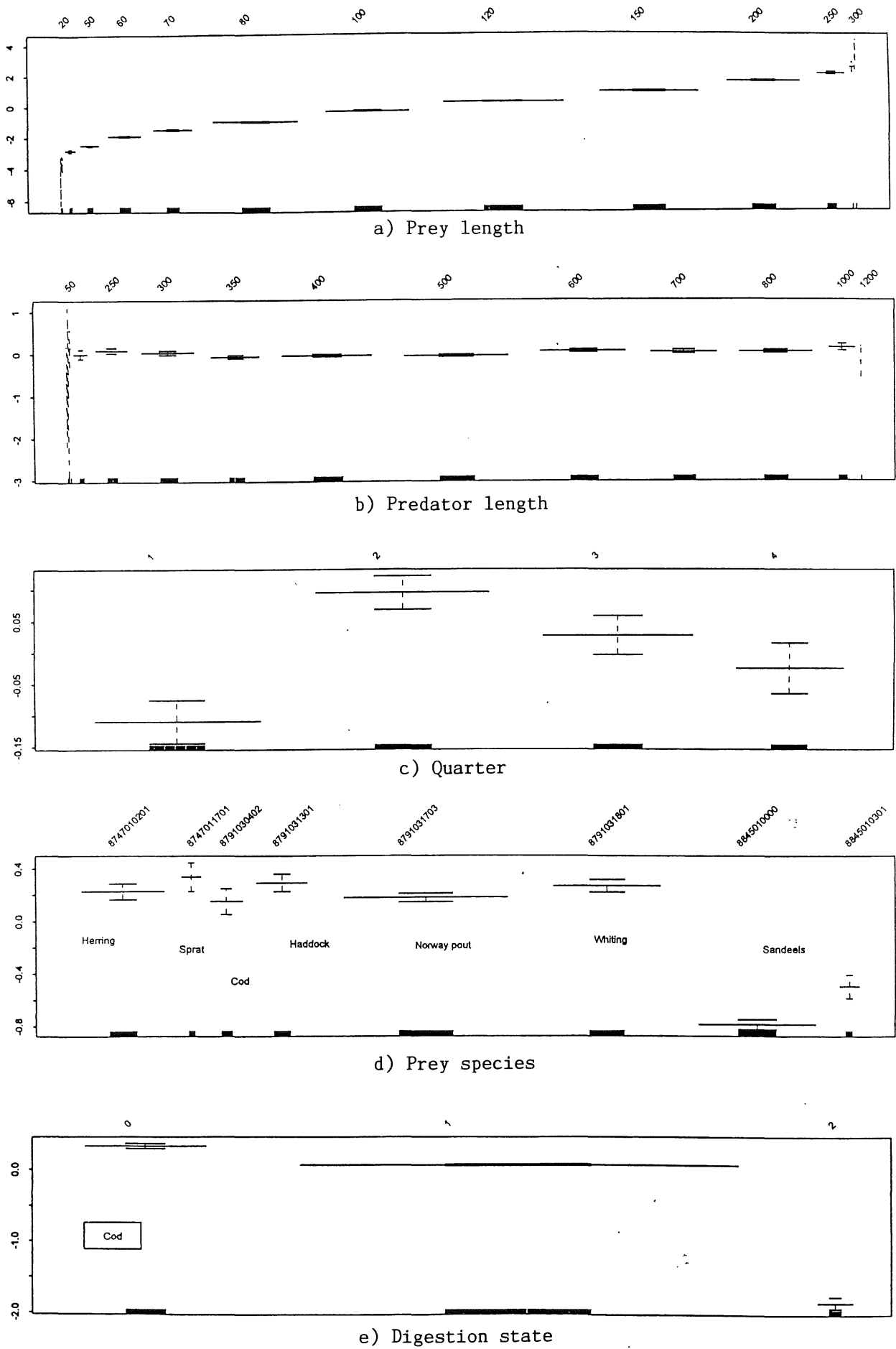
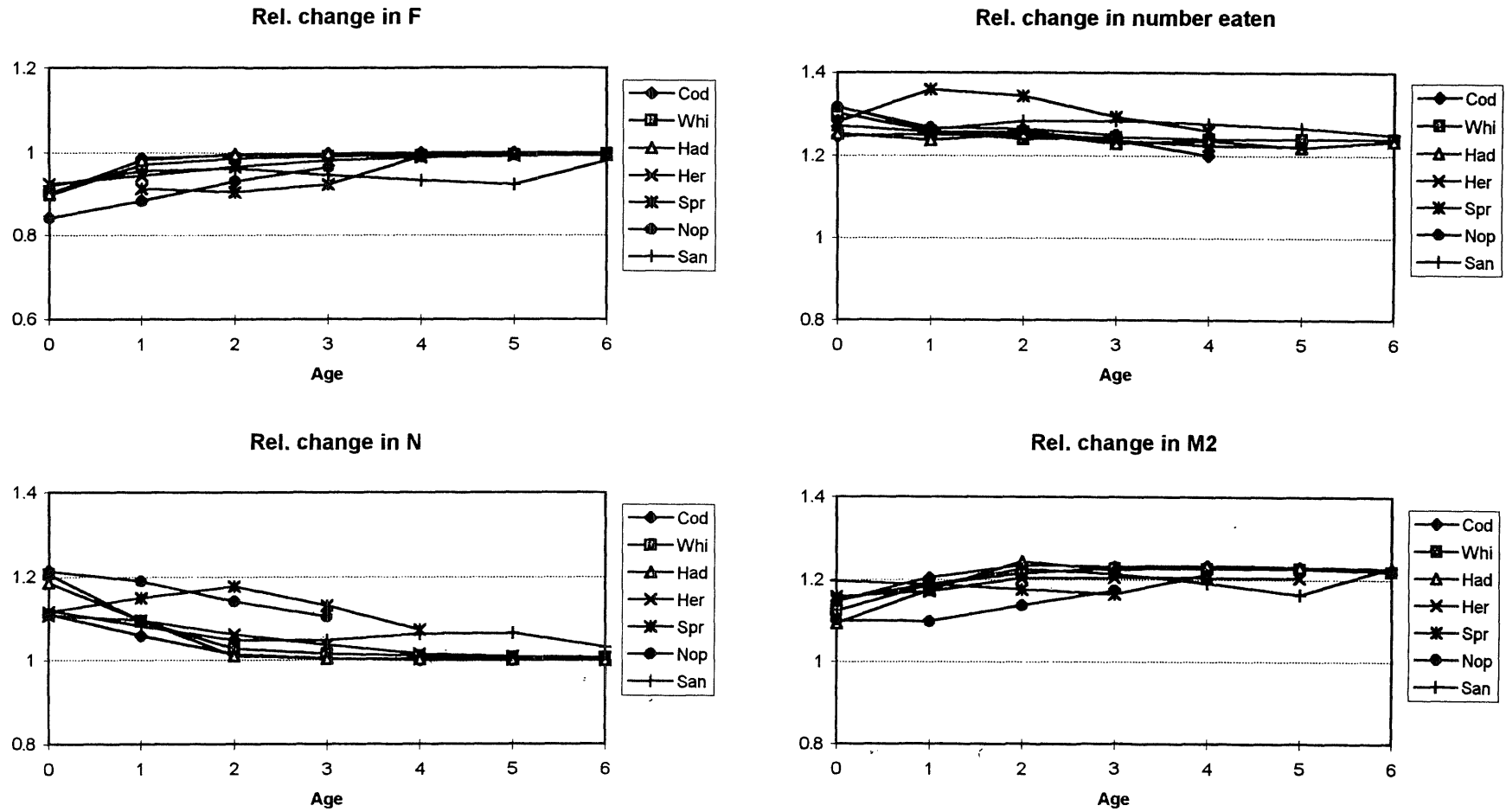


Figure 5.3.4 Cod. The influence of the factors average prey length (a), predator length (b), quarter (c), prey species (d) and digestion state (e) on the average prey weight. In each case, the effect is seen with all other factors accounted for.

Figure 5.4. The effects on M_SVPA of using a revised conversion factor (1.6) to estimate prey mean weights at age from the stomach contents data. Values of fishing mortality (F), stock size (N), numbers eaten and predation mortality (M₂) are averages for the period 1986-1991. They are expressed as changes relative to the outputs generated using the 'traditional' conversion factor of 2.



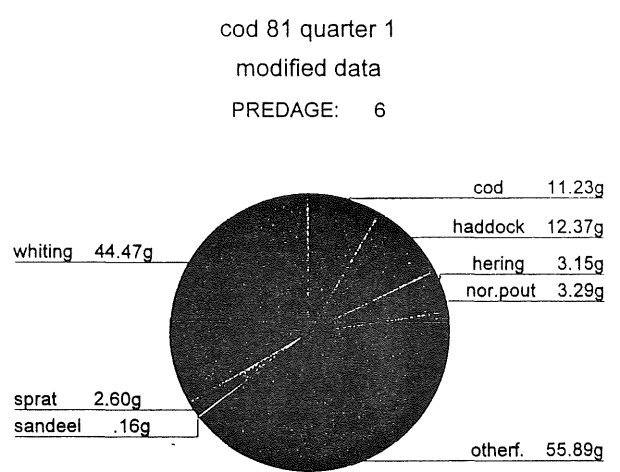
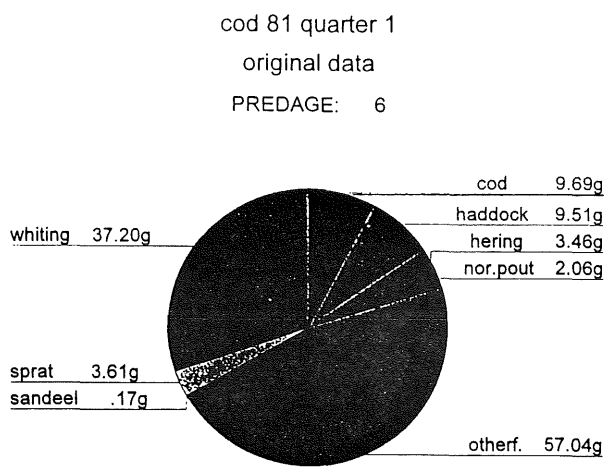
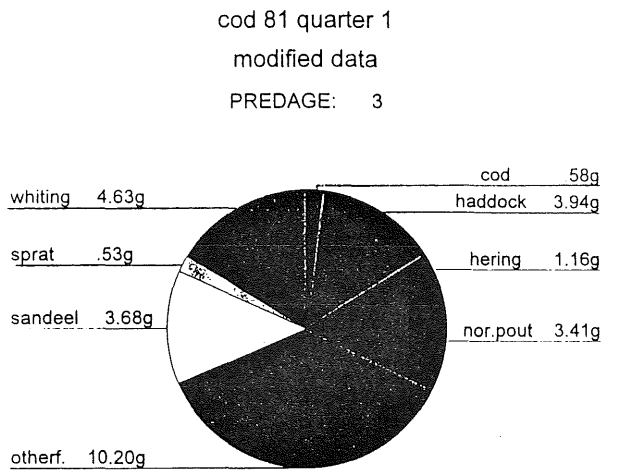
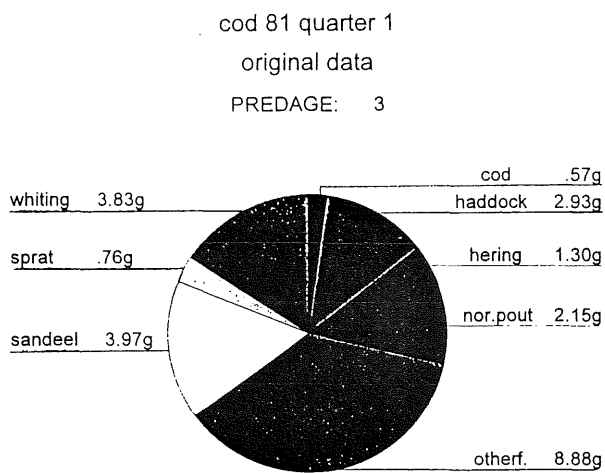
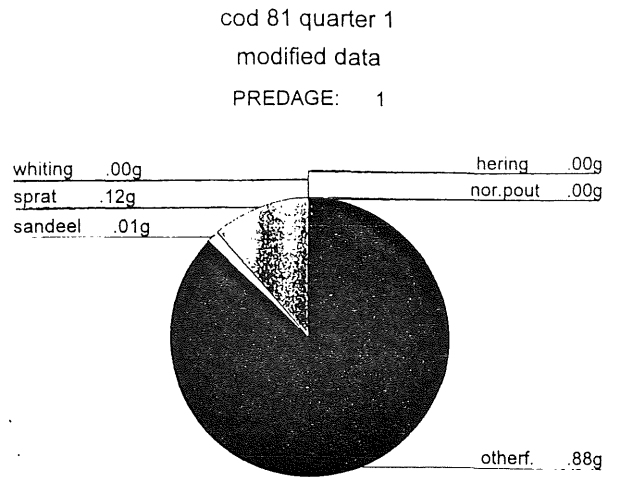
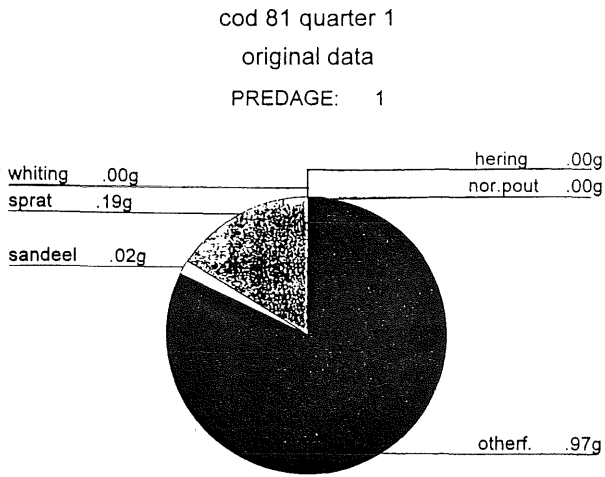
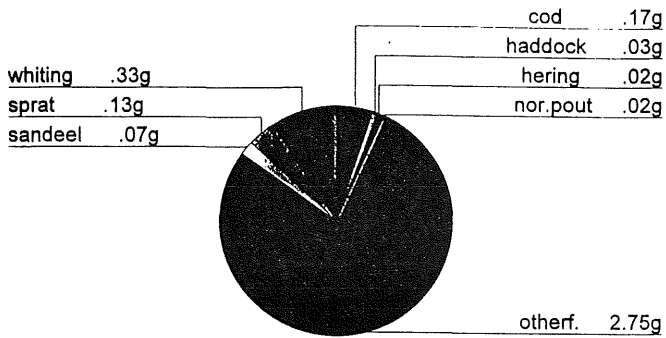


Figure 6.1.a. Cod - Quarter 1, 1981. Comparison of weights of MSVPA prey in stomachs of predators aged 1, 3 and 6, estimated using the standard ISR algorithms (original), with estimates derived from a model incorporating temperature- and prey-specific evacuation rates (modified).

cod 81 quarter 3

original data

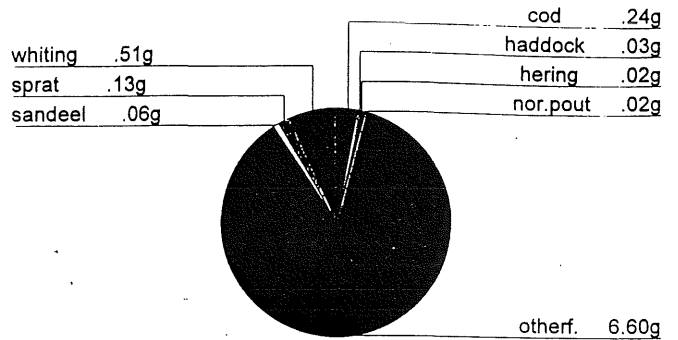
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cod 81 quarter 3

modified data

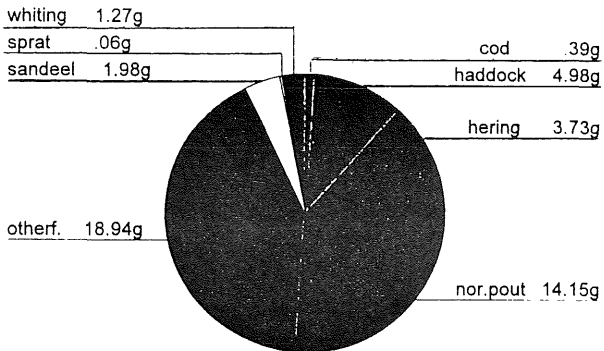
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cod 81 quarter 3

original data

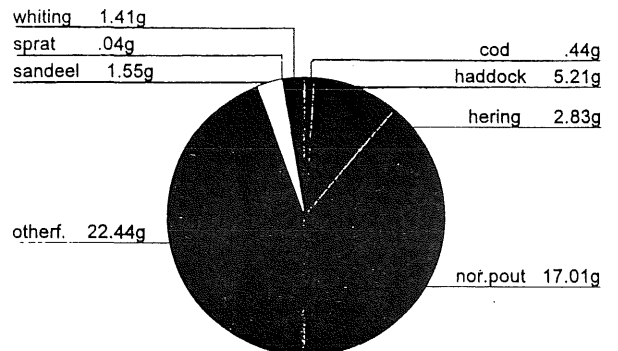
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cod 81 quarter 3

modified data

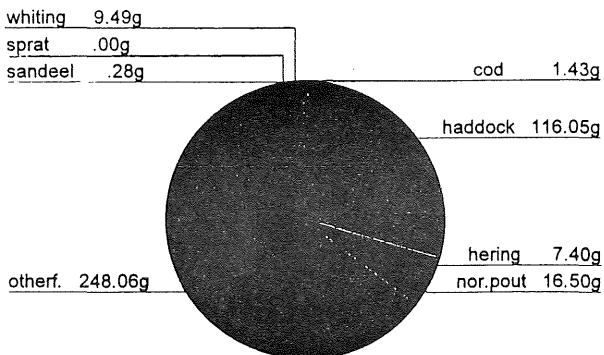
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cod 81 quarter 3

original data

PREDAGE: 6



cod 81 quarter 3

modified data

PREDAGE: 6

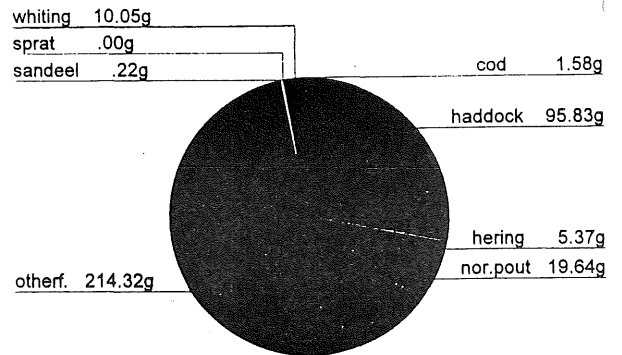


Figure 6.1.b. Cod - Quarter 3, 1981. Comparison of weights of MSVPA prey in stomachs of predators aged 1, 3 and 6, estimated using the standard ISR algorithms (original), with estimates derived from a model incorporating temperature- and prey-specific evacuation rates (modified).

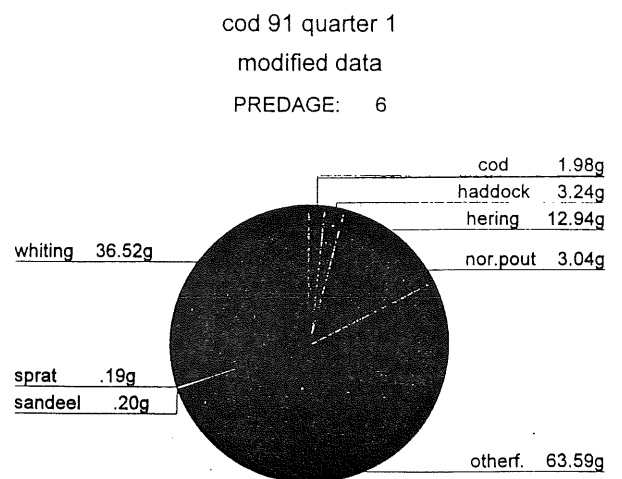
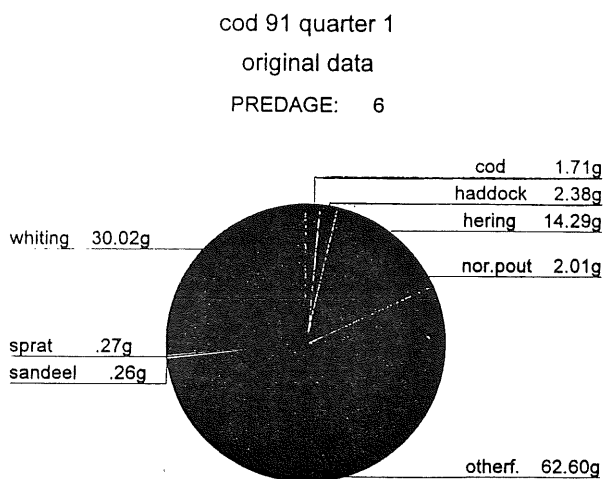
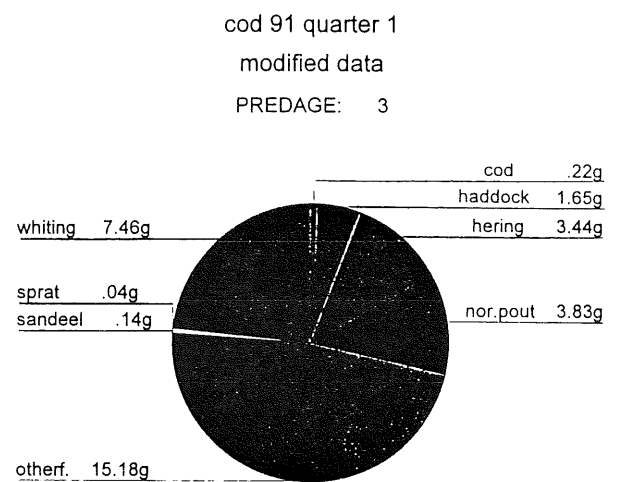
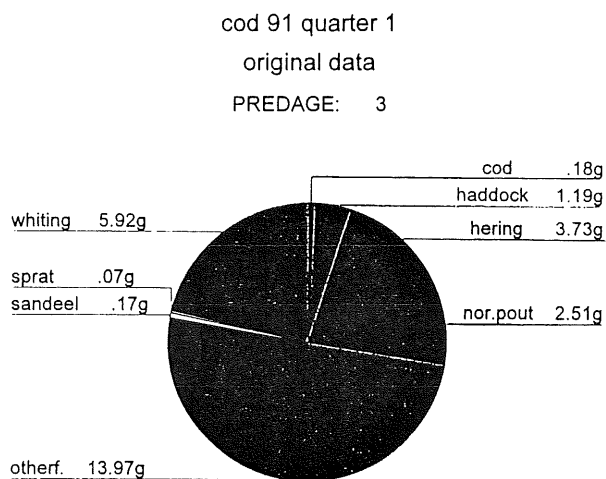
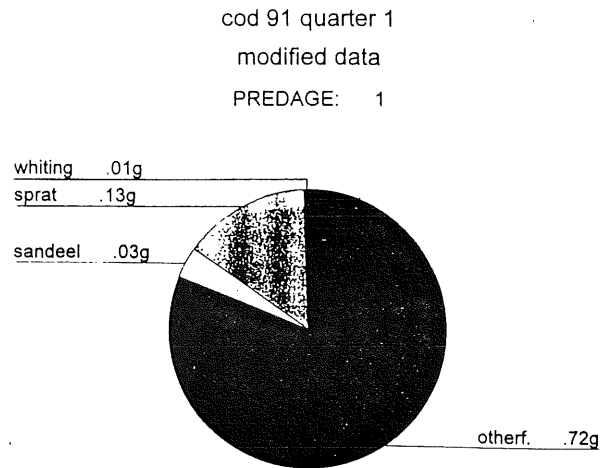
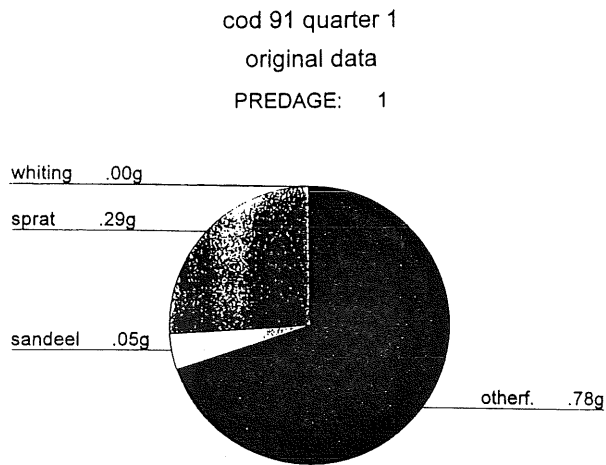


Figure 6.1.c. Cod - Quarter 1, 1991. Comparison of weights of MSVPA prey in stomachs of predators aged 1, 3 and 6, estimated using the standard ISR algorithms (original), with estimates derived from a model incorporating temperature- and prey-specific evacuation rates (modified).

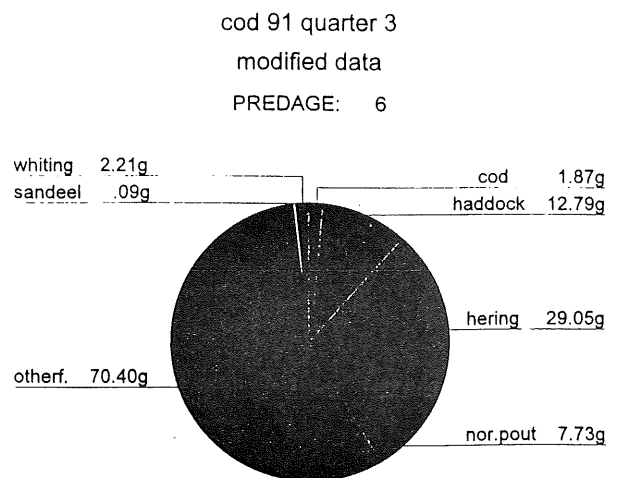
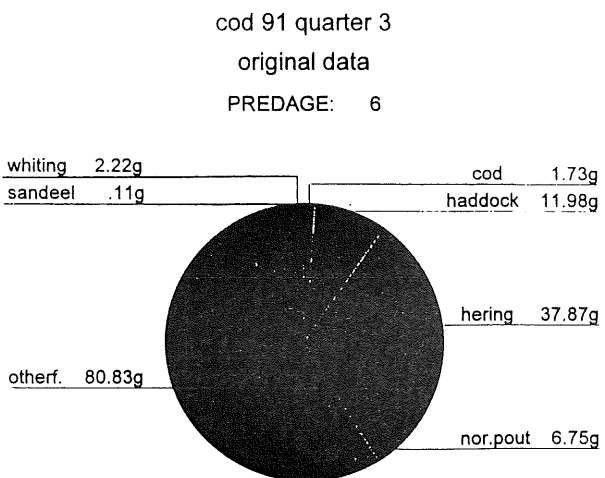
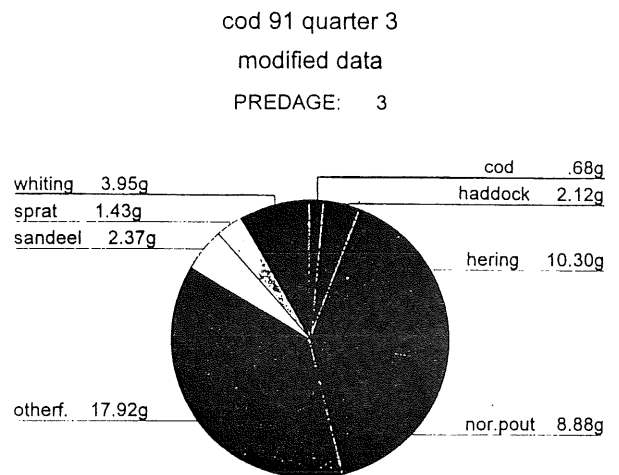
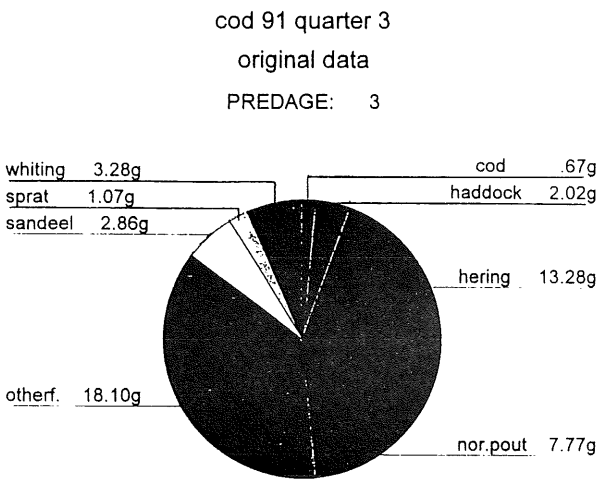
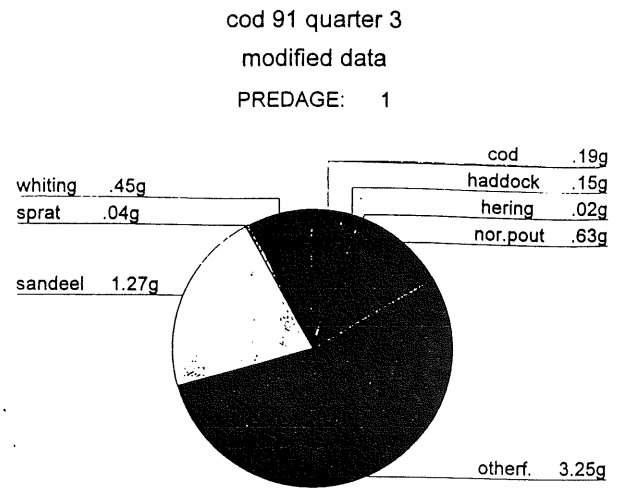
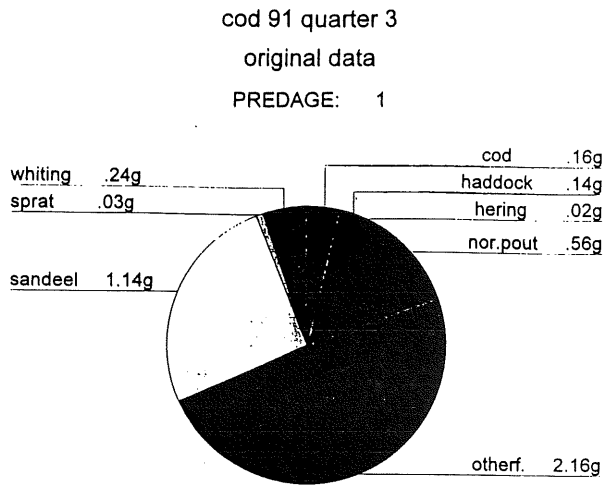


Figure 6.1.d. Cod - Quarter 3, 1991. Comparison of weights of MSVPA prey in stomachs of predators aged 1, 3 and 6, estimated using the standard ISR algorithms (original), with estimates derived from a model incorporating temperature- and prey-specific evacuation rates (modified).

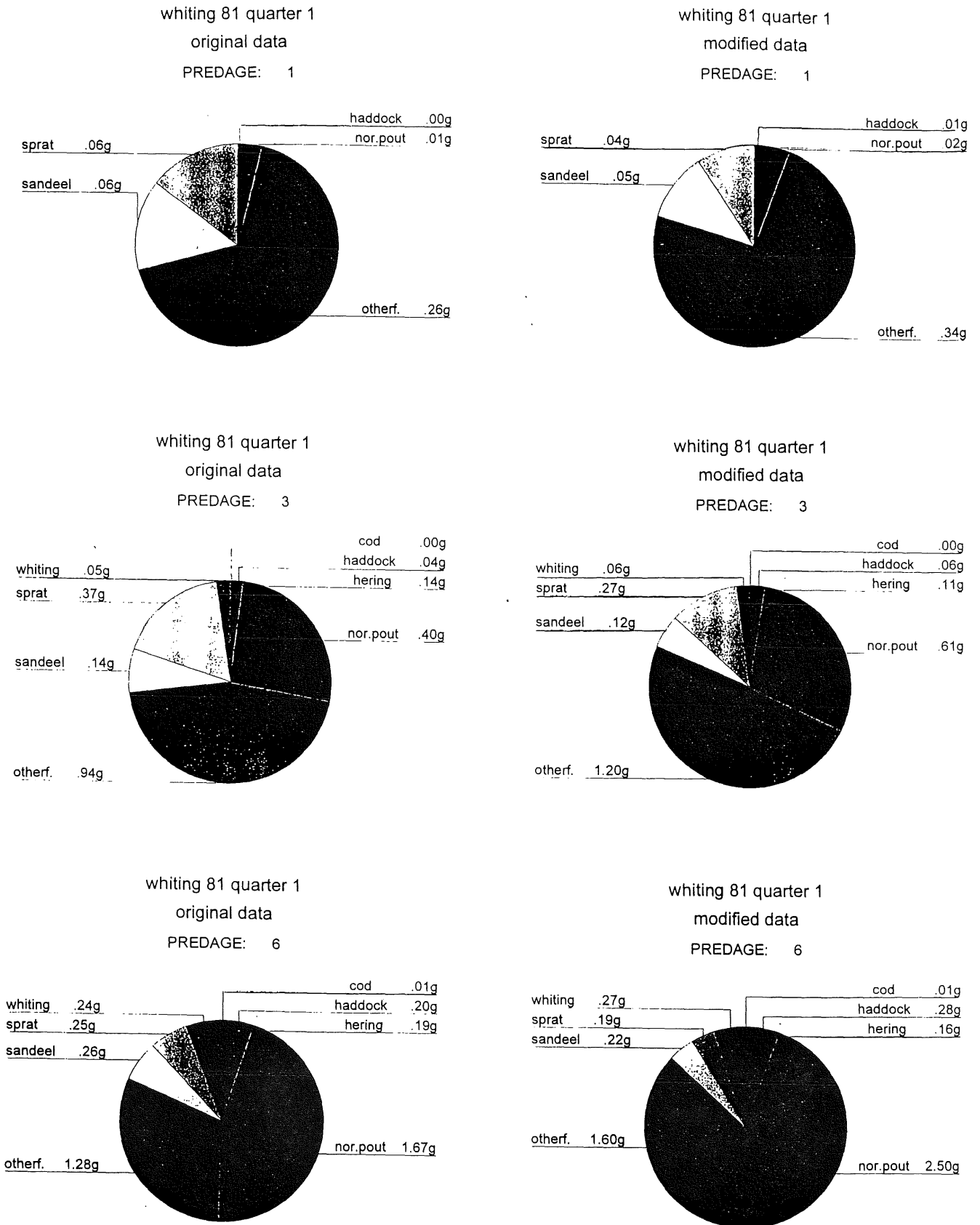


Figure 6.2.a. Whiting - Quarter 1, 1981. Comparison of weights of MSVPA prey in stomachs of predators aged 1, 3 and 6, estimated using the standard ISR algorithms (original), with estimates derived from a model incorporating temperature- and prey-specific evacuation rates (modified).

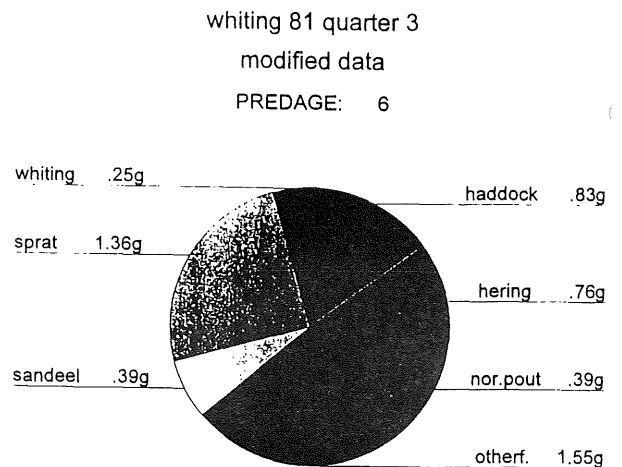
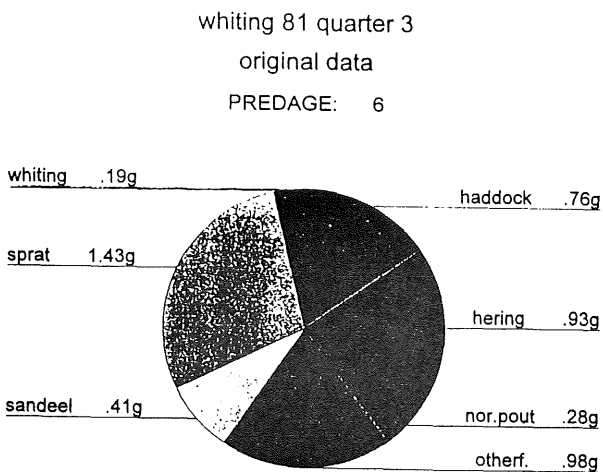
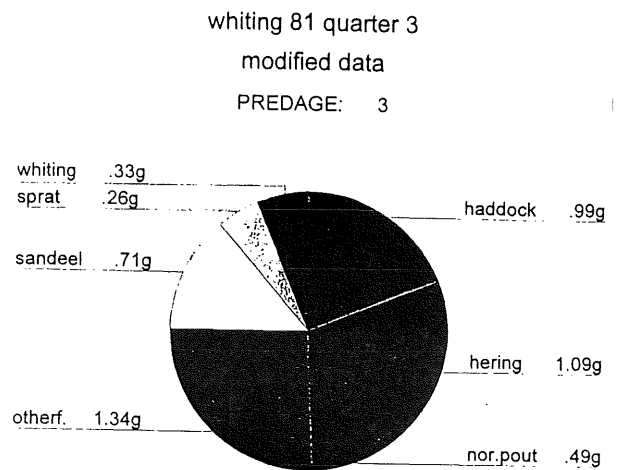
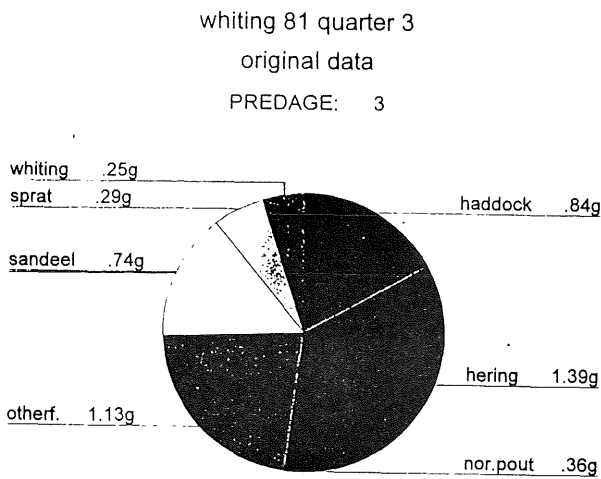
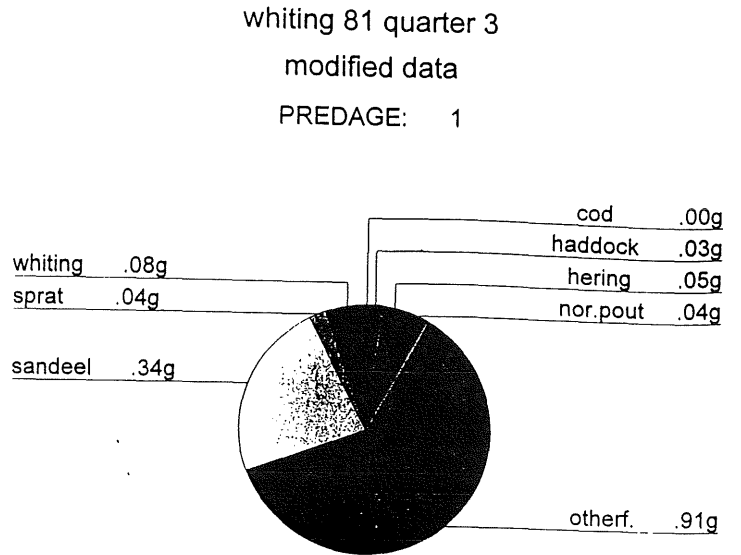
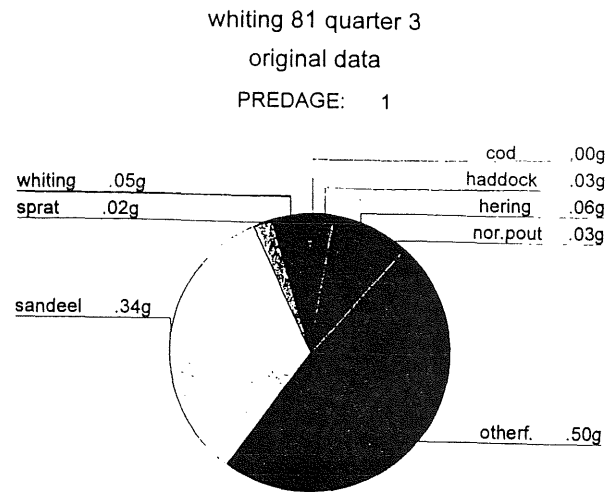


Figure 6.2.b. Whiting - Quarter 3, 1981. Comparison of weights of MSVPA prey in stomachs of predators aged 1, 3 and 6, estimated using the standard ISR algorithms (original), with estimates derived from a model incorporating temperature- and prey-specific evacuation rates (modified).

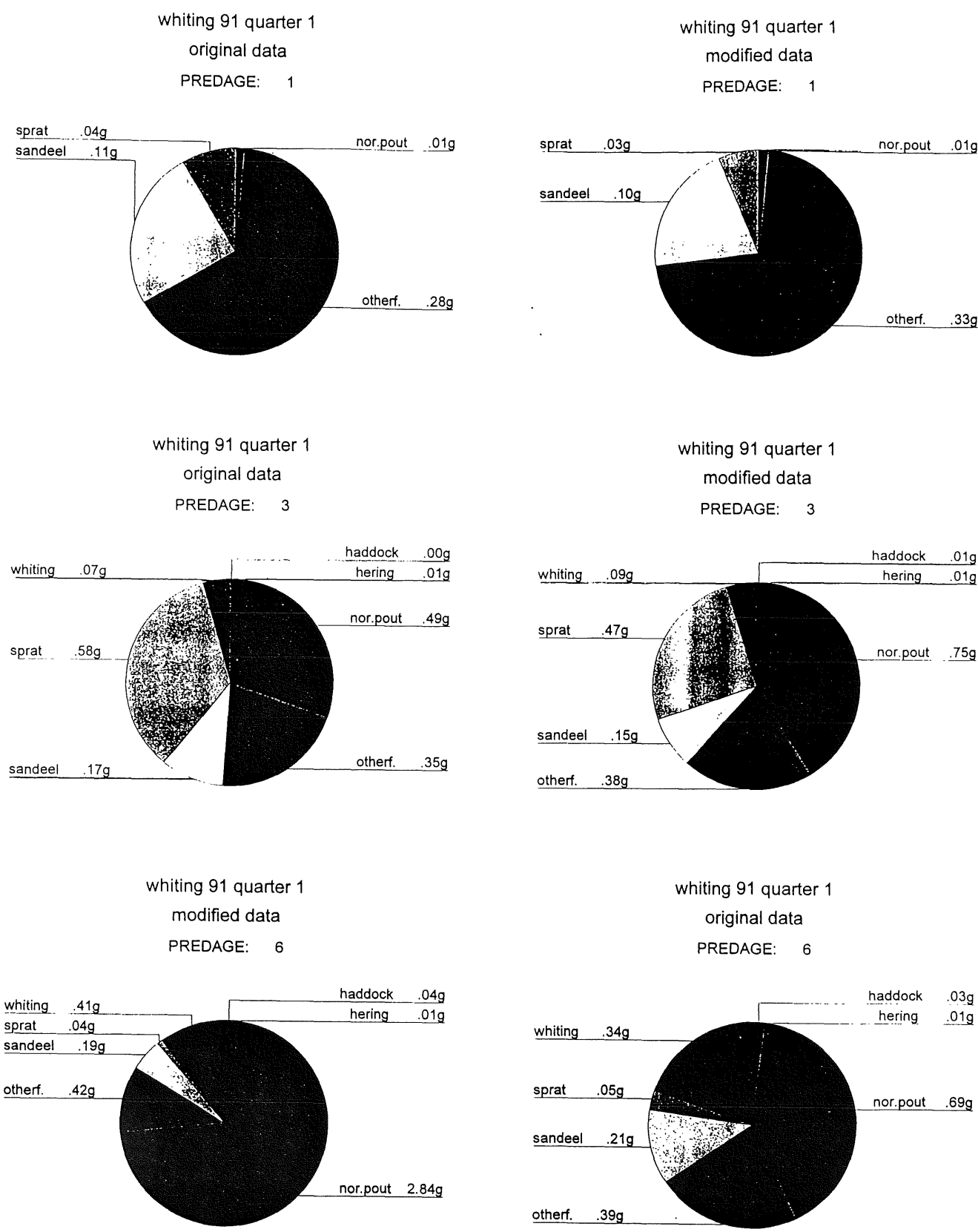


Figure 6.2.c. Whiting - Quarter 1, 1991. Comparison of weights of MSVPA prey in stomachs of predators aged 1, 3 and 6, estimated using the standard ISR algorithms (original), with estimates derived from a model incorporating temperature- and prey-specific evacuation rates (modified).

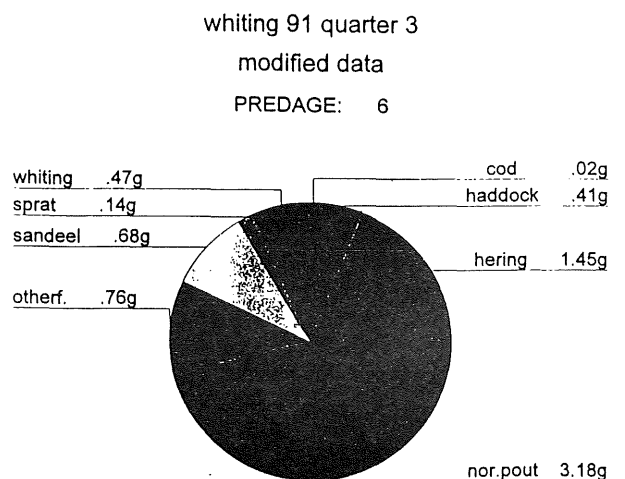
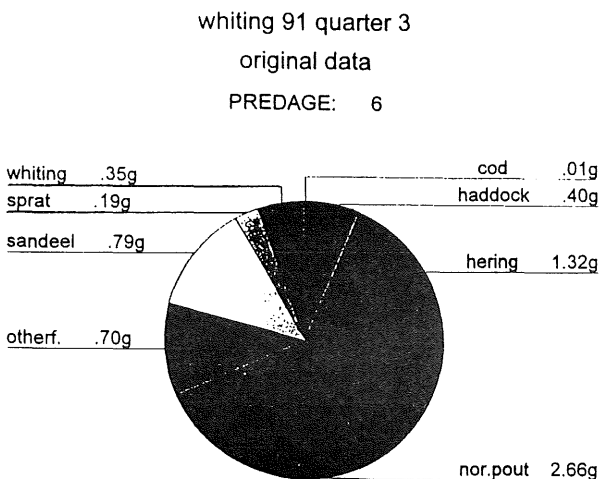
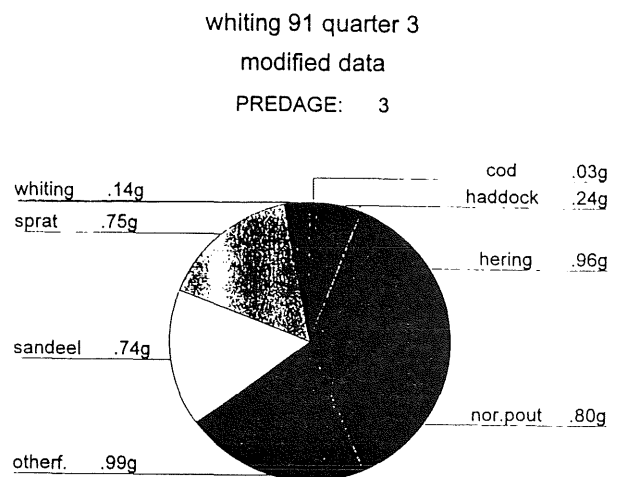
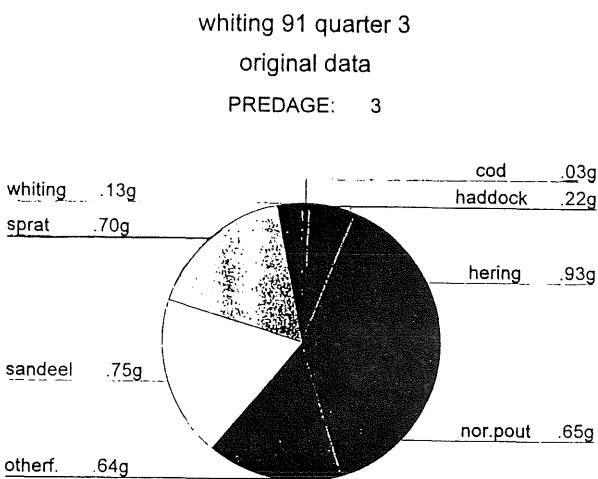
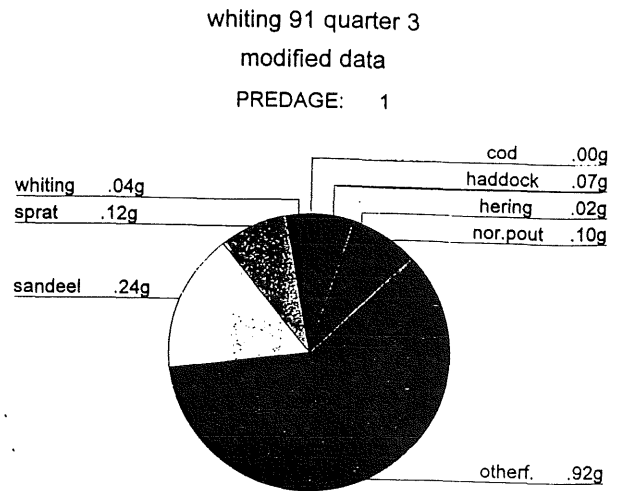
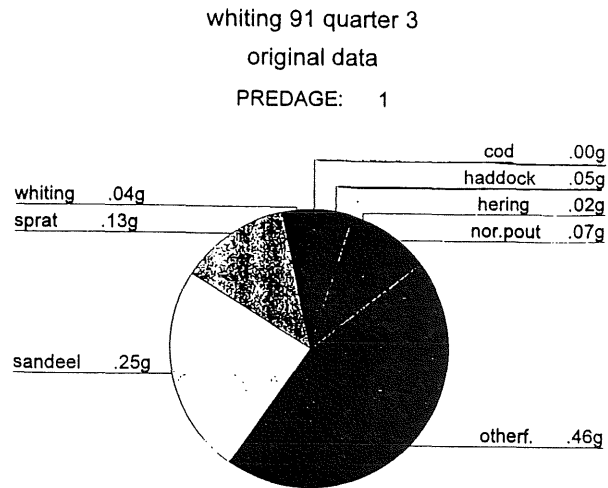


Figure 6.2.d. Whiting - Quarter 3, 1991. Comparison of weights of MSVPA prey in stomachs of predators aged 1, 3 and 6, estimated using the standard ISR algorithms (original), with estimates derived from a model incorporating temperature- and prey-specific evacuation rates (modified).

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		1187	6362	24415	60517	82680	122839	
PREY : GADUS MORHUA								
Age class								
1			60	248	532	1484	627	
2			29	327	3318	8741	8930	
3					14	41	130	
Total			89	580	4120	10583	9786	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
1		0	94	1510	3050	2941	3008	
2			5	1379	10097	11244	6162	
3			0	35	530	602	320	
4			0	7	41	49	23	
Total		0	99	2932	13719	14837	9513	
PREY : MERLANGIUS MERLANGUS								
Age class								
1		1	319	1291	2963	5447	6344	
2			179	1339	9946	13728	21963	
3			19	701	4452	5789	7138	
4			12	409	1065	771	1286	
5			3	78	206	150	350	
6			0	15	42	27	119	
Total		1	536	3832	18673	25912	37203	
PREY : TRISOPTERUS ESMARKI								
Age class								
1		2	101	1033	1374	992	701	
2		0	23	1059	2085	1715	1281	
3			0	54	134	115	81	
Total		2	125	2148	3593	2822	2062	
PREY : CLUPEA HARENGUS								
Age class								
1		1	215	500	774	952	1061	
2			8	275	405	309	683	
3			4	527	614	430	1712	
Total		1	227	1320	1804	1693	3456	
PREY : SPRATTUS SPRATTUS								
Age class								
1		104	149	54	115	259	889	
2		85	485	598	1004	1540	2463	
3		0	66	108	172	237	259	
4		0	1	1	2	3	3	
Total		190	701	761	1295	2040	3614	
PREY : AMMODYTIDAE								
Age class								
0			0	0				
1		19	138	1095	528	254	109	
2		3	62	1230	579	229	59	
3			5	547	287	83		
4			6	653	342	99		
5			2	212	111	32		
6			2	229	120	35		
Total		22	216	3966	1966	731	168	
PREY : OTHER								
All size classes		972	4368	8875	15347	24061	57037	

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 2		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		1767	12173	43372	93702	110506	162615	
PREY : GADUS MORHUA								
Age class								
0		23	88	93	29	1		
1		2	57	591	6004	6286	943	
2			1	221	2233	2499	656	
3				67	1127	1272	330	
Total		25	146	972	9393	10058	1929	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
0		1	12	49	150	159	41	
1		15	154	1092	752	515	1053	
2			28	1280	2783	5000	4530	
3				9	116	281	273	
Total		16	194	2430	3801	5955	5897	
PREY : MERLANGIUS MERLANGUS								
Age class								
0		0	6	4	164	162	21	
1		1	106	1129	2097	807	4804	
2			70	1059	5860	6609	13551	
3			0	193	2089	2762	11921	
4				54	598	690	1500	
5				1	7	24	350	
6				0	4	13	199	
Total		1	182	2484	10813	11063	32344	
PREY : TRISOPTERUS ESMARKI								
Age class								
0			4	78	49	34	78	
1		0	94	985	2048	2305	1094	
2			18	718	1228	1320	489	
3			0	8	14	15	5	
Total		0	116	1790	3339	3675	1667	
PREY : CLUPEA HARENGUS								
Age class								
1		9	126	276	1086	899	2194	
2		0	29	220	1843	4716	6638	
Total		9	155	494	2914	5604	8795	
PREY : SPRATTUS SPRATTUS								
Age class								
0		16	40	2	16	44	184	
1		15	149	79	426	330	769	
2		26	273	222	1133	736	1408	
3		3	33	36	156	79	146	
Total		59	496	339	1731	1189	2506	
PREY : AMMODYTIDAE								
Age class								
0		101	1501	1541	2255	2126	481	
1		170	1574	1431	3457	3554	1235	
2		78	417	797	875	825	624	
3		8	121	377	434	276	157	
4		3	66	292	366	205	85	
5		1	27	107	129	73	33	
6		0	15	87	113	58	19	
Total		361	3720	4632	7630	7116	2635	
PREY : OTHER								
All size classes		1295	7166	30231	54081	65845	106841	

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		237	3513	15309	45987	115076	163152	400075
PREY : GADUS MORHUA								
Age class								
0		171	1006	161	536	1414	348	
1			6	166	929	3127	721	
2				61	442	1598	362	
Total		171	1012	389	1907	6140	1431	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
0		26	762	1901	1597	1379	731	
1		0	143	2171	6376	5779	3619	
2			26	890	7039	11995	76720	
3			1	18	203	662	28874	
4				0	1	5	5583	
5							526	
Total		27	932	4927	14989	19539	116248	
PREY : MERLANGIUS MERLANGUS								
Age class								
0	1	324	770	197	22			
1	2	494	627	1411	874	908		
2		28	278	1636	1967	7222		
3		3	134	551	757	1164		
4		1	31	102	154	180		
5			3	12	17	8		
6			1	5	7	3		
Total	1	326	1297	1272	3739	3776	9487	
PREY : TRISOPTERUS ESMARKI								
Age class								
0		19	1217	8255	16234	19797	10641	
1			271	2463	2177	1864	2460	
2			383	3436	2894	2393	3402	
Total		19	1907	14680	22469	25459	17175	
PREY : CLUPEA HARENGUS								
Age class								
0		17	281	125	38	16		
1		0	257	394	279	331		
2		0	56	52	21	31		
3			99	3160	15771	14583	7397	
Total		17	693	3731	16109	14961	7397	
PREY : SPRATTUS SPRATTUS								
Age class								
0		1	0	0	3	9	2	
1		108	254	51	15	3		
2		18	80	12	0	0		
3		1	13	1				
Total		129	347	64	19	12	2	
PREY : AMMODYTIDAE								
Age class								
0	1	69	875	1650	757	660	277	
1		1	50	96	7	1	0	
2		3	121	198	17	6	3	
3		0	13	26	2			
4		0	5	9	1			
Total	1	73	1066	1982	784	667	280	
PREY : OTHER								
All size classes		235	2750	8055	18943	55061	92599	248056

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 4		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		855	7178	10889	36230	98841	95356	138876
PREY : GADUS MORHUA								
Age class								
0	2	8	42	331	902	716	954	
1			17	1172	6076	115	1743	
2			13	1244	4606	7612	2160	
3			1	51	188	311	88	
Total	2	8	73	2798	11771	8754	4944	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
0		233	1363	3106	6459	7677	5471	
1		1	30	441	2525	3227	6955	
2			7	742	3331	5051	27195	
3			1	71	290	460	3392	
4			0	0	3	4	1	
5			0	0	1	1	0	
Total		234	1401	4361	12609	16420	43014	
PREY : MERLANGIUS MERLANGUS								
Age class								
0		16	86	278	652	790	490	
1		9	85	3943	12194	9039	3514	
2		3	36	3046	10470	6700	12482	
3			3	383	1399	1665	3892	
4			1	123	445	425	201	
5			0	3	12	21	6	
6			0	9	34	56	16	
Total		27	212	7785	25206	18695	20600	
PREY : TRISOPTERUS ESMARKI								
Age class								
0	5	39	596	1578	2715	3149	3447	
1		39	353	854	2539	2992	420	
2		4	47	118	251	290	36	
Total	5	81	996	2551	5505	6431	3903	
PREY : CLUPEA HARENGUS								
Age class								
0		50	295	725	2	2	1	
1		4	33	323	863	320	91	
2		0	1	53	157	58	17	
3		0	1	13	29	21	6	
4		0	1	8	11	16	5	
5		0	2	8	8	19	5	
6		0	1	139	1043	1306	186	
Total		54	334	1269	2113	1742	310	
PREY : SPRATTUS SPRATTUS								
Age class								
1	0	13	59	182	610	37	162	
2		8	64	219	776	48	206	
3		0	3	11	43	3	11	
4		0	1	4	14	1	4	
Total	0	22	126	412	1431	88	380	
PREY : AMMODYTIDAE								
Age class								
0	1	170	333	1129	4471	2075	3365	
1		20	16	205	729	1207	2388	
2		26	22	283	1004	1661	3292	
3		11	16	204	718	1189	2386	
4		8	15	194	682	1129	2272	
5		2	4	56	196	325	655	
6		2	5	62	216	369	715	
Total	2	239	412	2138	8035	7987	15135	
PREY : OTHER								
All size classes		847	6513	7335	14915	32172	35239	50589

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1985		QUARTER : 1	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		982	10983	39432	88878	108512	166523	
PREY : GADUS MORHUA								
Age class								
1			22	36	38	18	88	
2			1	83	314	585	2343	
3					3	8	18	
Total			23	118	355	611	2448	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
1			474	1184	1538	1613	679	
2			88	1423	5994	7739	6314	
3			1	37	245	464	666	
4				4	32	60	89	
5					1	3	5	
Total			563	2648	7810	9878	7753	
PREY : MERLANGIUS MERLANGUS								
Age class								
1		28	273	674	491	1157	1626	
2			232	1856	1754	4221	14694	
3			21	157	604	1349	6365	
4			6	17	129	272	1977	
5			0	2	26	56	704	
6			0	2	31	70	544	
Total		28	532	2708	3034	7125	25911	
PREY : TRISOPTERUS ESMARKI								
Age class								
0			1	0				
1			848	7709	17450	14597	8286	
2			290	6089	21453	17214	7068	
3			29	379	1534	1186	394	
4			3	21	80	62	21	
Total		0	1171	14198	40523	33076	15769	
PREY : CLUPEA HARENGUS								
Age class								
1		2	111	62				
2		4	1274	1769	1433	3303	7259	
3			155	3028	9736	12090	10740	
4			27	1071	6217	8799	5850	
5			1	153	1438	1779	1354	
6			1	69	607	1118	607	
Total		6	1568	6152	19433	27091	25812	
PREY : SPRATTUS SPRATTUS								
Age class								
1		12	53	135	200	4	6	
2		3	71	76	79	367	812	
3			56	199	50	150	370	
4			7	34	7	17	43	
5			0	1	0	1	3	
6			0	0	0	0	0	
Total		15	188	444	336	540	1234	
PREY : AMMODYTIDAE								
Age class								
1		28	146	389	1316	1082	199	
2			376	481	1323	1287	153	
3			24	62	186	166	14	
4			1	1	2	3	0	
6			12	162	276	236		
Total		28	561	1094	3103	2775	366	
PREY : OTHER								
All size classes		905	6378	12070	14283	27415	87229	

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1985		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		71	2172	12460	58054	115498	174776	238362
PREY : GADUS MORHUA								
Age class								
0			12	36	37	236	196	
1					165	2047	2395	793
2					621	7801	13177	8648
3					7	70	58	
Total			12	36	829	10154	15826	9441
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
0			62	727	774	285	200	140
1			0	291	2019	3503	1584	1841
2				149	2506	7139	4729	4378
Total			62	1167	5300	10928	6512	6360
PREY : MERLANGIUS MERLANGUS								
Age class								
0			28	204	160	43	88	56
1				505	1439	3329	3635	3607
2				262	1566	4887	3614	3624
3				18	219	798	288	119
4				4	59	273	140	27
5					5	50	41	
6					1	11	9	
Total			28	992	3449	9390	7815	7432
PREY : TRISOPTERUS ESMARKI								
Age class								
0			1	8	136	378	306	111
1				20	1318	5102	1393	744
2				6	312	825	145	74
3				0	2	5	1	0
Total			1	34	1769	6309	1845	981
PREY : CLUPEA HARENGUS								
Age class								
1				212	170	94	10	0
2				3	288	1961	2730	1736
3					65	537	509	780
4					141	773	833	1627
5					1	3	3	6
Total				215	665	3369	4086	4149
PREY : SPRATTUS 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	1443	583	227
1				5	120	85	29	10
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	1543	612	237
PREY : OTHER								
All size classes			71	1623	6568	37250	78483	139255

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1986		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		1350	8600	26166	46010	77281	98224	
PREY : GADUS MORHUA								
Age class								
1			34	1335	168	752	294	
2			1	92	136	1409	1215	
3					88	756	1094	
Total			35	1427	392	2916	2604	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
1		13	1244	3199	3226	4438	5898	
2			19	117	978	3533	4199	
3				55	375	1435	1827	
Total		13	1264	3370	4580	9406	11924	
PREY : MERLANGIUS MERLANGUS								
Age class								
1		7	712	2329	1648	2022	1534	
2			86	434	1029	2217	2429	
3			6	258	905	1208	1563	
4			0	20	143	193	242	
5				2	39	59	64	
6				2	24	28	17	
Total		7	804	3045	3788	5728	5849	
PREY : TRISOPTERUS ESMARKI								
Age class								
1			945	4963	8931	9402	11391	
2			204	966	2718	2430	951	
3			9	41	125	143	38	
4			0	1	3	4	1	
Total		0	1158	5970	11777	11979	12380	
PREY : CLUPEA HARENGUS								
Age class								
1		1	1	1	0	0		
2		65	491	887	4330	5897	7272	
3		0	114	1701	5750	15406	14411	
4			105	589	1512	3293	3483	
5			42	60	97	250	399	
6			1	8	27	86	79	
Total		66	755	3245	11717	24932	25649	
PREY : SPRATTUS SPRATTUS								
Age class								
1		0	1	4	2	1	0	
2		7	51	155	65	25	4	
3		18	165	348	123	47	12	
4		5	41	88	31	12	3	
5		0	2	3	1	0	0	
6		0	0	1	1	0	0	
Total		31	261	599	222	85	20	
PREY : AMMODYTIDAE								
Age class								
1		162	1377	2125	851	249	149	
2		12	224	144	96	118	143	
3				0	1	1	5	
4				0	0	0	0	
Total		174	1601	2269	947	369	297	
PREY : OTHER								
All size classes		1060	2723	6241	12589	21867	39501	

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1986		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		80	3637	15649	37545	80837	125687	366563
PREY : GADUS MORHUA								
Age class	0	12		16	13	39	7	
	1				6	83	774	346
Total		12	0	19	31	121	781	346
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0		19	881	1584	1752	104	13
	1		0	427	947	2589	5451	8811
	2		0	7	9	30	84	4902
	3			0	1	12	29	11299
	4							159
Total			19	1315	2541	4382	5667	25185
PREY : MERLANGIUS MERLANGUS								
Age class	0		28	104	235	567	140	1204
	1		1	138	445	998	2255	1095
	2				31	1247	3964	2587
	3				13	403	1690	1635
	4				0	18	39	137
	5				0	8	18	22
Total			30	242	725	3241	8106	6680
PREY : TRISOPTERUS ESMARKI								
Age class	0		18	905	1496	2118	1604	2018
	1		4	2991	7426	12030	3920	5692
	2		0	127	505	1244	595	337
	3				94	362	488	212
Total			23	4023	9521	15754	6608	8260
PREY : CLUPEA HARENGUS								
Age class	0		0					
	1		102	319	205	173	1	44
	2		3	366	1086	2661	8938	69472
	3		1	263	1601	7238	13539	40734
	4		0	21	274	1380	10294	102761
	5			1	26	126	1182	12875
	6					1099	2626	1142
Total			107	970	3192	12677	36597	227014
PREY : SPRATTUS SPRATTUS								
PREY : AMMODYTIDAE								
Age class	0		201	855	500	713	6147	2747
	1		336	693	185	103	810	398
	2		20	42	15	8	52	31
	3		6	12	4	1		4
	4		0	0	0	0		0
	5				1	0		1
Total			563	1603	705	826	7009	3181
PREY : OTHER								
All size classes		68	2896	7478	20829	43836	60919	95897

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1987		QUARTER : 1	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		1175	6845	20579	63969	67900	77397	
PREY : GADUS MORHUA								
Age class								
1			2	160	187	308	270	1343
2					1	3263	3895	5392
3						84	80	192
Total			2	160	188	3655	4246	6927
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
1			47	497	1596	2768	4933	2760
2				8	73	5292	8879	3316
3				0	1	119	120	83
4						37	22	26
Total			47	505	1670	8217	13954	6185
PREY : MERLANGIUS MERLANGUS								
Age class								
1			13	724	3223	4402	2725	2412
2			0	11	1134	6180	5647	3068
3				0	208	1131	1843	1159
4				0	50	262	471	791
5							2	31
6								15
Total			13	735	4616	11975	10688	7476
PREY : TRISOPTERUS ESMARKI								
Age class								
1			6	616	1896	1577	2171	367
2			0	55	1316	773	279	453
3				4	53	109	156	275
4				0	1	12	21	37
5						46	85	151
Total			6	674	3266	2518	2714	1286
PREY : CLUPEA HARENGUS								
Age class								
1				8	4	21	11	7
2			56	547	1262	4991	5103	6524
3				98	671	2366	4253	2169
4				10	58	336	802	218
5					0	168	412	82
6						121	298	58
Total			56	662	1995	8003	10880	9057
PREY : SPRATTUS SPRATTUS								
Age class								
1			1	1	1			
2				1	2	0		
3				4	15	5		
4				1	6	2		
5				0	0	0		
6				0	0			
Total			1	7	25	7		
PREY : AMMODYTIDAE								
Age class								
1			20	158	272	16		
2			20	448	738	15		
3			0	9	32	0		
4				0	0	0		
6				3	91	163	89	156
Total			41	617	1133	195	90	156
PREY : OTHER								
All size classes		1009	3484	7687	29401	25328	46310	

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1987		QUARTER : 3	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		238	3685	12879	47074	94990	159968	254626
PREY : GADUS MORHUA								
Age class								
0				2	1	0		
1					103	3736	6142	2184
2					201	3256	3810	39030
Total				2	304	6991	9952	41213
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
0			23	351	508	256	57	15
1			1	137	3362	9690	7335	2592
2				0	403	3543	1759	17660
3					55	490	237	835
4					4	36	17	1900
Total			24	488	4331	14014	9406	23000
PREY : MERLANGIUS MERLANGUS								
Age class								
0			56	311	250	180	935	1062
1			15	285	1626	4953	15830	7709
2			0	62	1435	8764	11788	3672
3				0	214	1870	3041	1157
4					72	585	1084	444
5					13	105	189	78
Total			71	658	3610	16457	32866	14123
PREY : TRISOPTERUS ESMARKI								
Age class								
0			38	536	1644	3269	2995	1182
1			22	688	2728	8873	9225	3692
2			0	18	127	363	351	77
3				3	31	65	55	
Total			60	1245	4530	12570	12626	4950
PREY : CLUPEA HARENGUS								
Age class								
0			3	1				
1			157	1096	2132	439	823	5485
2			55	900	2410	4441	6245	14777
3			1	122	1041	2184	4055	10654
4			0	27	149	338	1126	4095
5				6	31	72	251	909
Total			217	2151	5762	7475	12500	35921
PREY : SPRATTUS SPRATTUS								
Age class								
0			0	0				
1			0	0	3			
2			2	11	92			
3			0	0	3			
Total			2	12	98			
PREY : AMMODYTIDAE								
Age class								
0			163	403	685	481	1913	8664
1			53	187	184	301	1054	12299
2			80	412	382	176	1711	7868
3			3	42	25	1	51	1826
4			1	8	5	0	13	315
5			0	1	1	0	2	5
Total			300	1052	1283	960	4744	30976
PREY : OTHER								
All size classes		238	3010	7269	27155	36522	77873	104443

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 1	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		1113	7601	27760	69124	93458	113538	
PREY : GADUS MORHUA								
Age class								
	1				41	106	160	627
	2				133	1923	801	1071
	3				8	121	34	11
Total			2	182	2151	995	1710	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
	1		89	1193	1478	1274	634	
	2			1	1	1	500	
	3				23	309	219	
	4				37	506	309	
	5				65	892	544	
	6				21	288	175	
Total			92	1194	1625	3271	2381	
PREY : MERLANGIUS MERLANGUS								
Age class								
	1	4	1146	2277	4231	3903	10142	
	2		141	1969	6681	6323	9759	
	3		12	1294	4360	5579	7314	
	4		2	219	1308	1208	1730	
	5		0	122	626	686	840	
	6		0	40	245	238	239	
Total		5	1301	5920	17450	17938	30023	
PREY : TRISOPTERUS ESMARKI								
Age class								
	1		871	1701	2295	2390	1317	
	2		85	734	1171	1527	606	
	3		0	70	67	154	85	
Total		1	956	2506	3533	4070	2008	
PREY : CLUPEA HARENGUS								
Age class								
	1		219	1088	3481	1985	3301	
	2		63	1235	3985	4763	4767	
	3		28	931	1680	4246	2786	
	4		6	309	783	3131	1958	
	5		0	167	561	2277	1473	
Total			316	3742	10490	16403	14285	
PREY : SPRATTUS SPRATTUS								
Age class								
	1	285	28	44	122	56	234	
	2	0	31	14	71	98	33	
	3		24	8	17	20	7	
	4		2	1	0	0	0	
	5		1	0	2	3	1	
Total		285	87	67	213	178	274	
PREY : AMMODYTIDAE								
Age class								
	1	38	201	155	129	176	191	
	2	5	11	9	15	46	37	
	3	2	6	5	9	25	19	
	4	1	2	2	2	4	3	
	5	0	1	1	2	5	4	
	6	0	2	2	2	2	2	
Total		46	223	175	176	265	258	
PREY : OTHER								
All size classes		776	4624	13974	33485	50340	62599	

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 2	
Age class	0	1	2	3	4	5	6+
PREY : ALL SPECIES							
All size classes	44	2604	18804	51400	111741	190870	251585
PREY : GADUS MORHUA							
Age class	0	1	1	0	0		
	1	2	43	240	278	296	155
	2			26	227	8624	8695
	3			12	107	4568	4614
	4			0	2	285	291
Total		3	45	279	614	13774	13755
PREY : MELANOGRAMMUS AEGLEFINUS							
Age class	0	2	3	2	0		
	1		131	1296	9022	16032	26583
	2		1	67	356	2086	1755
	3		0	9	175	1615	1233
	4			1	32	298	228
	5			2	35	332	254
	6			0	7	66	50
Total		2	135	1378	9628	20429	30103
PREY : MERLANGIUS MERLANGUS							
Age class	0	1	15	12	1	0	
	1	10	655	1389	2868	2549	5283
	2		363	1642	4000	3158	9609
	3		78	1136	2517	3337	9713
	4		8	184	1087	796	1783
	5		5	99	465	561	915
	6		1	40	62	135	222
Total		11	1125	4502	11002	10537	27712
PREY : TRISOPTERUS ESMARKI							
Age class	0		6	4	0		
	1	40	1940	5636	5596	4127	9538
	2	2	601	899	960	2742	2202
	3	0	278	510	219	257	186
	4	0	23	39	21	45	33
Total		42	2849	7087	6796	7172	11960
PREY : CLUPEA HARENGUS							
Age class	0	2	21	8	32	47	22
	1	0	131	773	2712	2369	4870
	2	1	112	5775	12603	18135	20364
	3	0	77	1858	4443	8314	9979
	4	0	29	462	953	1898	2832
	5	0	49	672	1349	3030	4715
Total		4	419	9548	22092	33792	42782
PREY : SPRATTUS SPRATTUS							
Age class	1	7	81	38	180	355	495
	2	0	14	159	211	204	193
	3	0	2	20	34	10	28
	4			0	3		0
	5			0	3		0
Total		8	96	217	431	569	717
PREY : AMMODYTIIDAE							
Age class	0	3	38	728	767	384	1087
	1		96	859	891	964	2172
	2		79	685	723	1276	2917
	3		55	381	510	1251	2963
	4		13	94	110	207	415
	5		7	86	155	565	1467
	6		11	90	134	313	696
Total		3	299	2923	3289	4958	11753
PREY : OTHER							
All size classes	42	2235	11212	25100	56220	92844	111209

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		75	4439	22205	48994	97297	120542	141504
PREY : GADUS MORHUA								
Age class		0	161	869	626	377	269	62
	1			11	44			88
	2							1332
	3							234
	4							17
Total		0	161	880	670	377	269	1734
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class			138	928	1661	566	1208	511
	1			34	356	105	159	11105
	2							368
Total			138	962	2017	671	1366	11984
PREY : MERLANGIUS MERLANGUS								
Age class		0	87	786	1087	639	793	254
	1		152	76	1317	5007	5524	1739
	2			8	371	872	818	216
	3			10	374	161	200	8
	4			1	45	36	20	
	5			1	21	12	10	
	6			0	8	2	4	
Total		0	239	882	3223	6729	7369	2217
PREY : TRISOPTERUS ESMARKI								
Age class		0	498	2372	2214	2799	3095	1266
	1		52	2753	4752	5443	3673	5393
	2		4	180	772	812	153	88
	3		0	6	35	37	5	3
Total		0	554	5313	7774	9094	6927	6750
PREY : CLUPEA HARENGUS								
Age class			12	1	61	792		
	1		3	968	2384	4605	12538	6097
	2			401	2593	14049	25382	11507
	3			283	1960	6761	10007	5787
	4			170	2881	6343	7224	6674
	5			161	3403	7737	8644	7808
Total			14	1984	13281	40286	63792	37873
PREY : SPRATTUS SPRATTUS								
Age class			3					
	1		28	546	528			
	2		0	373	434			
	3			81	105			
Total			32	1000	1067			
PREY : AMMODYTIDAE								
Age class		0	1081	1135	2195	1609	553	110
	1	0	17	173	400	404	16	2
	2	0	4	5	58	83	1	
	3	0	11	13	59	94	0	
	4	0	8	32	34	32	0	
	5		5	39	34	17		
	6		11	107	76	17		
Total		0	1137	1503	2857	2257	571	112
PREY : OTHER								
All size classes		74	2163	9681	18104	37883	40247	80834

Appendix 1-A. Average stomach content weight (g) per 1000 COD stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1991			QUARTER : 4	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		1068	7529	23937	53880	78422	190421	277656
PREY : GADUS MORHUA								
Age class	0		67	116	153			267
Total			67	155	153			267
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0		957	1912	4284	6390	7985	7574
	1		1	3	919	4282	6264	5698
	2				5	29	14	4
Total			960	2087	5472	10700	14262	13276
PREY : MERLANGIUS MERLANGUS								
Age class	0		417	1441	751	508	303	1504
	1		324	2272	2549	6710	8098	9653
	2		72	490	1058	2911	5687	6418
	3		37	225	291	2703	3022	3433
	4		22	133	11	223		
	5		9	55		46		
	6		7	42		46		
Total			888	4658	4659	13147	17110	21008
PREY : TRISOPTERUS ESMARKI								
Age class	0		811	2541	5032	10456	20089	20483
	1		12	457	2488	5944	5795	4814
	2		0	19	90	214	215	180
	3		0	1	5	11	11	9
Total			838	3018	7615	16644	26110	25487
PREY : CLUPEA HARENGUS								
Age class	0			41	21			3602
	1		3	81	758	1494	73509	99433
	2		3	99	698	1391	4704	5763
	3			26			208	279
	4			5				
	5			14				
Total			7	266	1480	2885	78422	109077
PREY : SPRATTUS SPRATTUS								
Age class	0		1	59	53	182	24	772
	1			120	2	2	0	116
	2			27				
	3			13				
	4			0				
Total			1	219	55	184	24	888
PREY : AMMODYTIDAE								
Age class	0		66	353	305	23	32	16
	1		28	103	90			
	2		7	21	8			
	3		12	77	73			
	4		4	16	1			
	5		3	10	0			
	6		3	11	0			
Total			4	122	590	478	23	32
PREY : OTHER								
All size classes		1063	4427	13108	33839	34999	54461	107637

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-8. Average stomach content weight (g) per 1000 HADDOCK stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 1	

Age class	0	1	2	3	4	5	6+

PREY : ALL SPECIES							
All size classes	221	856	2361	4673	7469	7595	

Age class		PREY : TRISOPTERUS ESMARKI					
0		0	0	2	2	1	
1		103	735	1764	2470	2815	
2		1	54	452	656	394	
Total		104	789	2219	3129	3210	

Age class		PREY : CLUPEA HARENGUS					
1			1	2	6	16	
2			0	1	2	4	
Total			1	3	8	20	

Age class		PREY : SPRATTUS SPRATTUS					
1		1	6	37	10	6	22
2			7	50	14	9	33
3			0	0	0	0	1
4			0	0	0	0	0
Total		1	13	87	24	16	55

Age class		PREY : AMMOXYTIDAE					
1		4	112	262	233	201	176
2			3	57	309	484	478
3			0	19	16	1	
4			0	23	19	1	
5			0	7	6	0	
6			0	8	7	0	
Total		4	116	376	591	688	654

PREY : OTHER							
All size classes	217	623	1108	1836	3628	3656	

Appendix 1-B. Average stomach content weight (g) per 1000 HADDOCK stomachs by age class of prey and predator by quarter for the total North Sea.

 PREDATOR : HADD Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 2

Age class 0 1 2 3 4 5 6+

PREY : ALL SPECIES

All size classes 190 312 1909 5978 10208 10405 16860

Age class PREY : TRISOPTERUS ESMARKI

1			1	41	351	821	107
2				2	18	43	6
Total			1	43	369	864	112

Age class PREY : SPRATTUS SPRATTUS

0			0	0			
1			0	0			
2			0	0			
Total			0	0			

Age class PREY : AMMODYTIDAE

0		14	158	249	626	691	684
1		2	450	2802	5347	4953	10949
2		1	158	979	1752	1555	3491
3		0	12	96	273	243	576
4		0	5	42	107	95	223
5			1	9	40	36	87
6			0	2	10	9	22
Total		19	785	4179	8154	7581	16032

PREY : OTHER

All size classes 190 292 1124 1756 1685 1959 716

Appendix 1-B. Average stomach content weight (g) per 1000 HADDOCK stomachs by age class of prey and predator by quarter for the total North Sea.

 PREDATOR : HADD Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 3

Age class 0 1 2 3 4 5 6+

PREY : ALL SPECIES

All size classes 163 1296 2875 5604 10101 19741 8119

Age class PREY : MELANOGRAMMUS AEGLEFINUS

0 1 8 21 21
 Total 0 1 8 21 21

Age class PREY : MERLANGIUS MERLANGUS

0 1 4
 Total 1 4

Age class PREY : TRISOPTERUS ESMARKI

0 8 1 229 1127 2791 6373 1004
 1 0 10 39 78 11
 2 0 8 26 23
 Total 8 1 231 1177 3001 6908 1089

Age class PREY : SPRATTUS SPRATTUS

0 0 0 1 2 2
 1 1 2 2 6
 2 0 0 0 0
 Total 1 2 2 8 2

Age class PREY : AMMODYTIDAE

0 6 215 686 1816 2697 4429 2390
 1 0 0 0 1 1
 2 1 0 3 9 10
 Total 6 217 686 1819 2707 4439 2390

PREY : OTHER

All size classes 149 1078 1954 2597 4360 8371 4640

Appendix 1-B. Average stomach content weight (g) per 1000 HADDOCK stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 4

Age class 0 1 2 3 4 5 6+

PREY : ALL SPECIES

All size classes 280 1218 2535 5291 6857 10837 8040

Age class PREY : MELANOGRAMMUS AEGLEFINUS

0 13 17
Total 13 17

Age class PREY : MERLANGIUS MERLANGUS

0 0 2 12 37
Total 0 2 12 37

Age class PREY : TRISOPTERUS ESMARKI

0 0 155 277 586 903 1761 535
1 17 47 98 114 170 61
2 0 0 1 1 2 1
Total 0 172 325 686 1018 1932 597

Age class PREY : CLUPEA HARENGUS

0 0 19
1 0 0
Total 0 19

Age class PREY : AMMODYTIDAE

0 3 57 586 1221 1573 2326 1629
Total 3 57 586 1221 1573 2326 1629

PREY : OTHER

All size classes 276 976 1605 3353 4266 6579 5777

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-B. Average stomach content weight (g) per 1000 HADDOCK stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 1	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		223	481	881	1439	1590	3006	
PREY : TRISOPTERUS ESMARKI								
Age class	1	0	8	64	237	229	303	
	2		0	14	12	12	7	
Total		0	8	78	250	241	309	
PREY : CLUPEA HARENGUS								
Age class	1				1	14	11	
	2				8	87	73	
	3				0	0	0	
Total					9	101	85	
PREY : AMMODYTIDAE								
Age class	1	10	31	56	31	19	8	
	2	0	0	0	0	0	0	
Total		10	31	56	31	19	8	
PREY : OTHER								
All size classes		214	441	739	1159	1230	2603	

Appendix 1-B. Average stomach content weight (g) per 1000 HADDOCK stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area :		TOTAL NORTH SEA			YEAR : 1991	QUARTER : 2	
Age class		0	1	2	3	4	5	6+	
PREY : ALL SPECIES									
All size classes		37	1171	2166	3296	4543	5316	4773	
PREY : TRISOPTERUS ESMARKI									
Age class									
1					2	6	4	1	
2					0	1	0	0	
Total			0	0	2	7	4	1	
PREY : CLUPEA HARENGUS									
Age class									
Total							4	41	
PREY : SPRATTUS SPRATTUS									
Age class									
1					1	1	2	2	
2					0	0	2	2	
Total					1	1	4	4	
PREY : AMMODYTIDAE									
Age class									
0		27	395	533	587	496	928	921	
1			15	74	161	282	261	164	
2			0	8	65	69	99	59	
3			0	4	30	27	46	27	
4				1	5	4	7	4	
5				1	5	4	8	5	
6				0	3	2	4	2	
Total		27	410	621	978	1048	1685	1337	
PREY : OTHER									
All size classes		10	762	1544	2315	3488	3618	3389	

Appendix 1-B. Average stomach content weight (g) per 1000 HADDOCK stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		102	1201	2483	5687	4636	5007	7633
PREY : GADUS MORHUA								
Age class	0					6	2	9
Total						6	2	9
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0		6	14	52	94	39	212
	1			0	11	20	8	49
Total			6	14	63	114	47	261
PREY : TRISOPTERUS ESMARKI								
Age class	0	0	19	238	220	51	34	33
	1							1839
Total		0	19	238	220	51	34	1872
PREY : AMMOYTTIDAE								
Age class	0	5	557	1039	3220	2714	2992	3733
	1		6	8	143	33	85	24
	2		0	1	4	3	3	1
	3		1	3	8	7	4	0
	4		1	2	6	6	3	0
	5		1	2	4	4	2	
	6		1	2	5	5	2	
Total		7	642	1069	3391	2771	3092	3759
PREY : OTHER								
All size classes		95	534	1162	2014	1693	1832	1732

Appendix 1-B. Average stomach content weight (g) per 1000 HADDOCK stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 4	

Age class		0	1	2	3	4	5	6+

PREY : ALL SPECIES								
All size classes		181	1033	2076	3242	4479	6149	14191

PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0				54	140	347	765
Total					54	140	347	765

PREY : MERLANGIUS MERLANGUS								

PREY : TRISOPTERUS ESMARKI								
Age class	0	5	146	395	553	853	878	4161
	1		0	0	18	43	103	232
Total		5	146	395	572	896	982	4393

PREY : CLUPEA HARENGUS								
Age class	0		0	0				
Total			0	0	35	90	222	490

PREY : SPRATTUS SPRATTUS								

PREY : AMMODYTIDAE								
Age class	0	0	112	285	363	406	304	623
	1		12	39	30	26	26	4
	2		1	2	1	1	1	
	3		0	2	1	3	2	
	4		0	0	0	0	0	
Total		0	125	329	395	436	334	664

PREY : OTHER								
All size classes		175	762	1351	2187	2917	4264	7878

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		387	1088	2075	3164	3457	4346	
PREY : GADUS MORHUA								
Age class	1	0	3	1				5
	2							253
Total		0	3	1				258
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1	3	2	38	84	112	171	
	2		0	4	9	11	26	
Total		3	2	42	93	123	197	
PREY : MERLANGIUS MERLANGUS								
Age class	1		6	49	152	356	236	
	2		0	1	3	6	4	
Total			6	50	155	362	240	
PREY : TRISOPTERUS ESMARKI								
Age class	0	0	0	0				
	1	11	41	216	343	401	689	
	2	0	17	174	374	523	941	
	3		0	6	14	20	37	
Total		12	58	396	731	944	1667	
PREY : CLUPEA HARENGUS								
Age class	1		60	135	268	176	188	
	2		0	1	4	5	2	
Total			60	136	272	181	190	
PREY : SPRATTUS SPRATTUS								
Age class	1	39	126	127	129	143	98	
	2	16	149	210	329	252	136	
	3	1	17	29	49	31	14	
	4	0	0	0	1	0	0	
Total		56	292	366	508	427	249	
PREY : AMMODYTIDAE								
Age class	0	0	0	1	0	0	0	
	1	51	74	83	61	65	81	
	2	5	15	42	54	68	133	
	3		0	5	17	27	16	
	4		1	7	20	33	19	
	5		0	2	6	11	6	
	6		0	2	7	11	7	
Total		56	91	142	166	215	264	
PREY : OTHER								
All size classes		259	577	941	1239	1205	1281	

Appendix-1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1981			QUARTER : 2	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		820	1585	2918	3130	3812	3777	
PREY : GADUS MORHUA								
Age class	0	5	8	16	8	8	14	
Total		5	8	16	8	8	14	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	10	24	96	94	65	92	
	1		7	103	116	96	286	
	2		2	20	19	14	15	
Total		10	33	219	229	175	392	
PREY : MERLANGIUS MERLANGUS								
Age class	0		0	0	0	0	0	
	1	1	16	59	57	39	67	
Total		1	16	59	57	39	67	
PREY : TRISOPTERUS ESMARKI								
Age class	0	3	29	5	3	2	2	
	1	0	79	435	333	236	436	
	2		16	102	87	71	113	
	3		0	1	1	1	1	
Total		3	124	543	424	311	552	
PREY : CLUPEA HARENGUS								
Age class	1	10	6	3	6	0	1	
Total		10	11	15	16	0	1	
PREY : SPRATTUS SPRATTUS								
Age class	0	13	17	17	48	34	29	
	1	6	21	28	82	66	55	
	2	7	12	17	58	52	45	
	3	1	1	1	4	4	4	
Total		27	51	63	192	157	132	
PREY : AMMODYTIDAE								
Age class	0	263	250	234	231	179	285	
	1	103	393	693	627	521	785	
	2	17	149	276	318	260	371	
	3	2	26	52	50	43	55	
	4	1	10	20	20	17	22	
	5	0	4	8	7	6	8	
	6	0	1	2	2	2	2	
Total		388	834	1285	1255	1028	1528	
PREY : OTHER								
All size classes		377	508	718	949	2094	1091	

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA			YEAR : 1981		QUARTER : 3	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		124	1027	3212	5010	4694	5699	4987
PREY : GADUS MORHUA								
Age class	0	0	1					
Total		0	1	0	0			
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	0	25	367	837	704	765	762
	1		0	3	5	2	3	2
Total		0	25	370	842	707	769	764
PREY : MERLANGIUS MERLANGUS								
Age class	0		49	201	253	166	194	186
Total			49	201	253	166	194	186
PREY : TRISOPTERUS ESMARKI								
Age class	0	0	31	191	359	221	205	284
	1			0	0	0	0	0
Total		0	32	192	363	225	208	287
PREY : CLUPEA HARENGUS								
Age class	0		61	747	1393	1144	1290	932
Total			61	747	1393	1144	1290	932
PREY : SPRATTUS SPRATTUS								
Age class	0		1	3	2	3	4	2
	1		21	117	237	942	1513	1145
	2		1	21	47	215	349	267
	3		0	1	2	10	16	12
Total			23	142	288	1170	1881	1426
PREY : AMMODYTIDAE								
Age class	0	0	324	315	358	295	225	334
	1		5	104	138	20	28	27
	2		7	139	184	26	37	37
	3		2	31	41	6	8	8
	4		1	11	15	2	3	3
Total		1	339	602	740	352	302	410
PREY : OTHER								
All size classes		123	496	957	1132	931	1056	981

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 4

Age class 0 1 2 3 4 5 6+

PREY : ALL SPECIES
All size classes 317 1290 1862 2983 3744 4461 5808

Age class PREY : GADUS MORHUA
0 4 18 38 41 33 73
Total 4 18 38 41 33 73

Age class PREY : MELANOGRAMMUS AEGLEFINUS
0 0 51 127 406 555 703 1036
1 1 2 5 7 13 20
Total 0 52 130 416 583 756 1118

Age class PREY : MERLANGIUS MERLANGUS
0 1 53 47 76 84 192 139
Total 1 53 47 76 84 192 139

Age class PREY : TRISOPTERUS ESMARKI
0 4 158 313 792 815 570 670
1 17 40 125 172 165 246
2 0 0 1 2 2 2
Total 4 175 356 958 1067 779 1025

Age class PREY : CLUPEA HARENGUS
0 17 35 67 50 164 319 398
1 0 0 1 30 86 199
2 0 1 3 8
Total 17 35 67 51 195 408 605

Age class PREY : SPRATTUS SPRATTUS
1 7 141 129 108 136 220 116
2 6 125 131 80 135 92 109
3 0 3 6 4 7 4 6
4 0 1 2 1 2 1 2
Total 13 270 266 192 278 316 230

Age class PREY : AMMODYTIDAE
0 17 186 145 102 72 64 22
1 4 36 76 78 109 65
2 5 46 96 99 139 82
3 1 11 23 23 33 19
4 0 4 8 8 12 7
Total 17 196 244 309 284 360 198

PREY : OTHER
All size classes 266 504 735 943 1212 1617 2420

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1985		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		423	1858	3892	5278	5718	5695	
PREY : GADUS MORHUA								
Age class	1			0	1	6	11	
Total				0	1	6	11	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1		34	171	182	265	253	
	2		0	1	0	0	1	
Total			34	172	182	265	254	
PREY : MERLANGIUS MERLANGUS								
Age class	1		1	67	134	124	134	162
	2			1	6	45	163	279
	3				0	0	3	4
Total			1	68	140	169	299	445
PREY : TRISOPTERUS ESMARKI								
Age class	0			0	1	0	0	0
	1		24	410	1424	1827	2376	2174
	2		2	118	489	605	851	811
	3		0	3	11	10	13	8
	4		0	0	0	0	1	0
Total			26	532	1924	2443	3241	2993
PREY : CLUPEA HARENGUS								
Age class	1		0	1	2	2	1	0
	2		1	84	293	469	348	432
	3			0	4	16	18	31
	4			0	0	0	0	0
Total			1	85	299	487	367	464
PREY : SPRATTUS SPRATTUS								
Age class	1		57	117	132	68	57	84
	2		25	170	338	681	278	375
	3		1	56	157	238	145	179
	4		0	8	24	44	25	34
	5		0	1	5	11	5	8
	6		0	0	1	3	1	2
Total			83	352	656	1046	511	682
PREY : AMMODYTIDAE								
Age class	1		25	60	146	221	291	241
	2		8	51	76	225	289	168
	3		0	4	5	19	25	15
	4		0	0	0	1	1	0
	6			3	6	19	6	1
Total			34	119	234	485	612	426
PREY : OTHER								
All size classes		278	668	466	464	416	420	

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1985		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		128	1662	2580	5218	7443	11978	13235
PREY : GADUS MORHUA								
Age class	0		4	5	4	6	1	
Total			4	5	4	6	1	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	7	34	127	543	644	2074	1706
	1			0	0	0	0	0
Total		7	34	127	543	644	2075	1707
PREY : MERLANGIUS MERLANGUS								
Age class	0	53	160	143	330	269	538	493
Total		53	160	143	330	269	538	493
PREY : TRISOPTERUS ESMARKI								
Age class	0	2	3	11	58	69	375	442
	1			11	288	536	2200	2934
	2			1	18	29	119	156
	3			0	0	0	0	0
Total		2	3	23	364	634	2694	3533
PREY : CLUPEA HARENGUS.								
Age class	0		9	23	46	50	16	30
	1		57	302	1127	1534	2342	1926
	2		0	69	297	829	1227	1768
	4				0	0		0
Total			66	394	1470	2413	3585	3724
PREY : SPRATTUS SPRATTUS								
Age class	0	6	99	177	313	335	906	690
	1		1	3	6	6	9	8
	2		31	83	142	148	274	199
	3		1	3	5	5	9	6
Total		6	132	265	466	494	1199	903
PREY : AMMODYTIDAE								
Age class	0	18	426	208	280	363	501	454
	1	0	94	96	199	289	594	705
	2		34	53	93	128	121	183
	3		1	9	32	36	23	47
	4			1	3	3	2	4
	5			0	2	2	1	3
	6			0	1	1	1	1
Total		18	555	367	609	822	1244	1397
PREY : OTHER								
All size classes		41	706	1255	1433	2161	642	1479

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1986		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		733	2368	3893	4685	5727	6809	
PREY : GADUS MORHUA								
Age class	1	5	10	7	10	6	2	
Total		5	10	7	10	6	2	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1	2	86	167	96	203	177	
Total		2	86	167	96	203	177	
PREY : MERLANGIUS MERLANGUS								
Age class	1	60	128	144	214	333	404	
	2			2	15	9	12	
Total		60	128	147	229	342	416	
PREY : TRISOPTERUS ESMARKI								
Age class	0	5	0					
	1	8	576	1363	1411	2421	3338	
	2	0	14	72	115	190	304	
	3		1	11	19	26	35	
	4		0	0	1	1	1	
Total		14	591	1446	1545	2638	3678	
PREY : CLUPEA HARENGUS								
Age class	1	5	42	33	21	13	1	
	2	32	284	330	517	313	192	
	3	0	0	2	5	3	2	
Total		37	326	364	543	329	195	
PREY : SPRATTUS SPRATTUS								
Age class	1	2	4	11	20	32	66	
	2	4	25	111	306	170	98	
	3	1	5	63	204	121	87	
	4	0	1	20	66	43	34	
	5	0	0	1	2	1	1	
	6	0	0	0	1	0	0	
Total		6	34	206	598	367	286	
PREY : AMMODYTIDAE								
Age class	1	248	585	663	561	647	816	
	2	20	48	113	165	145	191	
	3			0	0	0	0	
	4			0	0	0	0	
Total		268	633	776	726	792	1008	
PREY : OTHER								
All size classes		341	560	780	938	1050	1048	

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1986		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		143	1335	2271	2879	5433	6869	6022
PREY : GADUS MORHUA								
Age class								
0		0	0	2	1	3	6	0
Total		0	0	2	1	3	6	0
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
0		4	14	115	58	160	133	450
1			0	0	0	0	0	0
Total		4	14	115	60	174	158	450
PREY : MERLANGIUS MERLANGUS								
Age class								
0		2	35	72	73	148	176	205
1				0	0	1	2	
Total		2	35	72	73	149	178	205
PREY : TRISOPTERUS ESMARKI								
Age class								
0		11	50	329	244	768	541	605
1			1	61	106	654	564	885
2				1	1	10	15	10
3				1	1	4	10	
4				0	0	0	0	
Total		11	51	391	353	1436	1131	1500
PREY : CLUPEA HARENGUS								
Age class								
0			15	20	26	21	33	19
1		2	88	210	401	884	1426	2162
2			0	7	49	172	1000	2
Total		2	104	237	476	1077	2459	2182
PREY : SPRATTUS SPRATTUS								
Age class								
0			33	53	46	114	188	89
1			19	17	8	7	11	0
2			11	23	40	74	65	1
3			0	1	1	2	2	0
Total			63	94	96	197	267	90
PREY : AMMODYTIDAE								
Age class								
0		11	468	380	190	438	388	1213
1		0	117	234	176	466	398	131
2			4	10	8	22	19	11
3			0	1	1	3	3	0
4			0	0	0	0	0	0
5				0	0	0		
Total		11	590	625	375	929	807	1356
PREY : OTHER								
All size classes		113	478	735	1445	1468	1863	238

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1987		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		595	2023	3371	4218	5020	4992	
PREY : GADUS MORHUA								
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1	8	200	383	430	457	425	
Total		8	200	383	430	457	425	
PREY : MERLANGIUS MERLANGUS								
Age class	1	14	50	75	107	140	137	
	2		0	0	0	1	2	
Total		14	50	75	107	140	139	
PREY : TRISOPTERUS ESMARKI								
Age class	1	45	656	1382	1367	1331	814	
	2	0	1	15	30	23	26	
	3		0	0	1	1	1	
Total		45	657	1398	1399	1355	842	
PREY : CLUPEA HARENGUS								
Age class	1	2	0	0	0			
	2	22	97	269	683	1475	2053	
	3		2	25	112	304	315	
Total		23	99	295	795	1779	2368	
PREY : SPRATTUS SPRATTUS								
Age class	1	21	50	16	32	10	24	
	2	24	104	216	386	412	192	
	3	4	43	99	194	107	166	
	4	1	9	22	44	31	62	
	5	0	0	1	2	1	2	
Total		50	207	354	658	561	446	
PREY : AMMODYTIDAE								
Age class	0	0						
	1	86	160	145	111	66	36	
	2	57	192	153	145	144	112	
	3	0	5	8	9	9	6	
	4		0	0	0	0	0	
Total		143	357	306	265	219	155	
PREY : OTHER								
All size classes		312	453	560	564	508	617	

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1987		QUARTER : 3	
Age class	0	1	2	3	4	5	6+
PREY : ALL SPECIES							
All size classes	47	1085	3050	5008	3800	4954	2366
PREY : GADUS MORHUA							
Age class 0				6	9	27	8
Total				6	9	27	8
PREY : MELANOGRAMMUS AEGLEFINUS							
Age class 0	0	4	23	93	61	110	32
Age class 1			1	14	29	31	0
Total	0	4	24	108	90	141	33
PREY : MERLANGIUS MERLANGUS							
Age class 0	4	72	150	161	55	57	27
Age class 1			0	2	2	4	1
Total	4	72	150	163	57	61	28
PREY : TRISOPTERUS ESMARKI							
Age class 0	0	18	175	652	353	614	122
Age class 1		6	128	556	312	551	117
Age class 2		0	0	5	3	6	1
Total	0	25	303	1214	669	1171	240
PREY : CLUPEA HARENGUS							
Age class 0		0	0				
Age class 1		10	117	267	614	696	433
Age class 2		0	5	27	83	106	44
Total		11	123	294	696	802	477
PREY : SPRATTUS SPRATTUS							
Age class 0		19	77	126	145	102	104
Age class 1		5	25	103	177	298	148
Age class 2		23	84	182	243	178	199
Age class 3		1	3	8	9	7	7
Age class 4		0	0	0	0	0	0
Total		48	189	419	574	584	458
PREY : AMMODYTIDAE							
Age class 0	1	219	978	1153	344	372	108
Age class 1	0	96	324	437	230	316	122
Age class 2		170	319	439	366	592	218
Age class 3		4	6	7	9	19	5
Age class 4		1	1	2	2	5	1
Age class 5		0	0	0	0	1	0
Total	1	491	1628	2038	952	1304	453
PREY : OTHER							
All size classes	41	435	634	767	754	865	670

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 1		

age class		0	1	2	3	4	5	6+

PREY : ALL SPECIES								
All size classes		432	1038	1688	2351	2172	2978	

Age class	PREY : MELANOGRAMMUS AEGLEFINUS							
1			1	4	28	25	32	
2				0	0	0		
Total			1	4	28	25	32	

Age class	PREY : MERLANGIUS MERLANGUS							
0			0	0	0	0	0	
1		0	40	67	179	177	332	
2			0	0	1	2	3	
Total		0	40	67	180	179	335	

Age class	PREY : TRISOPTERUS ESMARKI							
1		5	219	513	835	820	1907	
2		0	1	2	13	14	42	
3		0	0	0	1	2	4	
Total		5	219	515	848	836	1953	

Age class	PREY : CLUPEA HARENGUS							
1		0	16	9	14	11	12	
2				0	0	0	0	
Total		0	16	9	14	11	12	

Age class	PREY : SPRATTUS SPRATTUS							
1		35	187	430	296	246	46	
2		1	51	150	93	74	4	
3		0	1	1	3	1	1	
4		0	0	0	0	0	0	
5		0	0	0	0	0	0	
Total		37	238	580	392	321	51	

Age class	PREY : AMMODYTIDAE							
1		107	135	143	126	146	197	
2		0	11	13	20	14	7	
3		0	6	7	11	6	1	
4		0	1	1	2	1	0	
5		0	1	1	2	1	0	
6		0	1	1	1	1	0	
Total		107	154	165	162	169	204	

PREY : OTHER								
All size classes		283	369	347	728	630	391	

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 2		
age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		948	2219	3017	3598	3782	4226	
PREY : GADUS MORHUA								
Age class	0	6	3	2	2	3	0	
Total		6	3	2	2	3	1	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	0	2	3	1	0	1	
Total		0	2	3	1	0	1	
PREY : MERLANGIUS MERLANGUS								
Age class	0	1	1	1	4	5	8	
	1	1	11	26	50	43	55	
Total		2	12	28	54	48	62	
PREY : TRISOPTERUS ESMARKI								
Age class	0	1	6	10	7	7	10	
	1	2	47	120	139	211	306	
	2	0	2	7	11	19	22	
	3	0	0	0	1	1	2	
	4	0	0	0	0	0	0	
Total		3	55	137	158	239	340	
PREY : CLUPEA HARENGUS								
Age class	0	1	6	7	16	28	8	
	1	1	9	19	64	111	118	
	2	0	0	0	0	1	0	
Total		1	15	26	81	140	126	
PREY : SPRATTUS SPRATTUS								
Age class	0	1	0	0	0	0	0	
	1	69	300	395	642	517	648	
	2	9	33	40	76	61	94	
	3	3	6	5	12	12	21	
	4	0	1	0	1	1	1	
	5	0	1	0	1	1	1	
	6	0	0	0	0	0	0	
Total		82	341	441	731	592	767	
PREY : AMMODYTIDAE								
Age class	0	218	741	1060	865	854	1136	
	1	97	296	387	522	494	571	
	2	20	107	156	258	277	273	
	3	4	34	57	95	92	106	
	4	1	7	13	22	22	24	
	5	1	4	7	12	12	14	
	6	1	6	10	23	23	22	
Total		341	1197	1691	1797	1775	2145	
PREY : OTHER								
All size classes		513	594	689	774	985	785	

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 3		
age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		269	1015	2845	4037	4515	4585	6421
PREY : GADUS MORHUA								
Age class	0		3	36	26	23	23	13
Total			3	36	26	23	23	13
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	1	49	294	224	268	238	396
Total		1	49	294	224	268	238	396
PREY : MERLANGIUS MERLANGUS								
Age class	0	1	35	101	126	164	170	348
	1		0	2	1	3	14	6
	2				0	0		0
	3				0	0		0
	4				0	0		0
Total		1	35	103	127	167	184	355
PREY : TRISOPTERUS ESMARKI								
Age class	0	36	73	320	384	445	425	1070
	1		0	29	248	252	307	1537
	2		0	1	13	10	16	50
	3		0	0	0	0	0	0
Total		36	73	352	646	706	753	2656
PREY : CLUPEA HARENGUS								
Age class	0		21	221	507	365	496	575
	1		0	49	422	298	802	741
Total			21	270	929	662	1298	1316
PREY : SPRATTUS SPRATTUS								
Age class	0	0	9	93	77	86	110	4
	1		116	393	514	883	517	127
	2		1	30	91	146	68	46
	3		0	4	13	8	17	12
	4		0	0	1	1	1	1
	5		0	0	1	1	1	1
Total		0	127	521	698	1123	714	192
PREY : AMMODYTIDAE								
Age class	0	106	233	492	491	424	458	632
	1	0	7	38	74	44	45	98
	2		0	2	7	10	6	6
	3		4	32	68	70	43	25
	4		0	10	25	46	24	12
	5		0	7	17	31	16	8
	6		1	34	65	57	28	10
Total		106	245	615	747	682	620	793
PREY : OTHER								
All size classes		124	462	654	640	883	754	700

Appendix 1-C. Average stomach content weight (g) per 1000 WHITING stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 4		
age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		624	1687	2675	4192	3217	3324	3288
PREY : GADUS MORHUA								
Age class	0	0	1	3	3	3	6	1
Total		0	1	3	3	3	6	1
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	12	19	110	323	108	145	176
	1			0	0	0	0	0
Total		12	19	110	323	108	145	176
PREY : MERLANGIUS MERLANGUS								
Age class	0	2	33	85	232	122	162	221
Total		2	33	86	233	124	162	221
PREY : TRISOPTERUS ESMARKI								
Age class	0	142	487	1120	2067	902	856	689
	1	0	5	76	119	145	55	123
	2		0	20	19	38	2	5
	3		0	0	0	0	0	0
Total		142	492	1216	2205	1085	913	818
PREY : CLUPEA HARENGUS								
Age class	0	3	29	44	124	38	55	63
	1		3	5	2	5	7	2
Total		3	32	49	126	42	61	65
PREY : SPRATTUS SPRATTUS								
Age class	0	19	127	151	125	354	434	455
	1	1	20	40	75	190	186	242
	2	0	1	1	2	4	4	5
	3		0	0	1	2	2	2
	4		0	0	0	0	0	0
Total		20	148	193	202	550	626	705
PREY : AMMODYTIDAE								
Age class	0	34	223	181	168	150	122	116
	1	11	62	96	184	101	43	71
	2	1	3	6	6	4	2	3
	3	1	8	23	25	33	10	9
	4	0	12	18	37	24	12	15
	5	0	13	19	45	25	12	18
	6	0	19	28	66	35	17	26
Total		46	339	377	543	401	242	291
PREY : OTHER								
All size classes		398	622	641	558	904	1168	1011

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-D. Average stomach content weight (g) per 1000 SAITHE stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 1		
Age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		6908	5309	6668	9351	24883	29680	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
1		102	90	142	512	850	947	
2			1	7	42	81	92	
3					0	1	1	
4					0	0	1	
Total		102	92	149	554	932	1041	
PREY : MERLANGIUS MERLANGUS								
Age class								
1					3	66	85	
2					5	127	168	
3					1	18	27	
4							1	
5							0	
Total					8	210	281	
PREY : TRISOPTERUS ESMARKI								
Age class								
0					0	4	6	
1		111	124	420	3370	8668	10257	
2		1	53	341	2676	8499	10305	
3			4	19	101	248	298	
4							1	
Total		112	181	780	6147	17419	20867	
PREY : CLUPEA HARENGUS								
Age class								
1					13	332	429	
2					11	271	351	
3					1	23	30	
Total					25	626	810	
PREY : SPRATTUS SPRATTUS								
Age class								
1			2	7	1	0	0	
2			298	994	114	53	68	
3			59	197	23	10	14	
4			1	2	0	0	0	
Total			360	1200	138	64	83	
PREY : AMMODYTIDAE								
Age class								
1		2502	1632	1635	50	4	6	
2		265	212	265	14	2	3	
Total		2767	1843	1901	64	6	8	
PREY : OTHER								
All size classes		3927	2833	2639	2415	5625	6590	

Appendix 1-D. Average stomach content weight (g) per 1000 SAITHE stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 2

Age class 3 4 5 6 7 8 9+

PREY : ALL SPECIES

All size classes 5524 6358 7817 27240 43618 46288

Age class PREY : GADUS MORHUA

0 47 43 31 330 431 135
 Total 47 43 31 330 431 135

Age class PREY : MELANOGRAMMUS AEGLEFINUS

0 2 20 320 883 621
 1 2 25 385 426 78
 Total 4 44 705 1309 698

Age class PREY : TRISOPTERUS ESMARKI

0 1 20 27
 1 14 250 1368 9407
 2 2 24 406 1410 9299
 3 0 0 5 16 109
 Total 4 39 662 2814 18841

Age class PREY : SPRATTUS SPRATTUS

0 59 52 12
 1 3 3 1
 Total 62 55 13

Age class PREY : AMMODYTIDAE

0 103 91 21 66 2438 2471
 1 1341 1182 277 335 10467 10559
 2 1270 1120 261 29 32 6
 3 455 401 93 2 2 0
 4 160 141 33 1 1 0
 5 90 80 18
 6 23 20 5
 Total 3441 3034 708 432 12940 13037

PREY : OTHER

All size classes 1975 3218 6982 25111 26125 13577

Appendix 1-D. Average stomach content weight (g) per 1000 SAITHE stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 3

Age class	3	4	5	6	7	8	9+
PREY : ALL SPECIES							
All size classes	5105	6086	8052	14266	26725	36437	
PREY : GADUS MORHUA							
Age class 0				2	18	22	10
Total				2	18	22	10
PREY : MELANOGRAMMUS AEGLEFINUS							
Age class 0	1267	1479	2083	4953	6919	5548	
1		0	334	3020	3868	2176	
2				1	7	18	
Total	1267	1479	2417	7973	10793	7738	
PREY : MERLANGIUS MERLANGUS							
Age class 0		46	178	706	841	369	
1			18	160	195	86	
Total		46	196	866	1036	454	
PREY : TRISOPTERUS ESMARKI							
Age class 0	67	386	838	846	1563	2297	
1		0	6	70	270	549	
2			9	96	373	760	
Total	67	386	856	1037	2281	3749	
PREY : CLUPEA HARENGUS							
Age class 0		18	40	6	7	18	
1				4	49	123	
2				0	4	11	
3						348	
Total		18	40	10	60	500	
PREY : AMMODYTIDAE							
Age class 0	1574	1270	768	94	94	41	
Total	1574	1270	768	94	94	41	
PREY : OTHER							
All size classes	2198	2886	3772	4268	12440	23945	

Appendix 1-D. Average stomach content weight (g) per 1000 SAITHE stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 4		
Age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		5566	6899	9493	21677	22840	35993	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0		49	250	4656	3570	1543	
	1						11	
	2						1	
Total			49	250	4656	3570	1555	
PREY : MERLANGIUS MERLANGUS								
Age class	1							5
	2							1
Total								6
PREY : TRISOPTERUS ESMARKI								
Age class	0		187	1005	1600	2106	4418	
	1		103	744	1616	3179	9030	
	2		8	72	183	413	1255	
Total			298	1822	3398	5699	14703	
PREY : CLUPEA HARENGUS								
Age class	0		11	97	10823	7569	343	
	1		0	2	221	154	6	
Total			11	99	11043	7723	350	
PREY : SPRATTUS SPRATTUS								
Age class	1				1	5	18	
	2				1	6	23	
	3				0	0	1	
	4				0	0	0	
Total					2	11	42	
PREY : AMMODYTIDAE								
Age class	0				42	222	839	
Total					42	222	839	
PREY : OTHER								
All size classes		5566	6541	7322	2535	5614	18498	

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-D. Average stomach content weight (g) per 1000 SAITHE stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SALT		Area : TOTAL NORTH SEA			YEAR : 1986		QUARTER : 3	
Age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		6805	8350	19778	29027	36961	57978	75576
PREY : GADUS MORHUA								
Age class								
Total		0	1	8	28	0	1	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
Total		407	419	657	2189	1292	2579	2140
PREY : MERLANGIUS MERLANGUS								
Age class								
Total		15	22	69	237	2	8	13898
PREY : TRISOPTERUS ESMARKI								
Age class								
Total		1036	1741	6962	17630	13536	26931	22492
PREY : CLUPEA HARENGUS								
Age class								
Total				0	97	3711	7312	16454
PREY : SPRATTUS SPRATTUS								
Age class								
Total		1362	1319	690	49	772	1521	1297
PREY : OTHER								
All size classes		3985	4848	11392	8797	17647	19626	19295

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-D. Average stomach content weight (g) per 1000 SAITHE stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 1		
age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		2621	4590	10602	14983	22367	24905	133178
PREY : GADUS MORHUA								
PREY : MELANOGRAMMUS AEGLEFINUS								
PREY : MERLANGIUS MERLANGUS								
PREY : TRISOPTERUS ESMARKI								
Age class								
1		1128	1304	720	851	1228	1661	512
2		447	797	1952	3159	3283	2311	823
3		42	102	788	1852	2991	3003	1072
4				41	224	688	915	374
Total		1617	2203	3501	6085	8191	7890	2781
PREY : CLUPEA HARENGUS								
Age class								
1		2	9	143	383	494	385	47
2		11	430	2354	2873	5526	7468	36960
3		11	420	2161	2133	3027	3344	45194
4		2	91	515	661	1053	1315	25738
5		0	4	120	425	846	960	15659
Total		27	954	5293	6475	10947	13472	123606
PREY : SPRATTUS SPRATTUS								
PREY : AMMODYTIDAE								
Age class								
1		21	31	53	30	11	236	588
2		0	1	0	0		5	12
3		0	0	0	0		0	1
4		0	0	0	0		0	0
Total		21	32	54	30	11	242	602
PREY : OTHER								
All size classes		957	1402	1754	2393	3218	3301	6190

Appendix 1-D. Average stomach content weight (g) per 1000 SAITHE stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 2		
age class	3	4	5	6	7	8	9+	
PREY : ALL SPECIES								
All size classes	16385	21251	43237	64741	116279	125194	151095	
PREY : GADUS MORHUA								
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1	2	26	84	37	3107	5578	11815
	2					1525	2738	2803
	3					61	110	109
Total	2	26	84	37	4694	8426	14727	
PREY : MERLANGIUS MERLANGUS								
Age class	1					369	667	5548
	2			1	9	2129	3808	13612
	3			1	11	1885	3360	8858
	4			0	1	300	536	1655
	5			0	0	121	217	560
	6			0	0	44	78	312
Total			2	22	4848	8667	30547	
PREY : TRISOPTERUS ESMARKI								
Age class	0	243	168	57	12			
	1	1283	2818	9451	13542	15979	14444	15911
	2	226	851	2851	3835	4737	3075	1343
	3	19	77	254	337	413	242	58
	4	3	14	44	53	71	43	10
Total		1775	3928	12657	17780	21200	17804	17323
PREY : CLUPEA HARENGUS								
Age class	1		1	45	72	555	970	1132
	2		32	1165	2493	9782	22883	32746
	3		16	701	2464	7168	8095	9636
	4		4	211	879	2812	3316	4198
	5		7	336	1446	5061	6001	6498
Total		0	61	2457	7354	25376	41266	54210
PREY : SPRATTUS SPRATTUS								
PREY : AMMODYTIDAE								
Age class	0	305	733	4952	4458	4018	4524	4879
	1	294	528	2726	2709	1808	1333	1407
	2	170	204	198	179	79		
	3	80	95	73	63	28		
	4	13	15	12	10	5		
	5	14	16	9	8	3		
	6	7	8	5	4	2		
Total		881	1599	7976	7432	5943	5857	6286
PREY : OTHER								
All size classes	13727	15638	20061	32117	54218	43175	28001	

Appendix 1-D. Average stomach content weight (g) per 1000 SAITHE stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 3		
age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		9233	14674	17219	18784	124840	176415	281064
PREY : GADUS MORHUA								
Age class								
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	3423	2383	1518	915	1298	1337	2420
Total		3423	2383	1518	915	1298	1337	2420
PREY : MERLANGIUS MERLANGUS								
Age class	0	576	663	626	581	167	64	64
Total		576	663	626	581	167	64	64
PREY : TRISOPTERUS ESMARKI								
Age class	0	2617	4901	4096	734	1936	2703	4264
	1	630	3585	6829	9870	10955	10252	12624
	2	113	609	931	1361	1730	1401	1536
	3	5	28	43	64	81	66	72
Total		3366	9123	11899	12030	14703	14422	18497
PREY : CLUPEA HARENGUS								
Age class	1			142	449	3261	3830	6885
	2	1	55	265	725	17530	29568	41762
	3	1	73	222	554	13824	20583	32972
	4	3	162	400	933	22855	29763	54446
	5	4	196	468	1078	33394	43460	80348
Total		9	487	1497	3740	90862	127200	216409
PREY : SPRATTUS SPRATTUS								
Age class	0	8	4					
Total		8	4					
PREY : AMMODYTIDAE								
Age class	0	376	414	186		254	571	635
	1					15	34	38
Total		376	414	186		269	605	673
PREY : OTHER								
All size classes		1474	1602	1492	1519	17542	32787	43002

Appendix 1-D. Average stomach content weight (g) per 1000 SAITHE stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 4	
age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		13827	21154	42296	68361	97602	112464	128896
PREY : GADUS MORHUA								
Age class								
PREY : MELANOGRAMMUS AEGLEFINUS								
0		1059	1283	1491	2944	3841	3154	4640
1		0	0	2	1			
Total		1059	1283	1493	2945	3841	3154	4640
PREY : MERLANGIUS MERLANGUS								
0		245	248	240	928	1152	519	377
Total		245	248	240	928	1152	519	377
PREY : TRISOPTERUS ESMARKI								
0		11126	12511	11768	9156	7399	7354	10909
1		584	3443	8820	9728	5437	680	820
2		14	127	340	354	184	23	
3		1	7	18	19	10	1	
Total		11725	16088	20946	19257	13029	8058	11729
PREY : CLUPEA HARENGUS								
0		0	1	3	2			3504
1		8	216	2101	5529	10489	13710	20706
2		12	330	3353	8687	16710	22196	26343
3		7	191	2057	5207	10215	13875	13179
4		14	370	3998	10122	19857	26969	25611
5		13	320	3452	8739	17143	23284	22111
Total		54	1427	14964	38287	74418	100038	111459
PREY : SPRATTUS SPRATTUS								
PREY : AMMODYTIDAE								
0		4	5	2				
Total		4	5	2				
PREY : OTHER								
All size classes		740	2102	4651	6943	5161	694	691

APPENDIX 1 AVERAGE STOMACH CONTENT TOTAL NORTH SEA

Appendix 1-E. Average stomach content weight (g) per 1000 MACKEREL stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : MACK		Area : TOTAL NORTH SEA		YEAR : 1991			QUARTER : 1	
age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		416	389	235	222	34	864	
PREY : AMMODYTIDAE								
Age class	1		0	230	217	33		
Total			0	230	217	33		
PREY : OTHER								
All size classes		416	389	5	5	1	864	

Appendix 1-E. Average stomach content weight (g) per 1000 MACKEREL stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : MACK		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 2	

age class		0	1	2	3	4	5 6+

PREY : ALL SPECIES							
All size classes		1135	2443	3141	3661	3805	4975

PREY : GADUS MORHUA							
Age class	0	1	2	2	2	1	12
Total		1	2	2	2	1	12

PREY : MELANOGRAMMUS AEGLEFINUS							
Age class	0	0	0	0			
Total		0	0	0			

PREY : TRISOPTERUS ESMARKI							
Age class	0	1	5	6	6	6	10
	1		0	1	3	6	10
Total		1	5	6	9	11	20

PREY : CLUPEA HARENGUS							
Age class	0		4	11	24	24	28
	1		0	12	5	36	43
Total			4	23	29	59	72

PREY : SPRATTUS SPRATTUS							
Age class	1	21	2	16	47	82	146
	2		0	6	22	44	82
	3		0	3	13	26	48
	4		0	1	2	4	8
	5		0	1	2	4	7
	6						27
Total		38	3	26	86	159	318

PREY : AMMODYTIDAE							
Age class	0	69	120	213	220	317	243
	1	17	85	258	308	372	311
	2	0	2	13	27	47	301
	3	0	26	112	43	92	242
	4		16	65	19	44	59
	5		5	22	7	16	30
	6		15	65	18	42	48
Total		87	270	748	642	929	1233

PREY : OTHER							
All size classes		1009	2159	2335	2894	2644	3320

Appendix 1-E. Average stomach content weight (g) per 1000 MACKEREL stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : MACK		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 3		
age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		847	2857	3351	2734	2202	2409	
PREY : GADUS MORHUA								
Age class	0		2	3	1	0	0	
Total			2	3	1	0	0	
PREY : MERLANGIUS MERLANGUS								
Age class	0		0	1	1	1	0	
Total			0	1	1	1	0	
PREY : TRISOPTERUS ESMARKI								
Age class	0	1	121	150	224	59	46	
	1			0	9	2	1	
Total		1	121	151	232	61	47	
PREY : CLUPEA HARENGUS								
Age class	0		3	15	13	25	26	
Total		0	3	15	13	25	26	
PREY : SPRATTUS SPRATTUS								
Age class	0		0	0	0	0	0	
	1		0	3	7	20	21	
Total			1	4	7	20	21	
PREY : AMMODYTIDAE								
Age class	0	5	339	450	427	194	91	
	1		1	1	7	2	18	
	2		0	0	1	1	7	
	3		0	1	2	7	13	
	4		0	1	2	6	7	
	5		0	1	1	4	5	
	6		0	1	2	5	5	
Total		5	341	456	441	219	146	
PREY : OTHER								
All size classes		840	2389	2722	2039	1875	2168	

Appendix 1-E. Average stomach content weight (g) per 1000 MACKEREL stomachs by age class of prey and predator by quarter for the total North Sea.

PREDATOR : MACK		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 4	

age class	0	1	2	3	4	5	6+

PREY : ALL SPECIES							
All size classes	1374	44	157	397	885	2666	3040

PREY : TRISOPTERUS ESMARKI							
Age class 0		7	43	152	147	880	369
Total		7	43	152	147	880	369

PREY : CLUPEA HARENGUS							
Age class 0		1	3	10	33	51	66
Total		1	3	10	33	51	66

PREY : SPRATTUS SPRATTUS							
Age class 0	63	1	2	5	19	35	49
1		0	1	5	29	75	144
2		0	0	0	3	9	20
3			0	0	1	3	8
4			0	0	0	0	0
Total	63	1	3	11	53	123	221

PREY : AMMODYTIDAE							
Age class 0	147	0	3	13	99	284	400
1			0	1	9	25	35
6							31
Total	147	0	3	14	108	309	466

PREY : OTHER							
All size classes	1164	34	105	210	544	1303	1918

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1981		QUARTER : 1	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES		0.70	2.12	9.22	20.67	22.38	29.45	
PREY : GADUS MORHUA								
Age class	1		56.63	52.43	64.22	62.47	40.89	
	2		270.85	180.92	156.40	160.53	141.68	
	3				213.43	183.79	105.65	
Total			75.20	81.35	82.27	97.48	108.96	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1	7.84	15.49	18.48	26.11	30.00	30.78	
	2		64.29	83.04	112.16	108.52	122.91	
	3		122.73	127.01	122.21	108.94	133.44	
	4		140.80	121.52	115.58	84.95	116.46	
Total		7.84	16.18	29.71	64.86	71.42	63.23	
PREY : MERLANGIUS MERLANGUS								
Age class	1	0.18	24.20	27.88	32.31	34.19	30.42	
	2		63.98	63.73	101.25	105.34	46.72	
	3		196.89	136.52	139.39	142.13	108.95	
	4		499.80	196.56	193.79	200.15	210.42	
	5		499.80	207.65	201.40	210.46	221.30	
	6		499.80	199.96	240.09	319.53	296.28	
Total		0.18	31.47	51.11	81.70	77.34	49.45	
PREY : TRISOPTERUS ESMARKI								
Age class	1	9.01	5.94	8.16	8.83	9.19	10.88	
	2	9.01	14.38	14.89	20.78	24.01	25.54	
	3		32.29	19.77	26.78	29.83	30.93	
Total		8.67	6.51	10.66	13.77	15.40	17.60	
PREY : CLUPEA HARENGUS								
Age class	1	19.20	19.43	25.68	29.00	31.52	33.66	
	2		32.28	25.90	33.57	42.27	38.20	
	3		44.24	79.31	93.72	93.42	80.51	
Total		19.20	19.87	33.96	38.69	39.87	48.91	
PREY : SPRATTUS SPRATTUS								
Age class	1	2.11	3.20	2.92	3.93	4.53	5.90	
	2	5.41	8.45	11.17	10.75	9.89	8.00	
	3	10.40	12.86	14.12	13.00	12.55	9.62	
	4	10.40	12.86	14.12	13.00	12.55	9.62	
Total		2.90	6.42	9.54	9.02	8.74	7.44	
PREY : AMMODYTIDAE								
Age class	0		0.20	0.22				
	1	2.93	3.18	5.02	4.01	3.52	2.91	
	2	4.61	7.75	12.31	10.78	8.19	5.14	
	3		32.55	26.22	24.79	24.80		
	4		32.55	26.22	24.79	24.80		
	5		32.55	26.22	24.79	24.80		
	6		32.55	26.22	24.79	24.80		
Total		3.08	4.12	10.41	8.94	6.64	3.43	
PREY : OTHER								
All size classes		0.60	1.57	5.02	8.69	9.73	23.23	

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1981		QUARTER : 2	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.76	1.22	1.86	2.05	2.04	5.68	
PREY : GADUS MORHUA								
Age class								
0		0.71	1.13	1.88	2.13	0.54		
1		12.16	33.31	45.51	51.80	51.52	40.24	
2			137.60	162.40	190.44	191.61	172.31	
3				502.68	502.68	502.68	502.68	
Total		0.76	1.84	15.22	65.42	71.96	69.17	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
0		18.16	4.91	9.50	8.11	8.13	8.13	
1		18.16	23.75	51.24	26.52	20.82	22.85	
2			50.57	81.81	116.68	105.32	76.76	
3				221.40	229.44	231.70	231.92	
Total		18.16	20.41	57.66	53.41	64.01	52.96	
PREY : MERLANGIUS MERLANGUS								
Age class								
0		16.48	1.39	1.24	4.18	4.49	4.49	
1		16.48	17.19	21.15	61.24	62.30	96.86	
2			78.03	89.99	83.95	84.89	121.79	
3			97.03	131.46	137.08	156.30	164.45	
4				137.10	160.47	175.87	168.73	
5				281.60	281.60	281.60	171.26	
6				281.60	281.60	281.60	171.26	
Total		16.48	16.24	29.72	66.65	74.40	129.31	
PREY : TRISOPTERUS ESMARKI								
Age class								
0			1.96	1.05	1.74	2.86	1.79	
1			10.56	17.51	22.07	24.36	22.03	17.65
2				34.85	64.17	46.34	42.36	36.52
3				53.66	75.31	50.69	46.67	42.10
Total		10.56	14.54	13.71	24.02	24.80	14.01	
PREY : CLUPEA HARENGUS								
Age class								
1		0.53	14.94	27.49	82.08	130.89	61.87	
2		4.22	38.62	86.39	160.74	274.82	148.01	
Total		0.54	16.84	39.34	118.77	233.78	110.35	
PREY : SPRATTUS SPRATTUS								
Age class								
0		0.67	5.50	1.73	10.40	12.80	12.08	
1		4.71	12.60	17.82	23.33	21.73	17.35	
2		14.60	19.21	19.74	25.35	25.68	22.02	
3		17.09	22.08	23.66	27.50	26.34	23.09	
Total		2.08	14.20	18.35	24.66	23.65	19.31	
PREY : AMMODYTIDAE								
Age class								
0		0.62	0.83	0.76	0.73	0.75	0.81	
1		4.21	2.36	2.54	1.93	2.07	1.80	
2		6.43	10.07	10.58	2.39	11.09	0.66	
3		7.58	15.03	18.25	3.26	19.30	0.47	
4		7.24	16.94	20.99	6.60	23.33	0.72	
5		10.67	18.21	21.49	4.59	24.81	0.51	
6		10.67	21.97	23.86	10.96	29.15	1.11	
Total		1.66	1.47	1.71	1.39	1.53	0.96	
PREY : OTHER								
All size classes		0.64	0.98	1.49	1.37	1.35	4.25	

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1981		QUARTER : 3	
Age class		0	1	2	3	4	5	6+
All size classes		PREY : ALL SPECIES						
		0.23	1.05	2.13	2.72	10.37	23.77	94.27
Age class		PREY : GADUS MORHUA						
0		8.71	7.98	27.71	15.91	12.30	13.18	
1			99.20	107.47	110.21	111.12	110.90	
2				13.60	13.60	13.60	13.60	
Total		8.71	8.03	32.80	25.55	23.56	24.04	
Age class		PREY : MELANOGRAMMUS AEGLEFINUS						
0		4.58	8.76	11.78	11.31	11.85	7.16	
1		11.14	80.98	109.45	119.37	120.02	126.83	
2			118.15	160.39	153.53	216.22	452.52	
3			85.84	122.63	140.39	254.61	566.02	
4				152.71	152.71	273.85	1014.19	
5							1433.83	
Total		4.59	10.48	26.42	62.36	88.61	326.06	
Age class		PREY : MERLANGIUS MERLANGUS						
0		8.00	6.63	6.51	7.25	38.00		
1			46.52	60.04	65.65	122.62	135.05	197.03
2				120.23	150.91	148.84	215.00	311.13
3				151.36	340.39	300.51	352.40	340.00
4				208.00	358.78	401.47	387.26	358.00
5					441.60	441.60	441.60	441.60
6					441.60	441.60	441.60	441.60
Total		8.00	6.67	10.23	32.60	148.34	207.22	298.55
Age class		PREY : TRISOPTERUS ESMARKI						
0		2.83	5.69	13.59	18.37	17.73	13.22	
1			35.17	42.02	42.25	42.04	56.99	
2			35.78	43.12	45.08	46.31	60.37	
Total		2.83	8.14	19.11	21.44	20.02	18.41	
Age class		PREY : CLUPEA HARENGUS						
0		22.12	18.44	13.84	12.83	19.69		
1		29.44	89.14	60.68	49.52	55.32		
2		29.44	118.92	114.54	92.64	106.58		
3			36.19	116.81	255.72	298.01	301.88	
Total		22.24	32.46	86.74	228.45	267.11	301.88	
Age class		PREY : SPRATTUS SPRATTUS						
0		4.85	2.65	2.72	3.19	3.05	3.04	
1		9.38	16.69	8.37	4.24	4.24		
2		21.86	23.39	9.68	4.24	4.24		
3		36.85	36.38	9.92				
Total		10.16	18.18	8.48	4.03	3.32	3.04	
Age class		PREY : AMMODYTIDAE						
0		2.07	1.57	2.21	2.14	2.10	2.34	2.25
1			9.87	12.96	15.74	14.03	4.09	3.97
2			6.35	7.27	8.20	7.12	4.09	3.97
3			12.95	17.66	21.09	20.51		
4			12.95	17.66	21.09	20.51		
Total		2.07	1.65	2.55	2.47	2.15	2.35	2.26
All size classes		PREY : OTHER						
		0.23	0.86	1.31	1.26	5.94	19.50	91.39

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area :	TOTAL NORTH SEA			YEAR : 1981		QUARTER : 4	
Age class		0	1	2	3	4	5	6+	
All size classes		PREY : ALL SPECIES 0.63	2.19	4.36	13.09	22.37	24.35	31.73	
Age class		PREY : GADUS MORHUA							
	0	24.48	24.14	10.54	28.22	39.49	53.40	98.70	
	1			381.90	377.51	377.44	292.45	358.66	
	2			637.21	607.77	565.12	584.70	617.91	
	3			641.83	619.42	585.96	601.47	627.21	
	Total	24.48	24.14	18.12	164.87	248.36	320.26	272.29	
Age class		PREY : MELANOGRAMMUS AEGLEFINUS							
	0		12.02	12.58	13.81	14.80	14.51	25.88	
	1		46.44	48.86	102.89	128.21	130.86	140.56	
	2			340.36	304.10	257.87	262.45	271.27	
	3			402.75	355.82	290.21	299.19	277.19	
	4			148.78	147.50	144.65	144.54	147.23	
	5			148.78	147.50	144.65	144.54	147.23	
	Total		12.05	12.85	18.81	26.82	28.57	115.20	
Age class		PREY : MERLANGIUS MERLANGUS							
	0		5.97	13.96	28.43	49.78	37.42	49.84	
	1		110.38	107.56	107.02	104.85	91.15	84.67	
	2		110.40	123.86	148.45	150.73	138.96	103.53	
	3			198.03	192.18	193.75	199.32	111.08	
	4			271.32	227.17	230.16	291.46	337.39	
	5			340.04	340.04	340.04	340.04	340.04	
	6			340.04	340.04	340.04	340.04	340.04	
	Total		9.73	29.17	111.70	121.10	104.72	99.24	
Age class		PREY : TRISOPTERUS ESMARKI							
	0		6.40	4.35	5.76	6.17	6.57	7.89	
	1			12.68	15.08	16.91	18.47	19.08	
	2			36.57	36.06	36.01	43.01	46.25	
	Total		6.40	6.73	7.72	8.21	9.89	9.77	
Age class		PREY : CLUPEA HARENGUS							
	0		15.80	16.67	13.60	27.47	68.80	68.80	
	1		40.29	41.67	53.28	55.60	85.44	85.44	
	2		62.40	62.28	62.22	55.64	85.50	85.50	
	3		24.48	25.01	42.57	51.96	114.99	114.99	
	4		24.48	24.65	32.34	45.45	141.39	141.39	
	5		24.48	24.57	28.46	38.93	155.20	155.20	
	6		24.48	68.47	205.25	214.15	214.89	214.74	
	Total		16.64	17.87	20.55	86.98	159.05	137.63	
Age class		PREY : SPRATTUS SPRATTUS							
	1		0.29	1.65	6.83	12.97	16.83	15.37	
	2			10.29	14.39	15.03	16.92	15.37	
	3			17.34	18.12	17.22	16.94	15.37	
	4			17.34	18.12	17.22	16.94	15.37	
	Total		0.29	2.48	9.52	14.09	16.88	15.37	
Age class		PREY : AMMODYTIDAE							
	0		0.84	3.62	2.12	3.81	4.52	5.41	
	1			6.84	8.67	14.33	14.41	14.41	
	2			6.91	9.15	15.03	15.10	15.10	
	3			8.08	16.47	24.66	24.56	24.56	
	4			9.05	21.55	30.47	30.24	30.24	
	5			10.20	26.62	35.67	35.31	35.31	
	6			10.20	26.64	35.94	35.51	35.98	
	Total		0.46	4.26	2.52	6.14	6.86	11.66	
All size classes		PREY : OTHER	0.63	2.05	3.57	8.78	17.34	19.86	25.89

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1985		QUARTER : 1	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.49	2.71	6.19	18.01	24.31	34.72	
PREY : GADUS MORHUA								
Age class								
1			58.40	26.80	25.49	44.44	54.20	
2			177.92	47.41	59.65	84.42	113.46	
3					129.32	110.66	110.66	
Total			59.69	38.47	52.34	82.44	109.17	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
1			17.60	24.72	40.58	36.82	25.08	
2			89.97	99.61	118.73	117.07	110.90	
3			220.26	194.71	171.91	181.33	202.43	
4				223.99	180.15	186.62	207.07	
5					206.30	206.40	206.40	
Total			20.16	42.45	86.78	87.57	88.36	
PREY : MERLANGIUS MERLANGUS								
Age class								
1		8.27	14.38	35.80	25.96	31.03	22.87	
2			73.22	80.87	62.50	75.30	89.13	
3			98.14	130.66	83.44	86.92	115.78	
4			106.10	144.97	118.41	118.80	172.95	
5			182.40	144.10	135.08	129.53	200.64	
6			182.40	135.62	149.15	138.70	179.69	
Total		8.27	23.72	62.81	54.50	63.57	83.88	
PREY : TRISOPTERUS ESMARKI								
Age class								
0			1.02	1.02				
1			7.23	10.64	13.81	14.06	14.47	
2			16.87	23.61	23.62	23.08	22.28	
3			45.98	44.98	32.53	32.02	35.09	
4			51.03	46.26	32.85	31.89	35.04	
Total		0.86	8.62	14.32	18.24	18.11	17.49	
PREY : CLUPEA HARENGUS								
Age class								
1		1.10	1.56	1.34				
2		8.67	9.21	18.99	16.56	20.09	20.77	
3			27.86	57.51	61.66	55.03	50.41	
4			25.35	72.27	87.59	86.18	68.02	
5			26.09	103.52	106.38	99.73	76.70	
6			67.14	88.64	104.29	116.46	80.65	
Total		2.64	7.26	29.45	58.05	52.74	38.32	
PREY : SPRATTUS SPRATTUS								
Age class								
1		2.87	2.46	1.49	1.49	2.18	2.18	
2		1.51	6.21	3.71	5.90	9.55	9.56	
3			8.66	10.20	9.24	17.16	16.07	
4			9.59	14.78	17.43	21.16	18.78	
5			10.85	13.58	21.48	25.97	24.07	
6			11.27	12.40	24.24	26.16	24.31	
Total		2.41	4.67	3.35	2.18	10.78	10.90	
PREY : AMMODYTIDAE								
Age class								
1		0.98	2.17	1.53	5.91	6.15	4.17	
2			6.47	9.14	11.04	10.69	8.09	
3			11.22	11.92	13.01	12.87	14.87	
4			11.34	13.43	11.20	11.24	14.34	
6			32.71	57.70	43.89	32.37		
Total		0.97	4.36	3.47	8.54	8.76	5.41	
PREY : OTHER								
All size classes		0.47	1.83	2.61	8.36	17.98	33.28	

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1985		QUARTER : 3	
Age class		0	1	2	3	4	5	6+
All size classes		PREY : ALL SPECIES						
		0.13	0.99	4.40	13.59	21.07	17.18	17.70
Age class		PREY : GADUS MORHUA						
0		6.76	4.36	8.21	23.04	23.04		
1				171.62	150.78	141.48	127.45	
2				337.76	238.78	231.23	240.89	
3				331.52	331.52	331.52		
Total		6.76	4.36	113.91	179.02	191.60	224.13	
Age class		PREY : MELANOGRAMMUS AEGLEFINUS						
0		2.92	5.88	8.69	2.70	4.06	4.64	
1		2.90	65.51	69.98	126.39	167.44	191.30	
2			307.02	287.79	255.59	240.53	255.63	
Total		2.92	9.07	41.84	67.77	83.10	111.85	
Age class		PREY : MERLANGIUS MERLANGUS						
0		4.19	4.15	4.75	4.45	4.45	4.45	
1			73.97	82.98	117.27	90.25	89.35	
2			122.08	201.87	176.40	133.99	122.29	
3			191.81	257.56	201.99	170.40	108.46	
4			187.92	258.05	205.04	192.93	124.80	
5				204.80	204.80	204.80		
6				204.80	204.80	204.80		
Total		4.19	17.07	57.65	131.74	87.17	88.47	
Age class		PREY : TRISOPTERUS ESMARKI						
0		1.45	2.60	2.47	3.72	4.34	3.94	3.97
1			25.71	21.92	27.13	19.45	20.63	27.98
2			33.39	30.89	37.77	27.00	28.86	26.64
3			35.50	34.92	46.46	44.52	35.14	25.00
Total		1.45	8.19	14.09	20.24	12.50	14.30	25.12
Age class		PREY : CLUPEA HARENGUS						
1		4.99	11.35	6.48	3.83	16.64	24.34	
2		14.95	21.45	57.51	70.54	49.47	71.96	
3			152.11	59.55	46.17	53.30	58.38	
4			183.77	157.27	42.09	51.00	52.82	
5			183.77	157.27	42.09	51.00	52.82	
Total		5.03	22.48	53.88	56.54	50.75	63.76	
Age class		PREY : SPRATTUS SPRATTUS						
1		31.69	31.69	31.69				
2		31.69	31.69	31.69				
3		31.69	31.69	31.69				
Total		31.69	31.69	31.69				
Age class		PREY : AMMODYTIDAE						
0		1.26	1.90	2.40	3.11	2.96	3.65	
1		3.28	8.41	3.57	4.45	4.49	4.75	
2		6.40	21.35	8.01	2.92		5.91	
3		17.31	46.96	34.59	2.92		5.91	
4		20.00	19.20					
5		20.00	64.94	65.22				
6		20.00	19.20					
Total		1.36	2.24	2.46	3.15	3.00	3.70	
All size classes		PREY : OTHER						
		0.13	0.82	3.41	12.11	16.43	14.36	15.99

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1986		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
All size classes		PREY : ALL SPECIES						
		0.84	3.85	8.60	13.32	24.21	25.67	
Age class		PREY : GADUS MORHUA						
1			74.53	65.21	45.58	64.23	31.90	
2			67.54	176.07	260.52	266.87	143.32	
3					428.32	459.04	215.48	
Total			74.39	67.96	88.77	156.56	114.29	
Age class		PREY : MELANOGRAMMUS AEGLEFINUS						
1		15.99	20.36	19.04	21.67	27.19	35.38	
2			73.24	81.23	110.97	118.34	130.15	
3				70.23	121.01	124.86	162.05	
Total		15.99	20.59	19.79	28.48	45.98	56.71	
Age class		PREY : MERLANGIUS MERLANGUS						
1		3.04	25.02	31.48	36.81	32.17	25.14	
2			47.41	66.38	99.72	131.76	105.44	
3			75.17	92.85	139.62	161.67	122.23	
4			57.67	126.20	200.00	213.88	140.94	
5				210.26	288.07	275.91	157.67	
6				219.75	286.94	260.00	108.15	
Total		3.04	26.49	36.48	60.61	64.82	59.00	
Age class		PREY : TRISOPTERUS ESMARKI						
1			9.57	8.55	9.65	10.73	10.88	
2			24.28	31.37	36.96	35.86	25.50	
3			26.43	41.63	44.61	42.96	44.05	
4			26.43	41.63	44.48	42.28	43.46	
Total		0.99	10.77	9.76	11.76	12.65	11.40	
Age class		PREY : CLUPEA HARENGUS						
1		0.60	0.84	0.76	0.78	1.68		
2		4.00	9.79	21.24	38.36	30.76	15.33	
3		6.29	39.48	55.73	44.41	60.47	69.84	
4			77.91	63.83	45.63	60.76	78.57	
5			81.12	88.68	150.36	130.93	168.16	
6			81.12	96.41	127.32	89.34	94.21	
Total		3.74	13.35	39.02	42.37	49.51	35.21	
Age class		PREY : SPRATTUS SPRATTUS						
1		2.90	5.05	5.48	5.00	5.07	12.84	
2		3.04	5.53	6.27	5.62	5.76	8.35	
3		3.39	9.12	10.62	9.61	10.21	12.55	
4		3.41	9.28	11.18	10.23	10.95	12.84	
5		3.42	12.32	11.48	10.42	11.15	12.84	
6		3.42	7.61	11.29	10.42	11.15	12.84	
Total		3.30	8.10	9.02	7.98	8.32	11.35	
Age class		PREY : AMMODYTIDAE						
1		1.71	2.88	3.12	3.32	4.49	3.62	
2		6.12	2.71	4.19	6.85	9.66	12.78	
3				7.34	6.62	27.67	34.08	
4				7.34	6.62	27.67	34.08	
Total		1.80	2.85	3.17	3.51	5.44	5.67	
All size classes		PREY : OTHER						
		0.72	1.97	4.84	7.63	16.18	24.29	

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1986		QUARTER : 3	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES		0.14	1.46	6.58	12.93	23.47	25.90	62.61
PREY : GADUS MORHUA		1.41		3.14	3.02	2.90	2.90	
Age class	0				119.20	119.20	119.20	119.20
	1				2.57	8.68	86.20	119.20
Total		1.41	2.62	3.05				
PREY : MELANOGRAMMUS AEGLEFINUS		5.65	10.83	10.75	11.99	13.55	79.04	
Age class	0	87.54	58.84	50.96	68.38	130.29	130.77	
	1	96.64	103.52	104.77	144.09	139.04	213.44	
	2		110.86	104.96	146.40	146.40	219.61	
	3						219.73	
	4							
Total		5.71	14.83	15.30	23.79	112.68	176.50	
PREY : MERLANGIUS MERLANGUS		7.72	9.61	13.19	20.24	18.87	23.87	
Age class	0	40.37	52.99	60.25	86.25	128.00	108.86	
	1			176.10	304.87	390.23	241.07	
	2			238.40	330.92	444.46	197.26	
	3			118.24	285.84	333.64	144.81	
	4			118.24	285.84	333.64	169.66	
	5							
Total		8.04	18.05	28.49	72.07	207.04	82.89	
PREY : TRISOPTERUS ESMARKI		2.69	7.58	9.01	9.45	9.78	17.11	
Age class	0	18.43	22.54	22.69	32.19	19.62	25.64	
	1	48.96	38.52	44.06	58.65	79.77	68.44	
	2			157.27	117.28	97.28	97.28	
	3							
Total		3.22	15.75	18.84	25.32	17.56	23.80	
PREY : CLUPEA HARENGUS		0.10						
Age class	0	5.95	9.46	7.77	3.51	0.50	1.99	
	1	83.28	51.10	61.10	58.02	57.41	105.27	
	2	96.83	134.08	89.25	73.45	74.43	139.36	
	3	96.83	119.88	139.02	198.18	176.29	255.47	
	4		141.44	149.85	167.54	167.48	255.15	
	5				395.20	395.20	395.20	
	6							
Total		5.96	22.54	49.70	62.04	87.12	158.74	
PREY : SPRATTUS SPRATTUS								
PREY : AMMODYTIDAE		2.10	2.17	2.22	4.13	4.41	4.41	
Age class	0	10.69	11.20	11.28	7.94	7.93	8.29	
	1	12.48	12.15	14.19	23.84	24.80	24.50	
	2	17.11	15.10	19.51	24.92		24.92	
	3	17.11	15.10	15.29	13.76		13.76	
	4			32.16	32.16		32.16	
	5							
Total		4.36	3.48	2.90	4.44	4.68	4.73	
PREY : OTHER		0.12	1.24	4.94	11.04	20.03	24.77	30.17
All size classes								

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1987		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.59	2.57	11.13	25.52	27.98	33.65	
PREY : GADUS MORHUA								
Age class								
1		27.09	26.82	22.43	30.46	45.09	127.94	
2				16.10	118.81	96.32	109.39	
3					136.93	116.36	146.13	
Total		27.09	26.82	22.38	95.73	90.10	113.37	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
1		6.98	16.63	19.76	28.39	39.91	36.06	
2			118.83	108.70	182.29	184.82	183.60	
3			121.12	105.14	187.91	185.52	184.25	
4					196.40	188.90	185.60	
Total		6.98	16.86	20.51	64.53	80.94	64.97	
PREY : MERLANGIUS MERLANGUS								
Age class								
1		6.57	14.21	37.97	41.49	28.39	25.17	
2		16.96	40.76	106.42	114.45	109.70	139.61	
3			124.15	194.23	119.42	105.81	144.81	
4			215.23	204.24	116.21	107.02	140.30	
5						289.07	289.07	
6							105.60	
Total		6.59	14.37	47.65	69.69	63.13	56.76	
PREY : TRISOPTERUS ESMARKI								
Age class								
1		7.99	10.77	13.72	13.40	14.62	15.37	
2		8.91	37.07	37.06	43.80	79.28	117.95	
3			39.37	32.54	76.90	113.87	119.36	
4			39.34	19.12	101.92	116.53	119.36	
5					119.36	119.36	119.36	
Total		8.00	11.47	18.62	18.35	17.59	40.71	
PREY : CLUPEA HARENGUS								
Age class								
1			1.26	1.59	2.30	2.45	2.51	
2		3.29	7.06	14.20	24.39	27.30	17.65	
3			35.25	34.46	53.71	65.74	58.57	
4			39.64	45.10	115.27	118.15	69.54	
5				45.44	130.00	131.03	120.90	
6					131.24	131.52	131.52	
Total		3.29	7.64	17.77	30.43	40.52	21.90	
PREY : SPRATTUS SPRATTUS								
Age class								
1		1.62	0.95	0.94				
2			17.92	17.26	15.89			
3			16.84	16.23	15.89			
4			16.76	16.19	15.89			
5			17.04	16.34	15.89			
6			18.31	18.25				
Total		1.62	6.03	9.25	15.89			
PREY : AMMODYTIDAE								
Age class								
1		1.19	2.17	2.12	1.12			
2		6.39	5.42	5.04	2.84			
3		20.24	12.93	15.40	12.37			
4			9.63	11.88	12.37			
6			31.16	47.36	62.72	80.80	80.80	
Total		2.01	3.96	4.07	8.76	27.26	80.80	
PREY : OTHER								
All size classes		0.51	1.53	7.03	16.84	15.71	29.59	

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA		YEAR : 1987		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES		0.18	1.01	4.65	12.92	29.03	29.88	37.09
PREY : GADUS MORHUA				9.31	9.31	9.31		
Age class	0							
	1				248.00	176.26	496.97	92.01
	2				248.00	199.85	425.09	512.82
Total			9.31	236.90	186.36	466.75	412.80	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	5.40	10.41	9.75	9.77	7.61	7.28	
	1	13.76	41.33	60.22	82.25	75.09	76.20	
	2		81.47	317.93	345.23	330.17	504.51	
	3			364.80	364.80	364.80	492.88	
	4			364.80	364.80	364.80	512.90	
Total		5.51	13.19	39.61	90.00	84.55	300.74	
PREY : MERLANGIUS MERLANGUS								
Age class	0	4.81	6.54	5.33	5.46	29.93	11.75	
	1	18.81	46.20	61.31	60.70	84.21	80.64	
	2	43.99	119.48	138.06	162.07	145.91	145.78	
	3		96.96	181.37	172.53	147.83	145.54	
	4			174.56	167.17	144.19	142.86	
	5			176.97	168.41	144.13	143.55	
Total		5.71	12.13	42.25	89.62	99.77	63.39	
PREY : TRISOPTERUS ESMARKI								
Age class	0	3.05	5.19	19.48	23.86	17.10	16.64	
	1	14.60	21.59	24.41	31.19	28.41	28.24	
	2	41.57	47.28	53.11	48.95	48.12	37.95	
	3		71.52	71.52	71.52	71.52		
Total		4.30	9.19	22.77	29.24	24.86	24.30	
PREY : CLUPEA HARENGUS								
Age class	0	0.74	0.97					
	1	7.15	9.47	17.19	9.94	34.24	15.82	
	2	14.10	36.15	55.80	66.31	78.30	89.03	
	3	26.13	84.98	123.67	109.64	129.20	197.56	
	4	47.28	243.41	254.27	301.45	350.75	294.76	
	5		261.12	291.20	361.35	369.60	308.80	
Total		7.10	15.07	32.68	56.45	89.89	61.57	
PREY : SPRATTUS SPRATTUS								
Age class	0	0.14	0.14					
	1	44.64	36.05	31.84				
	2	44.64	36.05	31.84				
	3	44.64	36.05	31.84				
Total		1.54	25.52	31.84				
PREY : AMMODYTIDAE								
Age class	0	2.48	1.53	1.67	5.70	1.60	4.76	
	1	9.73	9.24	7.54	8.40	8.53	14.99	
	2	11.27	10.87	9.02	5.45	8.45	22.11	
	3	17.59	31.08	26.33	35.82	10.96	58.09	
	4	17.40	28.00	24.21	33.40	10.96	54.58	
	5	17.14	17.86	18.79	18.57	10.96	19.83	
Total		3.81	3.25	2.68	6.29	3.11	10.21	
PREY : OTHER								
All size classes		0.18	0.86	3.50	10.48	16.75	28.66	39.47

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 1	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES		0.83	3.85	13.96	28.00	35.30	34.67	
PREY : GADUS MORHUA								
Age class	1			15.90	47.10	73.33	66.55	
	2			171.88	286.09	63.87	166.86	
	3			442.85	438.93	308.80	403.47	
Total			10.06	53.71	232.37	67.09	81.48	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1		30.49	38.38	32.67	33.53	44.28	
	2			44.61	35.67	47.01	199.22	
	3				385.01	426.63	392.91	
	4				385.01	426.63	462.78	
	5				385.01	426.63	462.78	
	6				385.01	426.63	462.78	
Total			25.03	38.38	35.59	76.59	121.43	
PREY : MERLANGIUS MERLANGUS								
Age class	1	20.95	18.14	24.34	28.96	22.99	23.92	
	2		59.34	76.61	93.66	79.18	79.51	
	3		59.33	94.11	119.87	116.02	136.63	
	4		63.53	145.39	158.88	145.71	164.35	
	5		164.72	161.52	171.79	164.54	174.08	
	6		164.72	205.98	180.56	166.03	183.46	
Total		7.74	19.77	43.71	65.35	57.57	48.67	
PREY : TRISOPTERUS ESMARKI								
Age class	1		10.54	11.65	16.54	16.79	15.79	
	2		14.98	17.86	26.94	30.50	30.14	
	3		12.15	24.18	33.26	41.79	41.45	
Total		0.82	10.83	13.18	19.18	20.76	19.03	
PREY : CLUPEA HARENGUS.								
Age class	1		20.64	40.37	39.65	20.76	23.76	
	2		31.83	51.56	52.73	54.81	53.80	
	3		22.45	49.02	48.38	65.63	62.92	
	4		21.36	58.30	63.81	101.12	99.27	
	5		25.09	96.02	85.68	122.55	116.10	
Total			22.40	48.05	48.36	55.27	46.95	
PREY : SPRATTUS SPRATTUS								
Age class	1	4.65	7.43	6.76	7.03	7.36	7.98	
	2	7.19	22.59	17.63	17.30	15.07	14.93	
	3		23.49	22.29	18.17	15.12	15.15	
	4		23.52	23.47	23.39	23.14	23.14	
	5		23.52	20.56	17.41	15.09	15.08	
Total		4.65	13.80	8.70	9.43	11.31	8.57	
PREY : AMMODYTIDAE								
Age class	1	3.51	2.43	3.55	2.85	2.88	2.64	
	2	8.90	8.23	6.53	8.54	8.50	7.99	
	3	8.97	17.35	16.03	11.00	8.86	8.62	
	4	8.97	22.56	22.34	15.71	8.81	8.50	
	5	8.97	21.31	21.40	11.07	8.93	8.75	
	6	8.97	40.98	40.15	19.77	8.93	8.75	
Total		3.93	2.63	3.85	3.60	3.71	3.21	
PREY : OTHER								
All size classes		0.61	2.70	9.33	20.00	29.63	29.87	

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 2	
Age class		0	1	2	3	4	5	6+
All size classes		PREY : ALL SPECIES 0.04	0.27	1.38	7.83	19.73	27.03	35.23
Age class		PREY : GADUS MORHUA						
	0		1.30	1.51	2.32	1.46		
	1		3.46	29.48	36.30	9.84	36.27	110.35
	2				42.24	42.24	1027.45	1562.46
	3				42.24	42.24	1075.18	1576.42
	4				42.24	42.24	1479.20	1662.75
	Total		2.29	18.81	36.09	16.93	655.78	1365.41
Age class		PREY : MELANOGRAMMUS AEGLEFINUS						
	0		1.27	6.16	5.82	5.99		
	1			32.86	63.45	114.34	137.13	121.66
	2			121.75	150.08	197.12	277.57	246.58
	3			162.79	248.22	308.15	306.65	305.81
	4				303.94	312.88	306.72	305.81
	5				303.94	312.88	306.72	305.81
	6				303.94	312.88	306.72	305.81
	Total		1.27	29.75	64.67	118.05	154.81	130.10
Age class		PREY : MERLANGIUS MERLANGUS						
	0		0.52	1.94	1.90	1.29	0.83	
	1		29.57	33.02	36.05	60.06	95.61	117.39
	2			78.40	59.69	99.75	109.98	140.68
	3			86.29	86.95	135.08	161.37	151.30
	4			90.90	119.70	217.48	210.78	178.51
	5			86.01	164.27	222.18	257.34	230.60
	6			113.61	151.11	176.61	239.06	186.38
	Total		3.97	33.69	51.14	96.03	127.03	134.38
Age class		PREY : TRISOPTERUS ESMARKI						
	0			1.35	1.32	0.52		
	1			15.42	17.51	23.49	27.30	33.31
	2			23.52	21.92	29.22	37.82	47.74
	3			31.97	53.87	54.89	52.30	48.64
	4			37.66	40.42	48.07	46.95	48.37
	Total			15.74	19.15	25.00	28.83	38.24
Age class		PREY : CLUPEA HARENGUS						
	0		3.00	3.54	18.81	24.29	23.81	24.29
	1		124.59	42.65	26.01	33.11	48.87	52.90
	2		124.59	70.20	75.14	83.04	109.69	120.33
	3		124.59	149.03	101.34	113.62	103.23	122.97
	4		124.59	216.18	139.35	134.72	94.37	126.03
	5		124.59	225.42	164.86	141.93	92.85	129.82
	Total		5.33	36.92	71.95	76.00	96.81	106.38
Age class		PREY : SPRATTUS SPRATTUS						
	1		6.42	12.85	10.93	9.26	8.84	12.64
	2		18.43	25.63	29.29	21.36	16.33	13.91
	3		18.43	27.17	29.56	25.75	29.90	16.71
	4				23.24	23.24		23.24
	5				23.24	23.24		23.24
	Total		6.64	13.97	22.61	13.97	10.74	13.10
Age class		PREY : AMMODYTIDAE						
	0		0.07	0.69	0.56	0.63	1.29	1.32
	1			3.76	5.73	6.47	10.28	7.61
	2			7.42	13.52	16.70	26.99	31.12
	3			9.86	21.34	23.07	28.67	35.91
	4			10.72	22.06	22.32	27.08	35.01
	5			9.83	24.44	28.60	30.20	39.44
	6			11.44	23.72	27.23	29.30	39.01
	Total		0.07	2.99	1.90	2.08	5.99	8.34
All size classes		PREY : OTHER						
			0.04	0.24	0.95	5.65	13.90	19.24
							24.27	

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 3	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES		0.02	1.43	6.94	11.29	19.50	28.40	32.23
PREY : GADUS MORHUA		0.31	3.73	6.31	8.64	9.56	8.14	7.71
Age class	0			17.97	16.08			42.13
	1							42.13
	2							42.13
	3							42.13
	4							36.35
Total		0.31	3.73	6.35	8.91	9.56	8.14	36.35
PREY : MELANOGRAMMUS AEGLEFINUS			8.29	15.17	12.39	15.43	16.34	14.68
Age class	0			76.29	110.50	119.21	122.07	144.56
	1							144.56
	2							104.97
Total			8.29	15.60	14.69	17.85	18.17	104.97
PREY : MERLANGIUS MERLANGUS		0.45	7.00	14.09	12.90	13.67	91.28	91.28
Age class	0		39.11	72.24	52.50	43.35	53.72	53.60
	1			107.20	84.21	64.90	50.97	46.36
	2			108.58	82.03	80.65	83.93	46.36
	3			105.79	81.35	84.72	93.29	
	4			100.37	76.75	96.15	88.52	
	5			100.37	75.64	90.22	88.52	
	6							
Total		0.45	14.64	15.48	27.02	37.75	56.54	55.34
PREY : TRISOPTERUS ESMARKI		1.99	4.74	5.75	4.78	5.97	8.10	7.28
Age class	0		20.74	32.05	37.63	41.15	36.18	58.58
	1		25.19	41.16	47.98	48.95	28.11	24.24
	2		23.78	42.14	48.23	48.83	23.38	21.84
	3				12.79	14.63	14.16	25.02
Total		1.99	5.15	10.53	12.79	14.63	14.16	25.02
PREY : CLUPEA HARENGUS			26.42	48.68	10.63	29.36		
Age class	0		54.69	59.59	80.88	49.17	48.79	52.69
	1			130.67	141.07	104.33	73.31	71.33
	2			178.55	175.71	137.51	83.21	77.15
	3			134.69	187.58	147.24	62.86	69.67
	4			116.27	189.57	149.96	63.86	70.38
	5							
Total			28.35	84.16	135.38	100.94	65.51	67.77
PREY : SPRATTUS SPRATTUS			5.20					
Age class	0		12.44	30.74	29.34			
	1		33.12	30.10	29.62			
	2			30.08	29.06			
	3				29.42			
Total			10.83	30.44	29.42			
PREY : AMMODYTIDAE		3.32	0.94	1.62	1.87	2.70	2.48	3.06
Age class	0	9.20	6.20	18.02	5.60	6.68	4.28	1.95
	1	9.20	8.43	16.10	7.49	19.42	8.86	
	2	9.20	8.83	25.40	7.88	24.12	8.86	
	3	9.20	9.10	31.21	8.14	23.79	8.86	
	4		9.29	31.70	8.26	25.07		
	5		8.54	38.63	10.20	24.28		
	6			2.10	2.24	3.38		
Total		4.17	0.99	2.10	2.24	3.38	2.51	3.03
PREY : OTHER		0.02	1.22	5.82	9.10	12.44	17.38	24.33
All size classes								

Appendix 2-A. Average prey weight (g) at time of ingestion for COD by age class of prey and predator by quarter for the total North Sea.

PREDATOR : COD		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 4	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES		0.56	2.86	7.08	10.81	13.70	30.46	40.29
PREY : GADUS MORHUA								
Age class	0	3.08	7.84	13.67				28.67
Total		3.08	6.51	13.67				28.67
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	14.90	15.33	17.44	22.12	28.61	32.36	
	1	73.51	56.10	181.95	210.22	156.90	144.80	
	2			239.40	245.86	252.57	254.86	
Total		14.77	14.65	19.87	34.59	44.70	48.56	
PREY : MERLANGIUS MERLANGUS								
Age class	0	24.38	37.84	28.55	38.34	40.60	49.60	
	1	50.99	84.28	111.55	142.32	188.26	136.58	
	2	61.15	92.32	184.96	174.30	226.38	223.55	
	3	99.06	99.06	228.20	175.26	241.05	242.16	
	4	99.06	99.06	253.34	166.38			
	5	99.06	99.06		166.38			
	6	99.06	99.06		166.38			
Total		34.48	62.16	82.93	139.26	194.12	146.01	
PREY : TRISOPTERUS ESMARKI								
Age class	0	6.79	9.10	10.17	9.41	9.36	9.42	
	1	17.37	30.65	34.95	41.04	44.64	44.61	
	2	43.51	36.20	46.43	55.04	51.98	49.39	
	3	43.51	39.19	47.02	55.04	51.98	49.39	
Total		6.37	10.24	13.40	13.20	11.45	11.15	
PREY : CLUPEA HARENGUS								
Age class	0		26.61	26.12			38.71	
	1	42.69	38.38	65.03	44.37	143.03	142.85	
	2	42.69	50.72	66.51	44.37	96.91	115.41	
	3		60.39			148.24	148.24	
	4		60.39					
	5		60.39					
Total		42.69	41.87	62.00	44.24	139.08	129.71	
PREY : SPRATTUS SPRATTUS								
Age class	0	4.93	5.63	5.59	5.20	6.09	8.16	7.33
	1		21.38	6.10	6.70	6.70		8.19
	2		25.85					
	3		27.11					
	4		27.11					
Total		4.93	12.46	5.61	5.21	6.10	8.16	7.43
PREY : AMMODYTIDAE								
Age class	0	2.38	2.52	2.82	2.00	2.77	2.77	
	1	10.59	13.18	10.27				
	2	18.21	18.03	9.47				
	3	15.72	11.95	10.47				
	4	17.81	13.09	9.47				
	5	17.69	12.62	9.47				
	6	17.42	12.34	9.47				
Total		1.89	3.81	3.73	3.83	2.00	2.77	2.77
PREY : OTHER								
All size classes		0.56	1.89	4.91	8.70	8.80	18.23	33.49

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-B. Average prey weight (g) at time of ingestion for HADDOCK by age class of prey and predator by quarter for the total North Sea.

 PREDATOR : HADD Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 1

Age class	0	1	2	3	4	5	6+
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PREY : ALL SPECIES

All size classes	0.15	0.22	0.68	0.99	1.30	1.33	
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Age class PREY : TRISOPTERUS ESMARKI

0		0.02	0.07	0.76	0.75	0.72	
1		9.33	7.77	8.54	9.66	10.98	
2		9.54	12.75	13.87	14.41	16.54	
Total		7.84	7.73	9.18	10.27	11.41	

Age class PREY : CLUPEA HARENGUS

1			6.40	6.40	6.40	6.40	
2			6.40	6.40	6.40	6.40	
Total			6.40	6.40	6.40	6.40	

Age class PREY : SPRATTUS SPRATTUS

1	2.48	9.40	10.85	10.68	7.66	10.05	
2		17.40	19.42	19.39	18.73	19.20	
3		14.13	16.18	17.68	16.67	17.68	
4		14.13	16.18	17.68	16.67	17.68	
Total	2.48	12.71	14.50	14.43	11.89	14.09	

Age class PREY : AMMODYTIDAE

1	2.80	3.19	3.56	5.13	6.50	5.30	
2		3.65	12.98	15.54	17.82	24.26	
3		38.23	33.09	32.27	31.68		
4		38.23	33.09	32.27	31.68		
5		38.23	33.09	32.27	31.68		
6		38.23	33.09	32.27	31.68		
Total	2.80	3.22	4.71	8.84	11.82	12.37	

PREY : OTHER

All size classes	0.15	0.16	0.34	0.42	0.67	0.68	
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Appendix 2-B. Average prey weight (g) at time of ingestion for HADDOCK by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 2	

Age class	0	1	2	3	4	5	6+

PREY : ALL SPECIES							
All size classes	0.15	0.11	0.15	0.34	1.59	2.67	8.08

PREY : TRISOPTERUS ESMARKI							
Age class	1		6.78	15.16	20.15	21.05	21.59
	2			20.51	20.70	21.05	21.59
Total			6.78	15.33	20.18	21.05	21.59

PREY : SPRATTUS SPRATTUS							
Age class	0		9.48	9.48			
	1		9.48	9.48			
	2		9.48	9.48			
Total			9.48	9.48			

PREY : AMMODYTIDAE							
Age class	0	1.27	1.61	2.39	3.93	3.72	7.39
	1	1.87	6.19	8.62	8.84	8.55	8.74
	2	6.35	10.34	11.80	11.66	12.01	12.16
	3	6.35	10.89	12.95	13.36	13.38	13.50
	4	6.35	10.71	12.63	13.02	13.12	13.25
	5		14.43	15.35	14.74	14.43	14.42
	6		14.43	15.35	14.74	14.43	14.42
Total		1.20	4.17	7.98	8.62	8.22	9.44

PREY : OTHER							
All size classes	0.15	0.10	0.09	0.10	0.31	0.67	1.87

Appendix 2-B. Average prey weight (g) at time of ingestion for HADDOCK by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA							YEAR : 1981	QUARTER : 3
Age class		0	1	2	3	4	5	6+		
PREY : ALL SPECIES										
All size classes		0.16	0.16	0.19	0.68	1.19	2.84	1.13		
PREY : MELANOGRAMMUS AEGLEFINUS										
Age class	0			3.26	7.55	13.76	17.39			
Total		4.01	3.26	7.55	13.76	17.39				
PREY : MERLANGIUS MERLANGUS										
Age class	0				13.34	13.34				
Total					13.34	13.34				
PREY : TRISOPTERUS ESMARKI										
Age class	0	2.11	3.83	2.32	3.11	8.02	20.94	29.17		
	1			20.60	46.40	46.76	40.30	37.92		
	2			56.87	62.47	57.59	52.51			
Total		2.11	3.83	2.35	3.24	8.51	21.71	29.70		
PREY : SPRATTUS SPRATTUS										
Age class	0		20.75	16.33	1.94	1.96	1.81			
	1		20.75	20.75	19.19	18.88				
	2		20.75	20.75	19.19	18.88				
Total			20.75	20.58	5.27	5.61	1.81			
PREY : AMMODYTIDAE										
Age class	0	2.05	2.33	2.81	2.96	3.26	3.85	2.18		
	1		4.17	0.96	2.41	5.66	7.62			
	2		4.17	0.96	2.41	5.66	7.62			
Total		2.05	2.34	2.80	2.96	3.27	3.85	2.18		
PREY : OTHER										
All size classes		0.15	0.14	0.13	0.36	0.60	1.53	0.77		

Appendix 2-B. Average prey weight (g) at time of ingestion for HADDOCK by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 4

Age class 0 1 2 3 4 5 6+

PREY : ALL SPECIES

All size classes 0.09 0.39 0.26 0.52 0.80 1.44 0.52

Age class PREY : MELANOGRAMMUS AEGLEFINUS

0 16.01 16.01

Total 16.01 16.01

Age class PREY : MERLANGIUS MERLANGUS

0 7.04 7.36 5.80 8.89

Total 7.04 7.36 5.80 8.89

Age class PREY : TRISOPTERUS ESMARKI

0 7.65 6.85 9.94 12.00 10.11 9.27 9.16

1 13.17 14.93 19.30 16.97 14.92 15.56

2 13.17 14.93 19.30 16.97 14.92 15.56

Total 7.65 7.20 10.45 12.68 10.60 9.59 9.56

Age class PREY : CLUPEA HARENGUS

0 13.76 13.76

1 13.76 13.76

Total 13.76 13.76

Age class PREY : AMMODYTIDAE

0 2.24 3.50 4.13 3.61 3.50 3.72 3.11

Total 2.24 3.50 4.13 3.61 3.50 3.72 3.11

PREY : OTHER

All size classes 0.09 0.32 0.17 0.34 0.53 0.98 0.39

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-B. Average prey weight (g) at time of ingestion for HADDOCK by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.05	0.11	0.19	0.24	0.28	0.40	
PREY : TRISOPTERUS ESMARKI								
Age class								
	1	8.31	8.36	8.85	8.63	9.00	10.18	
	2		19.58	19.31	21.90	21.66	21.72	
	Total	8.31	8.43	8.65	8.24	8.98	9.99	
PREY : CLUPEA HARENGUS								
Age class								
	1			63.79		63.79	63.79	
	2			63.79		63.79	63.79	
	3			63.79		63.79	63.79	
	Total			63.79		63.79	63.79	
PREY : AMMODYTIDAE								
Age class								
	1	1.58	1.60	1.63	1.44	1.39	1.33	
	2	3.54	4.40	4.13	3.75	3.85	3.44	
	Total	1.58	1.60	1.63	1.44	1.39	1.33	
PREY : OTHER								
All size classes		0.05	0.10	0.16	0.20	0.22	0.35	

Appendix 2-B. Average prey weight (g) at time of ingestion for HADDOCK by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 2	

Age class	0	1	2	3	4	5	6+	

PREY : ALL SPECIES								
All size classes	0.01	0.02	0.01	0.02	0.04	0.05	0.05	

Age class	PREY : TRISOPTERUS ESMARKI							
1				3.32	15.39	17.27	22.91	
2				3.32	15.39	17.27	22.91	
Total		0.22	0.22	3.32	15.39	17.27	22.91	

Age class	PREY : CLUPEA HARENGUS							
Total						24.12	24.12	

Age class	PREY : SPRATTUS SPRATTUS							
1				11.64	11.64	11.64	11.64	
2				11.64	11.64	11.64	11.64	
Total				11.64	11.64	11.64	11.64	

Age class	PREY : AMMODYTIDAE							
0	0.16	0.50	0.48	0.51	0.58	0.61	0.53	
1		1.65	2.19	2.88	2.78	2.81	2.24	
2		4.14	17.88	17.95	17.99	16.10	11.73	
3		4.14	20.40	19.84	22.59	17.67	12.26	
4			20.58	19.65	21.93	17.50	12.21	
5			21.77	22.02	34.66	19.56	12.81	
6			21.77	22.02	34.66	19.56	12.81	
Total	0.16	0.52	0.54	0.70	0.85	0.77	0.64	

PREY : OTHER								
All size classes	0.00	0.01	0.01	0.02	0.03	0.03	0.04	

Appendix 2-B. Average prey weight (g) at time of ingestion for HADDOCK by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.01	0.04	0.12	0.41	0.36	0.40	0.64
PREY : GADUS MORHUA								
Age class	0					1.55	1.55	1.55
Total						1.55	1.55	1.55
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	6.71	6.84	18.09	21.30	21.19	24.88	
	1		25.53	25.53	25.53	25.53	25.53	
Total		6.71	6.87	19.03	21.94	21.86	25.00	
PREY : TRISOPTERUS ESMARKI								
Age class	0	0.69	4.40	4.58	4.53	2.94	3.62	2.32
	1							31.66
Total		0.69	4.40	4.58	4.53	2.94	3.62	25.85
PREY : AMMODYTIDAE								
Age class	0	1.23	2.18	1.76	1.81	1.42	1.52	1.40
	1		3.21	5.67	4.42	4.24	4.30	3.62
	2		1.51	10.85	6.33	6.32	5.37	3.65
	3		1.51	16.24	13.13	14.66	11.15	3.65
	4		1.51	17.04	17.45	18.14	16.38	3.65
	5		1.51	17.27	19.48	19.48	19.48	
	6		1.51	17.27	19.48	19.48	19.48	
Total		0.02	0.16	0.72	1.87	1.44	1.56	1.41
PREY : OTHER								
All size classes		0.01	0.02	0.06	0.17	0.15	0.17	0.19

Appendix 2-B. Average prey weight (g) at time of ingestion for HADDOCK by age class of prey and predator by quarter for the total North Sea.

PREDATOR : HADD		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 4	

Age class		0	1	2	3	4	5	6+

PREY : ALL SPECIES								
All size classes		0.02	0.15	0.30	0.45	0.63	0.79	1.35

Age class		PREY : MELANOGRAMMUS AEGLEFINUS						
	0				35.22	35.22	35.22	35.22
Total					35.22	35.22	35.22	35.22

Age class		PREY : TRISOPTERUS ESMARKI						
	0	1.70	8.93	10.84	10.25	11.33	8.30	7.73
	1		21.05	21.05	28.13	27.90	27.47	27.39
Total		1.70	8.93	10.85	10.46	11.66	8.96	8.03

Age class		PREY : CLUPEA HARENGUS						
	0		0.64	0.64				
Total			0.64	0.64	65.60	65.60	65.60	65.60

Age class		PREY : AMMODYTIDAE						
	0	0.97	1.92	2.02	1.57	1.44	1.73	2.22
	1		5.01	4.53	3.60	3.37	3.64	4.03
	2		6.83	5.48	4.68	5.41	4.70	
	3		6.83	3.99	4.68	8.21	7.31	
	4		6.83	5.48	4.68	5.41	4.70	
Total		0.97	2.05	2.18	1.65	1.50	1.81	2.24

PREY : OTHER								
All size classes		0.02	0.11	0.20	0.32	0.43	0.57	0.82

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 1		

Age class		0	1	2	3	4	5	6+

PREY : ALL SPECIES								
All size classes		0.03	0.24	0.19	0.15	0.14	0.32	

Age class		PREY : GADUS MORHUA						
	1	9.98	11.29	11.57				85.12
	2							85.12
Total		9.98	11.29	11.57				85.12

Age class		PREY : MELANOGRAMMUS AEGLEFINUS						
	1	8.27	5.55	11.70	12.36	12.84	13.56	
	2		13.60	13.59	13.06	12.14	9.12	
Total		8.27	5.65	11.86	12.43	12.77	12.75	

Age class		PREY : MERLANGIUS MERLANGUS						
	1		13.40	15.20	16.34	19.74	18.19	
	2		33.97	34.08	34.58	35.87	36.23	
Total			13.48	15.33	16.49	19.88	18.32	

Age class		PREY : TRISOPTERUS ESMARKI						
	0	0.96	1.03	1.06				
	1	4.85	5.86	7.17	8.33	9.64	9.93	
	2	8.17	8.43	11.42	13.47	14.54	15.57	
	3		7.87	17.36	22.24	24.89	27.96	
Total		4.79	6.40	8.66	10.50	12.04	12.71	

Age class		PREY : CLUPEA HARENGUS						
	1		13.42	10.63	8.71	14.86	13.24	
	2		35.03	35.03	35.03	35.03	35.03	
Total			13.43	10.71	8.81	15.11	13.35	

Age class		PREY : SPRATTUS SPRATTUS						
	1	1.99	3.37	3.05	3.32	3.37	3.04	
	2	6.34	9.84	10.01	9.48	9.05	6.98	
	3	8.94	18.29	15.71	12.19	14.76	12.66	
	4	8.94	18.29	15.71	12.19	14.76	12.66	
Total		2.54	5.46	5.69	6.54	5.90	4.70	

Age class		PREY : AMMODYTIDAE						
	0	0.30	0.88	1.02	1.03	0.90	0.56	
	1	1.82	2.23	2.37	2.51	2.79	3.25	
	2	5.30	8.43	9.55	11.84	12.52	13.92	
	3		32.30	36.79	36.57	35.61	32.34	
	4		32.30	36.79	36.57	35.61	32.34	
	5		32.30	36.79	36.57	35.61	32.34	
	6		32.30	36.79	36.57	35.61	32.34	
Total		1.89	2.58	3.49	5.42	6.91	7.26	

		PREY : OTHER						
All size classes		0.02	0.13	0.09	0.06	0.05	0.10	

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 3		

Age class		0	1	2	3	4	5	6+

PREY : ALL SPECIES								
All size classes		0.11	0.27	0.48	0.89	0.47	0.64	0.57

PREY : GADUS MORHUA								
Age class	0	5.92	5.03					
Total		5.92	3.95	2.22	2.22			

PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	10.46	5.99	8.76	8.11	6.93	7.24	6.14
	1		26.25	25.86	22.03	16.13	16.01	16.73
Total		10.46	6.01	8.80	8.14	6.94	7.26	6.15

PREY : MERLANGIUS MERLANGUS								
Age class	0		4.09	3.41	3.15	5.42	6.36	7.02
Total			4.09	3.41	3.15	5.42	6.36	7.02

PREY : TRISOPTERUS ESMARKI								
Age class	0	0.96	2.56	2.39	2.66	3.34	3.09	4.05
	1			35.78	35.68	34.94	33.04	32.93
Total		0.96	2.57	2.40	2.69	3.40	3.12	4.08

PREY : CLUPEA HARENGUS								
Age class	0		10.36	12.39	14.62	15.76	19.89	15.62
Total			10.36	12.39	14.62	15.76	19.89	15.62

PREY : SPRATTUS SPRATTUS								
Age class	0		3.67	2.93	6.21	9.69	9.65	9.57
	1		9.24	15.17	18.57	22.12	22.54	23.37
	2		10.50	22.39	23.74	24.62	24.85	25.38
	3		12.74	24.89	25.08	25.08	25.27	25.73
Total			8.69	14.65	19.03	22.50	22.90	23.69

PREY : AMMODYTIDAE								
Age class	0	7.47	2.05	1.64	1.40	1.62	1.53	1.58
	1		36.76	21.84	16.72	14.83	14.47	15.18
	2		33.07	19.84	15.37	13.39	13.01	12.75
	3		37.45	22.21	16.96	15.10	14.73	15.68
	4		37.45	22.21	16.96	15.10	14.73	15.68
Total		0.68	2.14	2.93	2.64	1.88	1.98	1.89

PREY : OTHER								
All size classes		0.10	0.14	0.15	0.23	0.10	0.13	0.12

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 2

Age class 0 1 2 3 4 5 6+

PREY : ALL SPECIES

All size classes 0.03 0.09 0.27 0.27 1.17 0.82

Age class PREY : GADUS MORHUA

0 0.43 0.73 1.08 0.67 1.13 1.12

Total 0.43 0.73 1.08 0.67 1.13 1.12

Age class PREY : MELANOGRAMMUS AEGLEFINUS

0 2.21 2.08 2.26 2.61 2.80 3.79

1 8.06 14.97 19.13 19.00 18.03

2 9.89 18.13 31.30 28.42 25.49

Total 2.21 2.63 4.33 5.36 6.08 9.65

Age class PREY : MERLANGIUS MERLANGUS

0 19.31 19.31 19.31 19.31 19.31

1 20.19 7.52 7.26 10.59 12.17 8.49

Total 20.19 7.52 7.27 10.59 12.18 8.50

Age class PREY : TRISOPTERUS ESMARKI

0 1.65 1.64 1.25 1.16 1.19 1.19

1 1.58 6.51 7.71 7.79 8.20 9.32

2 10.16 12.88 17.09 17.79 16.03

3 10.02 14.07 22.03 22.53 18.93

Total 1.64 3.95 7.90 8.34 8.92 9.91

Age class PREY : CLUPEA HARENGUS

1 0.87 0.77 0.78 0.79 0.62 0.62

Total 0.87 1.38 3.24 1.75 0.62 0.62

Age class PREY : SPRATTUS SPRATTUS

0 3.15 5.68 6.06 7.16 7.83 7.22

1 9.81 8.36 6.98 8.33 8.65 8.17

2 17.65 10.85 10.77 11.81 11.64 11.95

3 19.38 14.15 18.15 15.92 14.16 15.62

Total 5.16 7.59 7.49 8.85 9.33 8.99

Age class PREY : AMMODYTIDAE

0 0.52 0.88 0.93 0.89 0.89 0.92

1 2.44 3.06 3.13 4.71 3.77 3.98

2 5.81 6.33 8.78 10.83 8.91 8.46

3 7.65 9.70 12.84 14.70 13.06 12.17

4 7.13 8.93 11.99 13.83 12.10 11.25

5 11.80 13.50 16.49 18.92 17.91 17.48

6 11.80 13.50 16.49 18.92 17.91 17.48

Total 0.70 1.89 2.52 2.94 2.75 2.73

PREY : OTHER

All size classes 0.01 0.03 0.07 0.09 0.75 0.28

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 4		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.16	0.10	0.14	0.19	0.44	0.63	0.57
PREY : GADUS MORHUA								
Age class	0		7.31	8.91	8.19	7.61	8.75	8.51
Total			7.31	8.91	8.19	7.61	8.75	8.51
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	7.47	9.34	8.51	8.69	10.02	11.79	11.54
	1		14.24	14.26	17.55	28.31	26.73	27.75
Total		7.47	9.43	8.58	8.81	10.30	12.17	11.96
PREY : MERLANGIUS MERLANGUS								
Age class	0	2.04	8.82	12.04	10.46	11.31	12.23	13.83
Total		3.05	8.82	12.04	10.46	11.31	12.23	13.83
PREY : TRISOPTERUS ESMARKI								
Age class	0	3.24	6.35	5.93	6.45	6.69	6.16	5.76
	1		9.98	11.55	13.35	16.65	24.49	26.52
	2		9.98	11.55	13.35	16.65	24.49	26.52
Total		3.24	6.58	6.30	7.06	7.68	7.57	7.63
PREY : CLUPEA HARENGUS								
Age class	0	5.94	6.28	8.19	9.00	12.76	16.25	60.66
	1		9.50	9.50	33.91	57.87	59.24	60.66
	2				60.66	60.66	60.66	60.66
Total		5.94	6.28	8.20	9.12	14.59	19.33	60.66
PREY : SPRATTUS SPRATTUS								
Age class	1	4.07	6.21	5.82	7.84	8.17	9.10	11.56
	2	4.33	7.17	5.66	7.82	8.37	13.23	14.03
	3	9.17	7.57	5.47	7.83	8.59	15.51	15.08
	4	9.17	7.57	5.47	7.83	8.59	15.51	15.08
Total		4.20	6.64	5.73	7.83	8.28	10.07	12.69
PREY : AMMOOYTIDAE								
Age class	0	0.98	1.92	2.09	1.76	2.04	3.79	1.50
	1		24.24	24.50	22.07	23.27	15.59	21.70
	2		24.24	24.50	22.07	23.27	15.59	21.70
	3		24.24	24.50	22.07	23.27	15.59	21.70
	4		24.24	24.50	22.07	23.27	15.59	21.70
Total		0.98	2.01	3.30	4.55	6.35	10.00	8.59
PREY : OTHER								
All size classes		0.13	0.04	0.05	0.06	0.15	0.24	0.24

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1985			QUARTER : 1	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.07	0.79	3.30	4.83	5.83	5.96	
PREY : GADUS MORHUA								
Age class	1			42.98	42.98	42.98	42.98	
Total				42.98	42.98	42.98	42.98	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1		16.95	14.78	13.63	14.37	13.03	
	2		17.43	16.58	16.46	16.51	16.41	
Total			16.95	14.79	13.63	14.38	13.04	
PREY : MERLANGIUS MERLANGUS								
Age class	1	15.58	16.28	16.26	17.61	16.41	17.62	
	2		52.88	65.23	73.59	88.92	90.89	
	3			91.95	91.95	91.95	91.95	
Total		15.58	16.44	16.78	22.15	29.91	36.23	
PREY : TRISOPTERUS ESMARKI								
Age class	0		1.72	1.71	1.76	1.72	1.81	
	1	6.90	9.45	9.61	9.41	9.63	10.01	
	2	9.28	15.15	15.50	14.99	15.10	15.08	
	3	6.50	18.97	31.70	31.95	31.43	32.63	
	4	6.50	16.30	38.93	34.90	33.15	33.03	
Total		7.06	10.33	10.67	10.39	10.67	11.03	
PREY : CLUPEA HARENGUS								
Age class	1	1.16	1.58	1.74	1.51	1.39	1.16	
	2	6.08	10.82	14.21	16.22	18.31	20.24	
	3		35.72	46.73	50.52	32.48	32.81	
	4		62.21	55.57	38.56	22.52	18.27	
Total		5.87	10.27	13.84	16.06	18.30	20.45	
PREY : SPRATTUS SPRATTUS								
Age class	1	1.37	1.89	1.98	1.95	2.04	1.98	
	2	3.12	4.12	4.55	4.66	4.47	4.60	
	3	7.50	11.62	13.98	9.63	9.67	12.20	
	4	7.78	12.32	14.26	10.88	10.60	13.48	
	5	7.71	13.27	18.21	26.55	19.47	28.00	
	6	9.52	15.58	26.50	42.87	36.09	43.07	
Total		1.67	3.24	4.26	4.97	4.75	4.83	
PREY : AMMOYTTIDAE								
Age class	1	1.23	2.30	4.25	4.70	4.82	4.22	
	2	5.34	8.14	7.00	7.45	7.73	7.65	
	3	14.84	14.42	12.74	10.71	10.60	10.94	
	4	14.69	14.31	13.08	10.24	9.26	9.04	
	6		34.50	32.30	31.74	31.66	32.13	
Total		1.52	3.60	5.10	6.09	6.10	5.28	
PREY : OTHER								
All size classes		0.05	0.31	0.62	0.90	0.99	1.03	

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA			YEAR : 1985		QUARTER : 3	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.01	0.22	0.24	0.31	0.33	1.61	1.74
PREY : GADUS MORHUA								
Age class	0		3.90	5.66	6.54	6.41	5.18	
Total			3.90	5.66	6.54	6.41	5.18	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	3.20	3.91	4.25	4.95	5.46	5.73	5.78
	1			19.94	19.94	19.94	19.94	19.94
Total		3.20	3.91	4.25	4.95	5.46	5.73	5.78
PREY : MERLANGIUS MERLANGUS								
Age class	0	2.66	4.47	0.56	0.17	0.28	0.19	0.23
Total		2.66	4.47	0.56	0.17	0.28	0.19	0.23
PREY : TRISOPTERUS ESMARKI								
Age class	0	0.99	1.94	3.61	5.24	7.31	11.96	13.19
	1			24.18	24.20	24.76	24.57	24.74
	2			24.53	24.33	24.78	24.59	24.75
	3			25.16	25.08	25.20	25.25	25.27
Total		0.99	1.94	6.34	15.34	19.66	21.42	22.30
PREY : CLUPEA HARENGUS								
Age class	0		2.66	4.08	4.72	5.05	4.10	5.67
	1		7.83	12.02	15.66	15.76	17.20	17.46
	2		20.84	25.67	30.97	36.88	33.33	33.62
	4				56.43	56.56		56.59
Total			6.19	11.80	16.10	18.61	20.26	22.15
PREY : SPRATTUS SPRATTUS								
Age class	0	3.28	6.28	5.58	6.10	6.66	6.88	6.95
	1		4.26	8.60	13.80	15.50	18.31	17.28
	2		4.26	8.14	12.91	15.05	18.41	17.35
	3		4.26	8.14	12.91	15.05	18.41	17.35
Total		3.28	5.61	6.24	7.38	8.12	8.12	8.09
PREY : AMMODYTIDAE								
Age class	0	0.60	1.60	1.96	1.95	1.97	1.79	2.13
	1	10.06	9.75	8.73	15.71	16.25	23.66	24.09
	2		6.75	6.92	13.17	12.56	19.79	19.42
	3		5.59	15.19	22.22	21.54	22.73	22.33
	4			23.35	24.22	24.19	23.99	23.27
	5			23.35	24.22	24.19	23.99	23.27
	6			23.35	24.22	24.19	23.99	23.27
Total		0.60	1.97	2.93	3.70	3.84	3.98	5.50
PREY : OTHER								
All size classes		0.00	0.10	0.12	0.10	0.10	0.18	0.33

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA			YEAR : 1986		QUARTER : 1	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.12	0.32	1.40	4.76	5.81	6.77	
PREY : GADUS MORHUA								
Age class	1	2.78	12.66	7.22	6.21	5.50	6.66	
Total		2.78	12.66	7.22	6.21	5.50	6.66	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1	9.09	31.09	33.71	33.01	33.53	31.47	
Total		9.09	31.09	33.71	33.01	33.53	31.47	
PREY : MERLANGIUS MERLANGUS								
Age class	1	6.50	18.67	15.38	11.57	11.83	10.28	
	2			7.45	7.45	7.45	7.45	
Total		6.50	18.67	15.12	11.18	11.65	10.17	
PREY : TRISOPTERUS ESMARKI								
Age class	0	3.76	0.65					
	1	7.94	8.86	11.88	12.46	13.11	13.61	
	2	15.23	17.75	19.46	22.06	23.23	25.98	
	3		22.76	21.70	23.03	25.85	31.18	
	4		22.74	21.62	22.80	25.52	30.76	
Total		5.52	8.94	12.16	12.95	13.61	14.25	
PREY : CLUPEA HARENGUS								
Age class	1	2.35	5.58	4.51	4.57	4.53	5.55	
	2	3.84	4.83	8.65	10.02	10.06	9.00	
	3	5.27	5.00	19.01	28.06	27.10	32.11	
Total		3.56	4.92	8.00	9.64	9.64	9.01	
PREY : SPRATTUS SPRATTUS								
Age class	1	2.27	1.61	1.56	1.87	1.88	1.88	
	2	5.82	6.08	6.67	7.02	6.72	6.69	
	3	5.37	8.48	9.93	9.96	9.75	9.59	
	4	5.91	11.43	16.09	15.51	16.66	16.57	
	5	5.19	9.44	11.10	11.06	10.86	10.56	
	6	14.48	14.54	11.73	11.33	11.24	10.92	
Total		3.97	4.72	6.60	7.57	6.40	4.69	
PREY : AMMODYTIDAE								
Age class	1	1.69	2.80	3.12	3.35	4.09	4.87	
	2	2.27	6.08	7.30	7.95	8.09	8.69	
	3			5.83	5.82	5.81	5.71	
	4			5.83	5.82	5.81	5.71	
Total		1.73	2.91	3.40	3.86	4.50	5.31	
PREY : OTHER								
All size classes		0.06	0.08	0.33	1.81	2.15	2.44	

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA			YEAR : 1986		QUARTER : 3	
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.12	0.20	0.71	1.03	2.01	2.91	4.18
PREY : GADUS MORHUA								
Age class	0	1.23	1.03	3.18	2.93	2.72	2.71	2.64
Total		1.23	1.29	3.17	2.93	2.72	2.71	2.64
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	1.80	2.71	3.33	3.34	3.47	3.75	3.52
	1		22.60	16.13	12.78	13.02	12.53	9.96
Total		1.80	2.71	3.33	3.43	3.68	4.24	3.52
PREY : MERLANGIUS MERLANGUS								
Age class	0	1.16	2.44	3.02	3.77	4.26	5.21	2.62
	1			29.28	28.52	38.37	38.37	
Total		1.16	2.44	3.02	3.78	4.29	5.26	2.62
PREY : TRISOPTERUS ESMARKI								
Age class	0	1.15	2.50	3.88	4.73	5.46	4.98	4.82
	1		9.93	14.70	18.19	19.65	19.98	16.84
	2			17.12	17.32	25.65	21.17	37.34
	3			15.98	16.15	16.14	16.16	
	4			15.98	16.15	16.14	16.16	
Total		1.15	2.54	4.40	6.13	8.22	8.17	8.41
PREY : CLUPEA HARENGUS								
Age class	0		2.87	2.60	2.02	3.58	3.45	7.47
	1	2.20	6.59	8.15	10.61	12.67	13.76	26.34
	2		31.73	35.10	31.87	36.52	44.68	31.94
Total		2.20	5.56	7.01	9.15	13.39	18.14	25.78
PREY : SPRATTUS SPRATTUS								
Age class	0		4.66	3.42	3.61	4.80	6.35	2.86
	1		5.38	6.66	7.77	4.88	4.12	3.83
	2		8.10	10.94	14.43	14.54	13.50	8.62
	3		8.10	10.94	14.43	14.54	13.50	8.62
Total			5.26	4.65	5.73	6.49	7.14	2.87
PREY : AMMODYTIDAE								
Age class	0	1.50	2.32	2.64	2.74	3.22	2.87	2.82
	1	14.93	9.10	9.97	9.53	11.86	11.19	11.03
	2		9.50	10.91	10.63	13.03	12.23	25.83
	3		13.19	14.19	14.12	16.07	15.17	14.85
	4		13.19	13.13	12.57	13.95	15.17	14.85
	5			32.50	31.56	34.08		
Total		1.50	2.74	3.71	4.23	5.24	4.68	3.07
PREY : OTHER								
All size classes		0.09	0.07	0.26	0.57	0.68	1.03	0.48

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1987		QUARTER : 1		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.12	1.35	2.95	4.13	5.37	5.02	
PREY : GADUS MORHUA								
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	1	11.54	10.70	10.42	13.23	16.66	19.06	
Total		11.54	10.70	10.42	13.23	16.66	19.06	
PREY : MERLANGIUS MERLANGUS								
Age class	1	5.49	8.11	8.11	9.62	12.73	12.95	
	2		48.99	48.99	48.99	48.99	48.99	
Total		5.49	8.11	8.12	9.66	12.78	13.08	
PREY : TRISOPTERUS ESMARKI								
Age class	1	7.14	9.02	10.25	9.82	9.49	9.44	
	2	9.24	16.96	34.73	40.42	38.03	41.95	
	3		45.20	48.73	48.72	49.02	49.02	
Total		7.14	9.03	10.33	9.99	9.62	9.69	
PREY : CLUPEA HARENGUS								
Age class	1	1.02	1.85	2.03	2.41			
	2	6.34	9.94	12.96	19.24	19.45	21.10	
	3		45.34	32.76	28.19	26.97	26.57	
Total		4.63	9.93	13.55	20.14	20.42	21.70	
PREY : SPRATTUS SPRATTUS								
Age class	1	0.96	1.67	1.78	1.72	1.30	1.69	
	2	3.03	4.39	8.00	9.08	9.15	5.51	
	3	14.59	17.74	16.66	14.66	13.89	12.65	
	4	16.80	18.18	17.83	16.31	15.37	9.38	
	5	16.18	17.85	16.80	14.64	14.16	13.88	
Total		1.65	3.66	8.20	8.52	8.99	6.45	
PREY : AMMODYTIDAE								
Age class	0	0.00						
	1	1.60	1.61	1.45	1.61	2.16	1.88	
	2	3.23	4.30	4.71	5.50	7.38	7.70	
	3	13.67	16.20	14.28	14.71	15.11	14.82	
	4		14.14	14.64	15.57	15.67	15.62	
Total		1.68	2.47	2.30	2.76	4.34	4.51	
PREY : OTHER								
All size classes		0.06	0.38	0.73	0.90	0.91	0.93	

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1987		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.01	0.05	0.45	1.25	1.73	2.39	2.10
PREY : GADUS MORHUA								
Age class	0				10.50	9.81	8.49	10.56
Total					10.50	9.81	8.49	10.56
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	1.24	1.71	3.00	4.64	5.51	6.65	6.88
	1			80.31	75.87	79.09	77.43	23.47
Total		1.24	1.71	3.10	5.30	7.84	8.32	6.90
PREY : MERLANGIUS MERLANGUS								
Age class	0	0.67	3.01	2.84	3.41	4.53	6.30	5.87
	1			8.98	8.99	9.67	9.62	9.56
Total		0.67	3.01	2.84	3.43	4.63	6.43	5.93
PREY : TRISOPTERUS ESMARKI								
Age class	0	4.29	1.70	7.05	9.69	10.12	10.27	10.90
	1		3.81	16.01	20.48	21.24	21.26	22.29
	2		38.66	34.43	33.00	33.26	32.80	32.74
Total		4.29	1.99	9.24	12.83	13.45	13.64	14.58
PREY : CLUPEA HARENGUS								
Age class	0		2.75	2.75				
	1		1.51	5.63	9.12	12.63	15.79	10.63
	2		11.69	25.64	34.58	34.10	38.17	38.50
Total			1.56	5.80	9.78	13.65	17.11	11.38
PREY : SPRATTUS SPRATTUS								
Age class	0		3.60	4.91	4.69	4.31	4.11	4.44
	1		8.91	5.59	5.88	5.21	4.84	4.91
	2		11.17	11.42	12.44	11.23	11.42	10.44
	3		11.17	11.38	12.11	11.22	11.39	10.48
	4		11.17	11.17	11.17	11.17	11.17	11.17
Total			5.97	6.80	7.01	6.37	5.70	6.25
PREY : AMMODYTIDAE								
Age class	0	1.01	4.39	5.63	5.64	5.44	4.85	5.18
	1	5.21	7.98	10.04	10.58	9.99	9.62	10.14
	2		8.31	9.02	9.66	10.03	10.21	10.38
	3		13.61	15.73	17.32	17.09	17.27	16.04
	4		13.61	15.73	17.32	17.09	17.27	16.04
	5		13.61	15.73	17.32	17.09	17.27	16.04
Total		1.03	5.92	6.73	6.98	7.71	7.73	8.37
PREY : OTHER								
All size classes		0.01	0.02	0.10	0.22	0.40	0.53	0.72

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 1	

Age class	0	1	2	3	4	5	6+

PREY : ALL SPECIES							
All size classes	0.03	0.24	1.33	2.66	2.56	6.00	

Age class	PREY : MELANOGRAMMUS AEGLEFINUS						
1		8.69	5.51	6.40	6.11	12.61	
2			27.84	27.84	27.84		
Total		8.69	5.51	6.41	6.11	12.61	

Age class	PREY : MERLANGIUS MERLANGUS						
0		0.01	0.01	0.01	0.01	0.01	
1	0.54	6.19	8.94	9.54	9.93	14.75	
2		33.49	29.79	20.92	25.08	33.47	
Total	0.54	6.19	8.97	9.57	9.99	14.83	

Age class	PREY : TRISOPTERUS ESMARKI						
1	4.65	6.94	8.04	11.36	10.33	15.34	
2	6.73	1.72	3.30	9.15	11.42	22.87	
3	5.66	6.69	13.17	15.10	15.37	15.54	
Total	4.65	6.89	8.00	11.32	10.36	15.45	

Age class	PREY : CLUPEA HARENGUS						
1	8.17	10.47	10.77	11.29	10.49	8.93	
2			46.50	46.50	46.50	46.50	
Total	8.17	10.47	10.77	11.29	10.49	8.94	

Age class	PREY : SPRATTUS SPRATTUS						
1	4.02	8.71	13.51	10.15	10.39	5.48	
2	8.42	15.81	17.53	16.79	17.25	14.13	
3	8.46	12.03	15.97	19.41	18.61	19.71	
4	17.53	22.72	23.06	23.10	22.13	21.28	
5	17.53	22.07	22.69	22.77	21.07	19.96	
Total	4.11	9.65	14.37	11.25	11.46	5.88	

Age class	PREY : AMMOOYTIDAE						
1	1.79	1.88	2.02	1.94	2.07	2.41	
2	5.26	13.15	10.55	10.06	8.92	6.21	
3	8.48	13.56	11.22	10.65	10.24	6.59	
4	8.07	13.52	11.12	10.54	9.95	6.57	
5	10.18	13.58	11.33	10.76	10.59	9.90	
6	10.18	13.58	11.33	10.76	10.59	9.91	
Total	1.79	2.10	2.28	2.37	2.31	2.46	

PREY : OTHER							
All size classes	0.02	0.09	0.32	1.07	0.98	1.55	

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 2		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.01	0.02	0.02	0.02	0.02	0.03	0.03
PREY : GADUS MORHUA								
Age class	0	1.48	1.55	1.67	2.40	3.22	0.83	
Total		1.48	1.55	1.67	2.40	3.22	2.81	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	0.19	0.20	0.21	0.21	0.21	0.21	
Total		0.19	0.20	0.21	0.21	0.20	0.21	
PREY : MERLANGIUS MERLANGUS								
Age class	0	0.33	0.28	0.45	1.27	1.53	1.62	
	1	10.95	12.45	11.91	12.73	13.39	15.05	
Total		0.50	2.60	5.08	7.56	7.29	7.40	
PREY : TRISOPTERUS ESMARKI								
Age class	0	0.28	0.66	1.54	1.68	2.56	4.64	
	1	9.47	11.24	12.07	12.97	13.00	13.53	
	2	8.95	10.55	11.99	16.75	20.86	19.95	
	3	6.15	8.91	11.63	17.33	23.22	22.27	
	4	9.49	15.41	18.18	24.81	29.07	29.34	
Total		1.26	3.98	7.96	10.09	12.00	13.09	
PREY : CLUPEA HARENGUS								
Age class	0	4.17	7.33	7.37	7.50	7.72	11.11	
	1	12.20	23.34	17.68	19.96	20.68	19.59	
	2	10.62	21.44	21.44	21.44	21.44	21.44	
Total		6.27	12.32	12.82	15.02	15.46	18.73	
PREY : SPRATTUS SPRATTUS								
Age class	0	0.71	1.20	1.28	1.28	1.28	1.28	
	1	4.77	5.50	6.38	6.71	6.56	6.17	
	2	13.27	12.15	10.65	11.02	11.96	13.30	
	3	14.67	14.26	13.26	16.07	17.54	18.98	
	4	14.80	14.79	14.52	15.56	15.29	16.57	
	5	14.79	14.54	13.47	13.19	13.00	13.87	
	6	8.54	8.51	8.49	8.48	8.46	8.53	
Total		5.04	5.87	6.64	7.06	6.97	6.74	
PREY : AMMODYTIDAE								
Age class	0	0.47	0.39	0.42	0.59	0.70	0.61	
	1	3.85	4.39	4.02	3.98	4.27	3.82	
	2	8.80	11.28	11.94	11.16	10.62	11.44	
	3	15.73	17.15	17.72	17.07	16.36	17.40	
	4	16.10	17.38	17.85	17.25	16.73	17.41	
	5	17.85	18.91	18.74	17.57	16.90	17.90	
	6	17.52	19.17	19.11	19.68	19.31	18.85	
Total		0.70	0.61	0.64	1.10	1.29	1.04	
PREY : OTHER								
All size classes		0.01	0.00	0.01	0.00	0.01	0.01	

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 3		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.01	0.05	0.23	0.33	0.71	0.74	0.63
PREY : GADUS MORHUA								
Age class	0		3.18	4.14	3.27	4.20	3.91	5.96
Total			3.18	4.14	3.27	4.20	3.91	5.96
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	1.50	6.67	5.35	6.11	6.15	6.27	13.34
Total		1.50	6.67	5.35	6.11	6.15	6.27	13.34
PREY : MERLANGIUS MERLANGUS								
Age class	0	0.71	2.13	3.58	4.57	4.55	4.85	9.30
	1		66.26	38.26	23.97	38.74	11.84	34.56
	2				29.95	46.53		35.15
	3				29.95	46.53		35.15
	4				29.95	46.53		35.15
Total		0.71	2.13	3.66	4.58	4.62	5.08	9.44
PREY : TRISOPTERUS ESMARKI								
Age class	0	2.57	3.44	4.39	4.11	4.53	4.57	5.81
	1		12.75	29.47	32.32	29.83	31.31	28.18
	2		14.60	43.34	43.66	41.76	42.34	38.05
	3		14.60	33.44	36.53	36.99	37.06	36.53
Total		2.57	3.45	4.74	6.36	6.61	7.22	11.06
PREY : CLUPEA HARENGUS								
Age class	0		4.41	20.28	20.53	19.45	22.33	17.60
	1		24.00	43.57	61.08	61.13	60.77	70.07
Total			4.48	22.46	29.41	28.04	36.65	30.44
PREY : SPRATTUS SPRATTUS								
Age class	0	4.18	2.96	3.49	3.50	3.71	3.89	6.29
	1		5.58	8.92	10.82	12.34	10.55	12.87
	2		10.09	14.52	15.17	15.51	16.79	16.16
	3		19.82	17.84	17.81	17.91	18.69	16.28
	4		16.25	16.01	16.42	16.29	16.12	16.20
	5		16.25	16.01	16.42	16.29	16.12	16.20
Total		4.18	5.29	7.14	9.13	10.74	8.68	13.43
PREY : AMMODYTIDAE								
Age class	0	0.73	1.59	1.84	2.47	2.00	1.89	2.51
	1	4.71	8.50	7.20	7.76	7.53	7.62	8.10
	2		13.55	14.55	8.65	13.97	11.01	11.29
	3		9.47	11.51	11.62	15.56	12.91	13.70
	4		13.51	15.89	16.26	19.85	17.24	17.89
	5		13.51	15.92	16.67	20.01	17.47	18.35
	6		19.94	21.01	20.96	21.14	19.41	18.35
Total		0.73	1.66	2.21	3.39	2.98	2.42	2.96
PREY : OTHER								
All size classes		0.00	0.02	0.06	0.05	0.15	0.13	0.07

Appendix 2-C. Average prey weight (g) at time of ingestion for WHITING by age class of prey and predator by quarter for the total North Sea.

PREDATOR : WHIT		Area : TOTAL NORTH SEA		YEAR : 1991		QUARTER : 4		
Age class		0	1	2	3	4	5	6+
PREY : ALL SPECIES								
All size classes		0.05	0.18	0.29	1.15	0.50	0.58	0.47
PREY : GADUS MORHUA								
Age class	0	11.73	6.32	4.43	4.28	4.28	4.28	4.28
Total		11.73	6.32	4.43	4.28	4.28	4.28	4.28
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	9.75	14.92	17.13	17.76	12.02	16.52	16.37
	1			5.73	5.82	6.74	7.03	7.80
Total		9.75	14.92	17.13	17.76	12.02	16.52	16.37
PREY : MERLANGIUS MERLANGUS								
Age class	0	1.03	7.96	10.79	11.97	11.61	14.34	13.91
Total		0.98	7.96	10.81	11.97	11.62	14.34	13.91
PREY : TRISOPTERUS ESMARKI								
Age class	0	3.74	5.35	5.81	5.90	5.89	6.09	6.39
	1	8.12	20.76	25.36	21.73	29.95	16.71	18.78
	2		11.04	36.70	40.53	49.70	10.42	13.13
	3		11.04	11.42	12.61	18.45	21.50	25.63
Total		3.74	5.39	6.19	6.19	6.83	6.34	7.12
PREY : CLUPEA HARENGUS								
Age class	0	10.85	12.92	11.67	10.75	13.03	9.81	10.08
	1		26.17	26.17	26.17	26.17	26.17	26.17
Total		10.85	13.55	12.31	10.85	13.79	10.52	10.27
PREY : SPRATTUS SPRATTUS								
Age class	0	2.55	3.52	4.38	5.15	4.57	4.70	4.42
	1	5.09	10.23	10.17	9.98	9.65	9.33	9.26
	2	10.78	16.78	17.47	19.53	18.32	17.63	18.04
	3		22.67	21.41	21.02	19.55	18.47	18.32
	4		24.46	24.20	24.18	23.89	24.41	24.01
Total		2.61	3.88	5.00	6.34	5.65	5.55	5.44
PREY : AMMODYTIDAE								
Age class	0	1.92	4.01	3.42	2.15	3.01	2.73	2.86
	1	5.00	15.55	17.68	25.47	18.50	14.15	20.72
	2	5.05	18.50	19.89	24.03	19.23	13.99	17.83
	3	6.76	17.88	14.52	18.14	13.62	13.98	19.87
	4	9.81	26.47	25.93	33.27	25.24	21.31	29.80
	5	13.47	29.71	29.16	34.69	28.28	24.66	32.47
	6	13.47	30.81	30.33	35.07	29.45	26.11	33.26
Total		2.32	5.50	5.87	5.73	5.77	4.23	5.15
PREY : OTHER								
All size classes		0.03	0.07	0.07	0.18	0.15	0.22	0.15

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-D. Average prey weight (g) at time of ingestion for SAITHE by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT Area : TOTAL NORTH SEA YEAR : 1981 QUARTER : 1

Age class 3 4 5 6 7 8 9+

PREY : ALL SPECIES

All size classes 1.65 1.87 2.36 2.46 3.81 4.05

Age class PREY : MELANOGRAMMUS AEGLEFINUS

1 0.82 0.97 1.85 36.02 28.45 27.43
 2 32.48 39.27 59.46 105.60 118.81
 3 222.24 222.24 222.24
 4 222.24 222.24 222.24
 Total 0.82 0.98 1.93 37.13 30.42 29.49

Age class PREY : MERLANGIUS MERLANGUS

1 46.50 46.50 46.60
 2 112.39 112.39 112.77
 3 112.39 112.39 113.64
 4 119.09
 5 119.09
 Total 77.94 77.94 79.01

Age class PREY : TRISOPTERUS ESMARKI

0 1.44 1.44 1.44
 1 8.08 8.54 10.10 11.56 14.00 14.34
 2 8.08 25.67 23.55 21.13 20.59 20.60
 3 29.22 32.64 40.97 35.93 35.63
 4 81.49
 Total 8.08 10.80 13.77 14.61 16.72 17.00

Age class PREY : CLUPEA HARENGUS

1 55.69 55.69 55.69
 2 96.45 96.45 96.45
 3 127.68 127.68 127.68
 Total 69.95 69.95 69.95

Age class PREY : SPRATTUS SPRATTUS

1 14.40 14.40 14.47 19.60 19.60
 2 14.40 14.40 14.47 19.60 19.60
 3 14.40 14.40 14.47 19.60 19.60
 4 14.40 14.40 14.47 19.60 19.60
 Total 14.40 14.40 14.47 19.60 19.60

Age class PREY : AMMODYTIDAE

1 2.45 2.54 2.62 3.06 4.00 4.23
 2 5.00 5.41 5.83 6.55 4.00 4.23
 Total 2.58 2.70 2.84 3.46 4.00 4.23

PREY : OTHER

All size classes 1.32 1.40 1.36 0.72 1.03 1.09

Appendix 2-D. Average prey weight (g) at time of ingestion for SAITHE by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 2	

Age class		3	4	5	6	7	8 9+

PREY : ALL SPECIES							
All size classes		1.26	0.89	0.49	0.60	0.75	1.16

Age class		PREY : GADUS MORHUA					
	0	2.40	2.21	1.04	0.83	0.86	0.92
Total		2.40	2.21	1.04	0.83	0.86	0.92

Age class		PREY : MELANOGRAMMUS AEGLEFINUS					
	0		2.71	2.71	2.47	1.18	0.94
	1		67.20	67.20	67.20	67.20	67.20
Total			5.83	5.83	5.22	1.73	1.06

Age class		PREY : TRISOPTERUS ESMARKI					
	0				0.49	0.49	0.54
	1		34.50	34.50	33.09	26.80	30.50
	2		60.45	60.45	59.48	51.48	41.17
	3		61.92	61.92	61.12	54.17	41.99
Total			47.46	47.46	42.47	23.45	32.13

Age class		PREY : SPRATTUS SPRATTUS					
	0	0.96	0.96	0.96			
	1	0.96	0.96	0.96			
Total		0.96	0.96	0.96			

Age class		PREY : AMMODYTIDAE					
	0	2.65	2.65	2.65	1.03	1.03	1.03
	1	3.50	3.50	3.52	2.16	1.95	1.94
	2	20.17	20.17	19.79	5.32	5.35	5.35
	3	22.71	22.71	22.62	5.32	5.35	5.35
	4	22.47	22.46	22.34	5.32	5.35	5.35
	5	23.31	23.31	23.31			
	6	23.31	23.31	23.31			
Total		6.66	6.66	6.65	1.92	1.67	1.66

PREY : OTHER							
All size classes		0.47	0.46	0.43	0.56	0.53	0.44

Appendix 2-D. Average prey weight (g) at time of ingestion for SAITHE by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 3		
Age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		0.09	0.11	0.21	0.95	0.76	0.63	
PREY : GADUS MORHUA								
Age class	0			2.36	2.36	2.36	2.36	
Total				2.36	2.36	2.36	2.36	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class	0	4.46	5.06	7.46	25.66	13.60	6.12	
	1		9.86	36.46	36.55	37.27	40.53	
	2				112.93	112.35	111.75	
Total		4.46	5.06	8.38	28.93	17.61	8.06	
PREY : MERLANGIUS MERLANGUS								
Age class	0		3.47	5.58	24.95	28.68	28.68	
	1			24.46	24.46	24.46	24.46	
Total			3.47	6.00	24.86	27.78	27.78	
PREY : TRISOPTERUS ESMARKI								
Age class	0	2.70	1.68	1.71	3.92	7.06	12.14	
	1		14.35	45.01	41.53	39.06	38.20	
	2			51.53	46.02	40.97	39.41	
Total		2.70	1.68	1.75	4.68	9.45	16.33	
PREY : CLUPEA HARENGUS								
Age class	0		1.38	1.38	1.49	13.50	13.50	
	1				42.67	42.67	42.67	
	2				72.76	72.76	72.76	
	3						222.72	
Total			1.38	1.38	2.40	34.90	84.60	
PREY : AMMODYTIDAE								
Age class	0	1.09	1.09	1.09	1.28	1.33	1.33	
Total		1.09	1.09	1.09	1.28	1.33	1.33	
PREY : OTHER								
All size classes		0.04	0.06	0.10	0.30	0.36	0.42	

Appendix 2-D. Average prey weight (g) at time of ingestion for SAITHE by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA		YEAR : 1981		QUARTER : 4		
Age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		0.48	0.43	0.50	5.70	4.63	3.36	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
0			18.27	16.45	39.30	38.86	32.44	
1							24.70	
2							26.08	
Total			18.27	16.45	39.30	38.86	32.36	
PREY : MERLANGIUS MERLANGUS								
Age class								
1							13.11	
2							13.11	
Total							13.11	
PREY : TRISOPTERUS ESMARKI								
Age class								
0			6.88	6.43	6.41	7.11	8.03	
1			12.70	15.40	17.28	18.32	18.91	
2			24.37	25.90	27.41	28.96	29.67	
Total			8.37	8.78	9.72	11.78	13.74	
PREY : CLUPEA HARENGUS								
Age class								
0			22.03	22.03	19.12	19.03	13.11	
1			22.03	22.03	19.12	19.07	14.66	
Total			22.03	22.03	19.12	19.03	13.13	
PREY : SPRATTUS SPRATTUS								
Age class								
1					15.76	15.76	15.76	
2					15.76	15.76	15.76	
3					15.76	15.76	15.76	
4					15.76	15.76	15.76	
Total					15.76	15.76	15.76	
PREY : AMMODYTIDAE								
Age class								
0					2.79	2.79	2.79	
Total					2.79	2.79	2.79	
PREY : OTHER								
All size classes		0.43	0.39	0.37	0.87	1.36	1.87	

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-D. Average prey weight (g) at time of ingestion for SAITHE by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAIT		Area : TOTAL NORTH SEA		YEAR : 1986		QUARTER : 3		
Age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		3.35	4.10	8.98	12.52	7.07	22.61	32.28
PREY : GADUS MORHUA								
Age class								
Total		15.00	15.00	15.00	15.00	15.00	15.00	
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
Total		4.54	4.73	5.03	5.04	7.77	7.72	7.84
PREY : MERLANGIUS MERLANGUS								
Age class								
Total		6.26	6.75	7.77	7.86	7.86	7.86	382.08
PREY : TRISOPTERUS ESMARKI								
Age class								
Total		5.60	8.34	18.21	18.39	27.45	27.32	27.62
PREY : CLUPEA HARENGUS								
Age class								
Total			211.11	211.11	211.11	211.11	211.11	160.83
PREY : SPRATTUS SPRATTUS								
Age class								
PREY : AMMODYTIDAE								
Age class								
Total		18.73	14.93	3.40	0.72	5.53	5.51	5.55
PREY : OTHER								
All size classes		2.37	2.94	7.71	10.66	4.00	21.06	21.89

APPENDIX 2

Appendix 2-D. Average prey weight (g) at time of ingestion for SAITHE by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAITHE		Area	: TOTAL NORTH SEA			YEAR : 1991	QUARTER : 1	

Age class		3	4	5	6	7	8	9+

PREY : ALL SPECIES								
All size classes		0.26	1.00	4.80	6.73	10.09	15.10	63.29

Age class	PREY : TRISOPTERUS ESMARKI							
1		6.29	6.95	6.52	9.78	11.63	11.82	14.23
2		9.57	15.43	22.33	26.53	29.87	35.59	42.10
3		7.35	16.78	30.36	39.48	54.11	74.66	98.11
4				37.58	36.80	38.20	42.23	47.11
Total		6.98	8.98	15.57	23.49	28.36	29.52	37.38

Age class	PREY : CLUPEA HARENGUS							
1		2.81	2.21	2.71	3.71	5.13	8.23	69.44
2		62.90	51.48	45.96	36.28	34.54	31.70	70.51
3		62.90	53.53	53.38	46.08	54.58	65.72	76.70
4		62.90	53.65	56.96	158.09	70.70	79.04	98.06
5		62.90	58.80	114.26	124.77	115.88	95.63	116.35
Total		24.18	43.43	34.22	26.59	32.78	37.43	81.79

Age class	PREY : AMMODYTIDAE							
1		1.35	1.00	0.75	0.72	0.72	3.08	3.08
2		4.24	5.45	4.62	4.50		3.85	3.85
3		4.24	5.45	4.62	4.50		3.91	3.91
4		4.24	5.45	4.62	4.50		3.91	3.91
Total		1.36	1.02	0.75	0.72	0.72	3.10	3.10

PREY : OTHER								
All size classes		0.10	0.33	1.00	1.42	2.04	3.50	19.10

Appendix 2-D. Average prey weight (g) at time of ingestion for SAITHE by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAITHE		Area	: TOTAL NORTH SEA			YEAR : 1991	QUARTER : 2	

Age class		3	4	5	6	7	8	9+

PREY : ALL SPECIES								
All size classes		0.26	0.33	0.67	1.05	1.53	1.96	2.96

Age class	PREY : MELANOGRAMMUS AEGLEFINUS							
1		30.56	30.56	30.56	30.56	151.39	151.39	97.68
2						253.21	253.21	240.04
3						257.30	257.30	257.30
Total		30.56	30.56	30.56	30.56	175.23	175.23	110.68

Age class	PREY : MERLANGIUS MERLANGUS							
1						80.49	80.50	130.09
2				17.09	17.09	115.54	119.73	127.42
3				17.09	17.09	91.12	94.34	116.72
4				17.09	17.09	69.99	71.12	100.03
5				17.09	17.09	47.82	48.00	75.69
6				17.09	17.09	54.40	54.93	93.26
Total				17.09	17.09	94.47	97.17	120.89

Age class	PREY : TRISOPTERUS ESMARKI							
0		0.15	0.39	0.13	0.07			
1		2.04	3.08	15.12	20.49	21.32	19.80	19.92
2		15.94	18.36	24.37	27.19	32.48	30.07	26.39
3		47.76	25.21	25.62	28.02	34.80	34.67	36.90
4		47.82	25.17	25.42	31.26	35.07	34.79	36.90
Total		0.79	2.82	10.49	18.02	23.32	21.19	20.34

Age class	PREY : CLUPEA HARENGUS							
1			31.55	64.55	67.31	81.15	69.07	66.57
2			33.43	71.37	88.72	80.33	36.35	33.70
3			41.83	97.73	140.72	122.65	86.59	78.40
4			50.00	118.40	164.04	112.29	74.92	63.60
5			52.60	124.16	169.06	172.39	146.61	125.45
Total		5.20	37.75	85.70	121.38	105.10	50.19	44.09

Age class	PREY : AMMODYTIDAE							
0		1.21	1.78	1.45	1.45	1.17	0.80	0.74
1		2.61	3.29	2.86	2.74	2.21	1.78	1.72
2		15.79	25.38	19.14	16.93	15.18		
3		19.16	30.73	21.09	18.43	16.18		
4		18.74	30.07	20.89	18.38	16.04		
5		23.98	38.48	24.77	21.00	18.33		
6		23.98	38.48	24.77	21.00	18.33		
Total		2.31	2.74	1.82	1.83	1.40	0.92	0.85

PREY : OTHER								
All size classes		0.23	0.25	0.34	0.57	0.77	0.78	0.68

APPENDIX 2

Appendix 2-D. Average prey weight (g) at time of ingestion for SAITHE by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAITHE		Area	: TOTAL NORTH SEA			YEAR : 1991	QUARTER : 3	

Age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		1.84	3.02	3.64	3.57	12.90	10.96	13.51

Age class		PREY : MELANOGRAMMUS AEGLEFINUS						
	0	14.49	14.32	11.60	12.32	15.60	16.57	17.22
Total		14.49	14.32	11.60	12.32	15.60	16.57	17.22

Age class		PREY : MERLANGIUS MERLANGUS						
	0	6.26	6.50	5.82	5.18	6.62	10.30	8.97
Total		6.26	6.50	5.82	5.18	6.62	10.30	8.97

Age class		PREY : TRISOPTERUS ESMARKI						
	0	4.20	2.80	3.05	5.36	8.08	8.94	9.05
	1	26.77	15.88	15.88	20.64	29.49	29.12	30.42
	2	30.30	15.76	20.41	38.34	43.57	43.79	40.91
	3	30.29	15.64	20.15	38.34	43.57	43.79	40.91
Total		5.18	4.52	6.53	18.44	22.53	20.96	19.99

Age class		PREY : CLUPEA HARENGUS						
	1			20.74	19.41	46.47	53.57	62.08
	2	110.52	108.08	32.49	27.26	147.02	190.31	188.47
	3	110.52	108.08	47.95	38.53	175.47	207.94	215.86
	4	110.52	108.08	69.38	56.23	200.71	221.89	238.47
	5	110.52	108.08	75.37	61.67	228.51	248.71	266.33
Total		110.52	108.08	47.37	38.08	172.03	200.41	213.17

Age class		PREY : SPRATTUS SPRATTUS						
	0	5.76	5.76					
Total		5.76	5.76					

Age class		PREY : AMMODYTIDAE						
	0	1.55	1.65	1.73		3.43	3.43	3.43
	1					4.41	4.41	4.41
Total		1.55	1.65	1.73		3.48	3.48	3.48

		PREY : OTHER						
All size classes		0.39	0.69	0.59	0.35	2.11	2.10	2.32

APPENDIX 2

Appendix 2-D. Average prey weight (g) at time of ingestion for SAITHE by age class of prey and predator by quarter for the total North Sea.

PREDATOR : SAITHE		Area : TOTAL NORTH SEA			YEAR : 1991		QUARTER : 4	
Age class		3	4	5	6	7	8	9+
PREY : ALL SPECIES								
All size classes		6.21	8.84	16.66	28.89	40.35	41.41	38.99
PREY : MELANOGRAMMUS AEGLEFINUS								
Age class								
0		17.99	22.57	22.67	21.06	21.27	22.02	21.64
1		35.80	36.03	36.32	36.32			
Total		18.00	22.57	22.68	21.07	21.27	22.02	21.64
PREY : MERLANGIUS MERLANGUS								
Age class								
0		17.35	16.16	15.25	17.82	16.06	10.56	9.90
Total		17.35	16.16	15.25	17.82	16.06	10.56	9.90
PREY : TRISOPTERUS ESMARKI								
Age class								
0		7.02	7.47	8.19	9.47	9.88	8.38	9.73
1		24.51	39.27	39.27	43.80	52.58	52.58	18.51
2		31.61	44.25	43.30	49.36	62.85	62.85	
3		31.61	44.25	43.30	49.36	62.85	62.85	
Total		7.28	9.11	12.54	16.09	15.23	9.04	10.07
PREY : CLUPEA HARENGUS								
Age class								
0		0.84	0.68	1.13	1.21			44.49
1		12.24	16.62	33.14	38.43	39.89	39.92	45.69
2		16.48	22.53	44.45	51.93	53.47	52.98	54.22
3		20.90	38.24	76.74	102.87	102.56	95.11	93.55
4		20.90	38.24	76.74	102.87	102.56	95.11	93.55
5		20.90	38.24	76.74	102.87	102.56	95.11	93.55
Total		17.37	27.57	56.44	70.04	71.84	69.63	66.79
PREY : AMMODYTIDAE								
Age class								
0		0.91	1.82	3.02				
Total		0.91	1.82	3.02				
PREY : OTHER								
All size classes		1.38	4.20	8.93	16.10	18.74	3.55	3.15

APPENDIX 2 AVERAGE PREY WEIGHTS.

Appendix 2-E. Average prey weight (g) at time of ingestion for MACKEREL by age class of prey and predator by quarter for the total North Sea.

PREDATOR : MACK Area : TOTAL NORTH SEA YEAR : 1991 QUARTER : 1

Age class	0	1	2	3	4	5	6+
PREY : ALL SPECIES							
All size classes	0.02	0.24	1.11	1.11	1.11	1.11	0.39
PREY : AMMODYTIDAE							
Age class							
1		2.21	2.21	2.21	2.21	2.21	
Total		2.21	2.21	2.21	2.21	2.21	
PREY : OTHER							
All size classes	0.02	0.24	0.05	0.05	0.05	0.05	0.39

Appendix 2-E. Average prey weight (g) at time of ingestion for MACKEREL by age class of prey and predator by quarter for the total North Sea.

PREDATOR : MACK Area : TOTAL NORTH SEA YEAR : 1991 QUARTER : 2

Age class 0 1 2 3 4 5 6+

PREY : ALL SPECIES

All size classes 0.04 0.02 0.01 0.01 0.01 0.01

Age class PREY : GADUS MORHUA

0 2.08 2.20 2.36 2.31 2.25 3.38
Total 2.03 2.13 2.36 2.29 2.25 3.38

Age class PREY : MELANOGRAMMUS AEGLEFINUS

0 2.22 2.22 2.22
Total 2.22 2.22 2.22

Age class PREY : TRISOPTERUS ESMARKI

0 2.32 1.68 1.29 1.20 1.10 2.94
1 11.84 11.84 11.84 11.84 11.84
Total 2.32 1.69 1.43 1.68 1.99 4.63

Age class PREY : CLUPEA HARENGUS

0 14.43 14.01 13.55 12.68 11.96
1 18.77 25.67 21.22 25.05 24.55
Total 14.59 18.28 14.46 18.08 17.36

Age class PREY : SPRATTUS SPRATTUS

1 2.34 5.62 6.82 9.71 10.88 10.27
2 16.64 19.14 19.60 19.87 17.22
3 20.10 20.04 20.02 20.01 18.29
4 20.10 20.04 20.02 20.01 18.29
5 20.10 20.04 20.02 20.01 18.29
6 23.68
Total 2.18 6.90 9.06 12.66 13.94 13.48

Age class PREY : AMMODYTIDAE

0 0.89 1.09 1.50 1.55 1.58 1.56
1 3.11 2.99 2.60 2.96 2.91 3.84
2 5.32 5.50 6.03 11.16 11.26 11.35
3 5.32 29.58 27.41 26.14 28.12 12.76
4 29.74 27.51 26.48 29.64 13.02
5 29.70 27.50 26.42 29.13 12.90
6 29.76 27.53 26.57 29.94 13.14
Total 1.04 1.92 2.95 2.56 2.74 4.21

PREY : OTHER

All size classes 0.03 0.02 0.01 0.01 0.00 0.00

Appendix 2-E. Average prey weight (g) at time of ingestion for MACKEREL by age class of prey and predator by quarter for the total North Sea.

 PREDATOR : MACK Area : TOTAL NORTH SEA YEAR : 1991 QUARTER : 3

Age class 0 1 2 3 4 5 6+

PREY : ALL SPECIES

All size classes 0.02 0.02 0.02 0.02 0.01 0.01

Age class PREY : GADUS MORHUA

0 2.38 2.23 2.16 2.25 2.79

Total 2.38 2.23 2.16 2.25 2.79

Age class PREY : MERLANGIUS MERLANGUS

0 1.19 1.69 2.60 2.69 2.73

Total 1.19 1.69 2.60 2.69 2.73

Age class PREY : TRISOPTERUS ESMARKI

0 1.14 1.61 1.73 2.44 2.29 2.84

1 17.87 18.00 17.87 18.06

Total 1.14 1.61 1.73 2.52 2.35 2.92

Age class PREY : CLUPEA HARENGUS

0 4.16 4.84 5.70 9.82 12.26

Total 0.05 1.16 3.77 4.99 9.60 12.01

Age class PREY : SPRATTUS SPRATTUS

0 0.73 0.73 0.73 0.73 0.73

1 12.13 12.13 12.13 12.13 12.13

Total 1.33 4.56 10.15 11.75 12.08

Age class PREY : AMMODYTIDAE

0 0.98 1.45 1.44 1.42 1.17 1.57

1 4.90 4.48 9.18 9.16 22.16

2 11.89 21.17 12.53 18.51 23.97

3 19.02 21.17 19.29 20.95 22.69

4 20.65 21.17 20.73 21.12 21.61

5 21.17 21.17 21.17 21.17 21.40

6 21.17 21.17 21.17 21.17 21.26

Total 0.98 1.45 1.45 1.47 1.31 2.41

PREY : OTHER

All size classes 0.02 0.02 0.02 0.01 0.01 0.01

Appendix 2-E. Average prey weight (g) at time of ingestion for MACKEREL by age class of prey and predator by quarter for the total North Sea.

 PREDATOR : MACK Area : TOTAL NORTH SEA YEAR : 1991 QUARTER : 4

Age class 0 1 2 3 4 5 6+

PREY : ALL SPECIES

All size classes 0.05 0.00 0.01 0.00 0.00 0.00 0.00

Age class PREY : TRISOPTERUS ESMARKI

0	7.70	6.24	6.96	7.21	7.35	7.36
Total	7.70	6.24	6.96	7.21	7.35	7.36

Age class PREY : CLUPEA HARENGUS

0	7.04	7.01	7.00	6.94	6.85	8.93
Total	7.04	7.01	7.00	6.94	6.85	8.93

Age class PREY : SPRATTUS SPRATTUS

0	1.35	4.97	5.83	6.99	7.18	7.40	8.10
1		11.99	13.68	13.87	14.58	14.92	14.66
2		14.50	16.68	16.78	17.07	17.17	17.47
3			18.43	18.43	18.43	18.43	19.18
4			18.43	18.43	18.43	18.43	19.18
Total	1.35	5.50	7.83	9.40	10.69	11.68	12.70

Age class PREY : AMMODYTIDAE

0	0.83	1.22	3.88	3.99	3.99	3.99	4.02
1			4.39	4.52	4.52	4.52	4.55
6							21.04
Total	0.83	1.22	3.92	4.03	4.03	4.03	4.28

PREY : OTHER

All size classes 0.04 0.00 0.00 0.00 0.00 0.00 0.00

