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FEEDING HABITS OF NORTHEAST ATLANTIC HARP SEALS (*Phoca*  
*groenlandica*) IN THE BARENTS SEA, AUGUST-SEPTEMBER 1987.

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ABSTRACT:

STOMACH SAMPLES FROM 59 HARP SEALS HAVE BEEN EXAMINED FOR A QUALITATIVE AND QUANTITATIVE ANALYSIS OF THEIR FEEDING HABITS IN THE BARENTS SEA. THE MOST FREQUENT FOOD ITEMS WERE THE AMPHIPOD Parathemisto libellula (55% vol.), FISH (34% vol.) AND THE DECAPOD Pandalus borealis (9% vol.). OF THE FISH POLAR COD (Boreogadus saida), NYBELIN'S SCULPIN (Triglops nybelini) AND GREENLAND HALIBUT (Reinhardtius hippoglossoides) MADE UP THE MAJOR PART. REMAINS OF THE SQUID Gonatus fabricii WERE PRESENT IN 29% OF THE STOMACHS, BUT MADE UP ONLY 1% OF THE VOLUME ON AN AVERAGE.

## INTRODUCTION:

Repeated invasions of harp seals on the Norwegian coast in the 1970-ies and 1980-ies have caused concern about the ecological role of the harp seals in the Barents Sea. Previous attempts by the Institute of Marine Research, Bergen, to sample feeding harp seals in the Barents Sea in 1981 and 1983, were not succesful, mainly because of faliure to develope techniques for capturing seals in the water. In another attempt in August-September 1987 stomach contents were collected from 59 harp seals in the northern Barents Sea east of Svalbard (Wiig, 1987) These samples have been thoroughly examined and the results are summarizes in this paper.

## MATERIAL AND METHODS:

Between august 20th and september 5th a total of 59 harp seals, 1 bearded seal and 4 ringed seals were caught in the area east of Svalbard ( $78^{\circ}\text{N} - 80^{\circ}\text{N}$ ,  $20^{\circ}\text{E} - 50^{\circ}\text{E}$ ). All seals were shot in the water. The seals were dissected immediately after capture to minimize the degradation of the stomach content. Stomachs were opened, rinsed and the content frozen for later examination. Lower jaws were collected for agedetermination and female reproductive organs for determination of the reproductive status. All seals were weighed and measured for assessment of condition. These data have not been analyzed yet, but all seals appered to be in good condition. The blubber thickness was between 3 and 6 cm in most seals and only three seals had less than 3 cm of blubber measured over the sternum.

In the laboratorium the drained stomach content was weighed. (The contents were drained in the field to minimize the volume of the samples). This means that only the solid material is weighed and this weight should only be seen as a minimum.

The thawn sample was then carefully examined, looking through the whole material under a dissecting microscope. All fish, crustaceans and squids were identified or kept for later identification. All otoliths were kept.

The contribution of all major groups were estimated as a volume %. This is easier than trying to separate the material for weighing, and assuming a density of 1.0 for all groups the vol. % can be directly converted to biomass.

When referring to "vol. %" in the text and the tables it means: the average of all the volume percentages for that group.

"% of biomass" means: the % that group make up of the total biomass (calculated by adding the weights of all the stomach contents). The weight of each group is estimated from the vol. % of the group for all stomachs separately and then summarized. (Density of all groups = 1.0).

Stomachparasites were collected for later identification. This material will be analysed by B. Berland, Zoological Laboratory, University of Bergen.

#### RESULTS AND DISCUSSION:

The average weight of the contents of all stomachs was 259 g. Five stomachs contained less than 10 g of food. The average without these almost empty stomachs was 283 g. Since the content had been drained before weighing in the lab these averages will underestimate the contents in the stomachs. Therefore they should only be taken as a minimum.

The data can be looked at in different ways (see table 1 + table 2), but in any case the dominating food items are the amphipod Parathemisto libellula, the fishspecies: polar cod (Boreogadus saida), Nybelin's sculpin (Triglops nybelini) and Greenland halibut (Reinhardtius hippoglossoides), and the decapod Pandalus borealis.

The data have not yet been looked at for eventual effect of area, sex and age of the seals.

FISH:

On an average 34.4% (vol.) of the stomach content was "fish" (fresh fish, fishremains and otoliths). The fresh fish found in the stomachs were dominated by polar cod (6% of total biomass, 7% vol. and 50.6% of no. of fresh fish) and Nybelin's sculpin (3% biomass and vol., 28.3% of no. fresh fish). A large number of young Greenland halibut were present in some stomachs (2% biomass and vol., 14.5% of no. of fresh fish), see Table 1 + Table 2.

If one looks at the otoliths (see table 2) the dominance of polar cod becomes even greater - 65.8% of the number of fish estimated from the otoliths. Nybelin's sculpin contributed with 10.7% and Greenland halibut with 6.4% of the fish estimated from the otoliths.

Otoliths of *Liparis* spp. were found (8.7% of otoliths), but since no other remains of these species were found it is difficult to assess the significance of these species as a source of food of harp seals.

A small number (less than 2% vol. and biomass) of redfish (*Sebastes marinus*), long rough dab (*Hippoglossoides platessoides*) and capelin (*Mallotus villosus*) were present.

All otoliths (2.2%) from the capelin were found in one stomach. This seal was caught further south (74°N, 30°E) than the rest of the seals.

AMPHIPODS:

*Parathemisto libellula* was present in 95% of the stomachs and contributed on an average 55% of the volume. It represented 58% of the total biomass examined.

There was no sign of other species than *P. libellula* among the many *Parathemisto* examined. Very few other amphipods were present (less than 0.2% vol.), but a few gammarids and one isopod (*Idotea granulosa*) were found.

DECAPODS:

*Pandalus borealis* made up the major part (8.8% vol. and 12.6% of biomass) of the decapods found in the samples. Other decapods made up only on an average 0.5% of the volume. Among these *Sabinea septemcarinatus* (0.2% vol.) was the most dominating species.

CEPHALOPODS:

Remains of cephalopods were found in 31% of the stomachs. The squid *Gonatus fabricii* was present in 29% of the stomachs, but made up only 1% of the volume in average. Of the total biomass examined it made up only 0.7%. Remains of the octopus *Bathypolypus arcticus* was found in 2 stomachs (one might have been *Elodone cirrhosa*).

BIVALVES:

Two stomachs contained remains of bivalves. These might have been secondary material from fish eaten by the seals. Anyway they only made up 0.03% of the volume.

CONCLUSIONS:

From the samples collected in 1987 it seems that polar cod and the amphipod *Parathemisto libellula* are very important food items for Northeast Atlantic harp seals, making up at least 60% of the vol. and total biomass. In the samples from 1983 only amphipods (*Parathemisto* sp.) were found (n=8, see enclosure 1). Polar cod and *Parathemistos* sp. has also been found in stomachs from harp seals in the Northwest Atlantic. Samples from West Greenland (unpub. data) and from Eastern Canada (Finley and Gibb, in press) have contained large quantities of polar cod and *Parathemisto* sp.

In our study only two commercially fished species were found in significant quantities. This was the decapod *Pandalus borealis* (8.8% vol., 12.6% of biomass) and young Greenland halibut (2.1% vol., 1.8% of biomass).

Remains of *Liparis* spp. (8.7% of otoliths) and the squid *Gonatus fabricii* were found in many stomachs, but contributed very little to the volume or biomass (less than 1%). Therefore it is hard to say how important these species are.

It must be emphasized that the conclusions in this paper are based on a relative small number of samples from a large area. More samples are needed before one can get a good idea of the feeding habits of harp seals in the Barents Sea. More information about the distribution and population size of the harp seals in the Barents Sea are also needed before one can make calculations on the total consumption of the population. Information about the daily food intake of the seals are also needed.

TABLE 1. DESTRIIBUTION OF THE FOOD ON MAJOR GROUPS OF ANIMALS:

	1	2	3
<u>FISH:</u>	X of % vol.	Fish = 100 %	% of biomass
Boreodadus saida	7.0 %	20.3 %	6.2 %
Triglops nybelini	2.9 %	8.4 %	3.3 %
Reinhardtius hippo.	2.1 %	6.1 %	1.8 %
Sebastes marinus	0.2 %	0.6 %	0.1 %
Hippoglossoides pl.	-	-	-
Mallotus villosus	-	-	-
Other fish	0.3 %	0.8 %	0.3 %
Unknown	21.9 %	63.7 %	16.0 %
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FISH TOTAL	34.4 %	99.9 %	27.7 %
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<u>CRUSTACEA:</u>			
Parathemisto libellula	54.9 %		58.4 %
Gammaridae spp.	0.1 %		-
Other amphipods	0.1 %		-
Pandalus borealis	8.8 %		12.6 %
Sabinea septemcarinatus	0.2 %		0.2 %
Other decapoda	0.3 %		0.1 %
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CRUSTACEA TOTAL	64.4 %		71.3 %
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<u>CEPHALOPODA:</u>			
Gonatos fabricii	1.0 %		0.7 %
Octapoda spp.	0.2 %		0.2 %
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CEPHALOPODA TOTAL	1.2 %		0.9 %
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BIVALVIA TOTAL	0.03 %		-
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"X of % vol." is the mean of how much the species contributed to the volume in %. Column 2 shows the distribution in the group "fish" when fish = 100 %. Column 3 shows the % of each group of the total biomass.

TABLE 2. COMPOSITION OF THE FISH CONSUMED BY HARP SEALS.

	1	2	3
	FRESH FISH	FISH FROM OTO.	F. FISH + OTO.
Polar cod (B. saida)	50.6 %	65.8 %	64.0 %
Nyb. sculpin (T. nyb.)	28.3 %	10.7 %	12.8 %
G. halibut (R. hippo.)	14.5 %	6.4 %	7.4 %
Redfish (S. marinus)	1.8 %	2.0 %	2.0 %
L.r. dab (H. plates.)	1.8 %	1.3 %	1.4 %
Capelin (M. villosus)	0.0 %	2.2 %	1.9 %
Liparis spp.	0.0 %	8.7 %	7.7 %
Other fish	3.0 %	0.2 %	0.5 %
Unknown	0.0 %	2.7 %	2.4 %

TABLE 2. COMPOSITION OF THE FISH CONSUMED BY HARP SEALS IN THE BARENTS SEA AUGUST-SEPTEMBER 1987. Column 1 shows the composition of the fresh fish found in the stomachs. Column 2 shows the composition of the number of fish calculated from the otoliths. Column 3 shows the composition calculated by adding the number of fresh fish and the number calculated from the otoliths.



TABLE 3. LIST OF SPECIES FOUND IN STOMACHS OF HARP SEALS CAUGHT IN  
THE BARENTS SEA AUGUST-SEPTEMBER 1987.

FISH:

Polar cod (*Boreogadus saida*)  
Long rough dab (*Hippoglossoides platessoides*)  
Spotted snake blenny (*Leptoclinus maculatus*)  
Sea snails (*Liparis* spp.)  
Capelin (*mallothus villosus*)  
Greenland halibut (*Reinhardtius hippoglossoides*)  
Redfish (*Sebastes marinus*)  
Nybelin's sculpin (*Triglops nybelini*)

CRUSTACEA:

Gammaridae sp.  
*Parathemisto libellula*

*Idotea granulosa*

*Lebbeus polaris*  
*Pandalus borealis*  
*Pasiphaea tarda*  
*Sabinea septemcarinatus*

CEPHALOPODA:

*Bathypolypus arcticus*  
*Elodone cirrhosa* (unsertain det.)  
*Gonatus fabricii*

MOLLUSCA:

*Astarte elliptica*  
*Leda pernula*

ENCLOSURE 1. SAMPLES FROM THE BARENTS SEA 1981 AND 1983.BARENTS SEA AUGUST 1981.

1 harp seal (male, 122 cm long, 53 kg) was caught 17. august 1981. The stomach was empty.

BARENTS SEA AUGUST-SEPTEMBER 1983.

8 harp seals were caught east of Svalbard and south of "Kvitøya" (80° N 31° E), 11.- 18. september 1983.

When the stomachs were examined three were empty and the rest contained 4, 3, 3, 3 and 6 deciliter of amphipods, respectively (Parathemisto sp., T. Øritsland, probably Parathemisto libellula).

no.	date	sex	length	weight	volume	content
1	11/9	F	138 cm	70 kg	0 dl	-
2	11/9	M	124 cm	59 kg	4 dl	amphipoder
3	14/9	F	112 cm	-	3 dl	amphipoder
4	15/9	F	116 cm	35 kg	3 dl	amphipoder
5	15/9	M	133 cm	77 kg	3 dl	amphipoder
6	18/9	M	162 cm	130 kg	6 dl	amphipoder
7	18/9	M	155 cm	134 kg	0 dl	-
8	18/9	M	171 cm	160 kg	0 dl	-

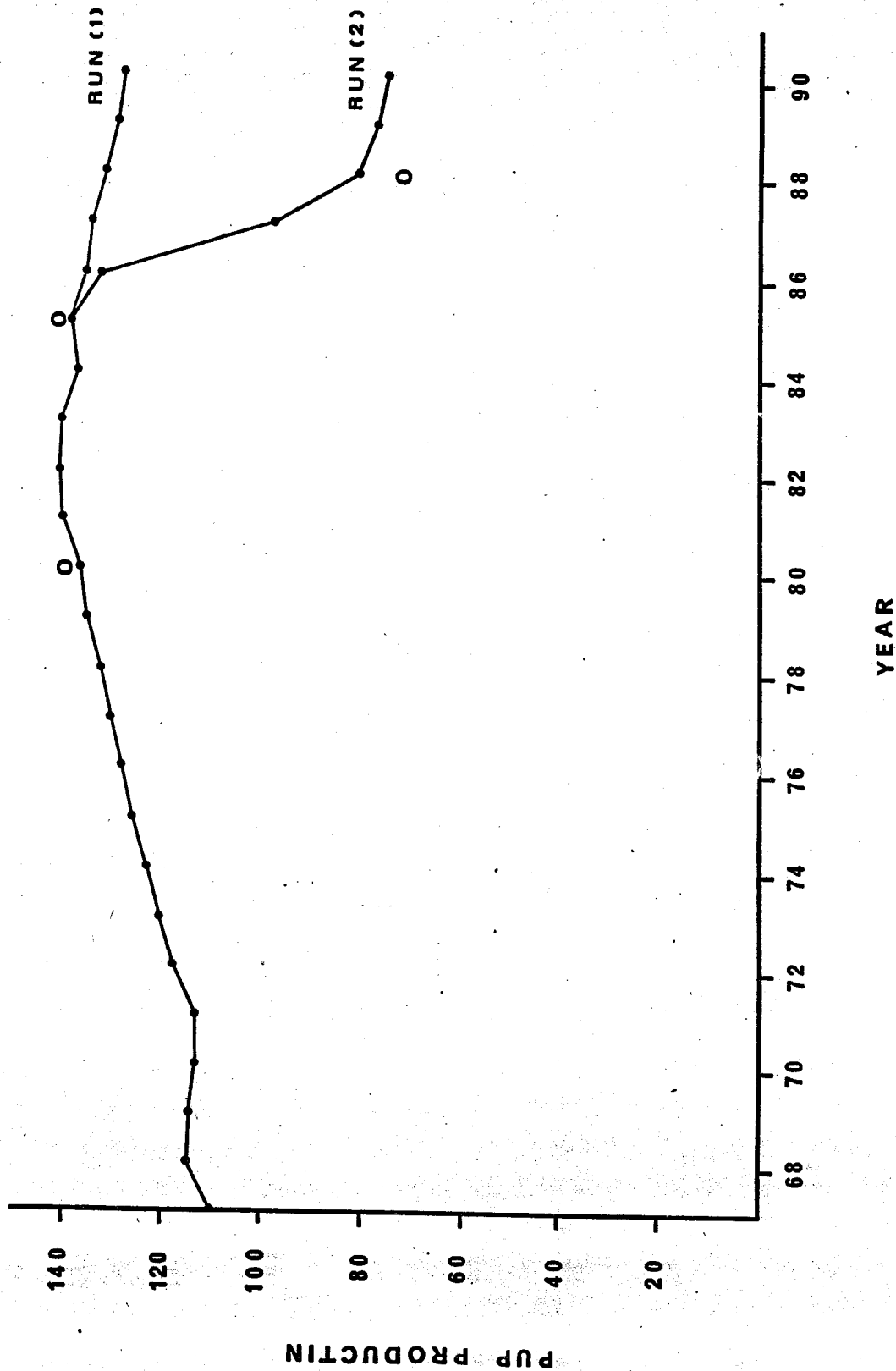


Figure 1. Calculated pup production 1967 - 1990.

(1): Constant natural mortalities.

(2): Higher natural mortalities 1985-1987.

O : Estimated number of breeding females from USSR aerial photographic surveys.