ARCTIC
VOL. 47, NO. 2 (JUNE 1994) P. 109-114

Diet of Ringed Seals (*Phoca hispida*) in a Fjord of West Svalbard

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(Received 23 November 1992; accepted in revised form 26 August 1993)

ABSTRACT. Stomachs of 134 ringed seals from West Svalbard (Kongsfjorden) and East Svalbard (drift ice) were examined. Twenty-four prey taxa were found. The most important items were arctic cod (*Boreogadus saida*), shrimp (*Pandalus borealis*), krill (*Thysanoessa inermis*) and the amphipod *Themisto libellula*. In spring young redfish (*Sebastes* sp.) was an important food item; in summer seals fed on dense aggregations of krill in front of glaciers. Mysids, amphipod crustaceans and small size classes of coastal fish species were abundant in Kongsfjorden, but seals take them as secondary food items only.

Key words: ringed seals, *Phoca hispida*, arctic food web, fjord ecology, Svalbard, prey taxa

RÉSUMÉ. On a étudié l'estomac de 134 phoques annelés du Svalbard occidental (Kongsfjorden) et du Svalbard oriental (glace de dérive). On a recensé 24 espèces-proies. Les plus importantes étaient la morue arctique *(Boreogadus saida)*, la crevette *(Pandalus borealis)*, le krill *(Thysanoessa inermis)* et l'amphipode *Themisto libellula*. Au printemps, la sébaste juvénile (sp. *Sebastes)* représentait une importante source alimentaire; en été, les phoques se nourrissaient du krill trouvé en forte concentration au pied des glaciers. Dans le Kongsfjorden, il y avait en abondance des mysis, des amphipodes et des espèces de poissons côtiers de petite taille, mais qui ne constituaient pour les phoques qu'une source alimentaire secondaire.

Mots clés : phoques annelés, *Phoca hispida*, réseau trophique de l'Arctique, écologie de fjord, Svalbard, espèce-proie

Traduit pour *Arctic* par Nésida Loyer.

INTRODUCTION

The ringed seal is the most abundant arctic pinniped and the most common seal in the Svalbard area. It has been studied in the Canadian Arctic (Dunbar, 1941; McLaren, 1958; Smith, 1987), Alaska (Lowry *et al.*, 1978, 1980), the Okhotsk Sea (Fedoseev, 1965), Greenland (Siegstad, 1988) and Svalbard (Gjertz and Lydersen, 1986; Lydersen *et al.*, 1985). Ringed seals appear to be generalist feeders, with a diet dominated by fish and medium-sized crustaceans. Few attempts have been made to relate the diet to the occurrence of potential prey species in the locality. Accordingly, little is known about how the ringed seal selects its prey.

Here we present data on gastrointestinal contents of ringed seals and on the occurrence and local distribution of potential prey species in Kongsfjorden, a fjord on the west coast of Svalbard.

STUDY REGION AND METHODS

Kongsfjorden (79°59′N, 12°E) is a West Svalbard fjord partly sheltered from direct exposure to the Greenland Sea by the island of Prins Karl Forland. The fjord is about 20 km long and 7-10 km wide, with depths exceeding 300 m in its outer part and with shallow basins of 40-60 m in the innermost parts. A chain of small islands and skerries divides the fjord into two basins (Fig. 1).

Water temperature ranges from +1 to +4°C in summer. During winter and early spring the entire water column is cooled down to −1.8°C. Kongsfjorden is naturally separated into an inner basin with brackish waters from glacial outflow and an outer basin influenced directly by open sea inflows. In summer the salinity ranges from 25.0 ppt at the surface of the inner basin to 34.5 ppt in the outer basin.

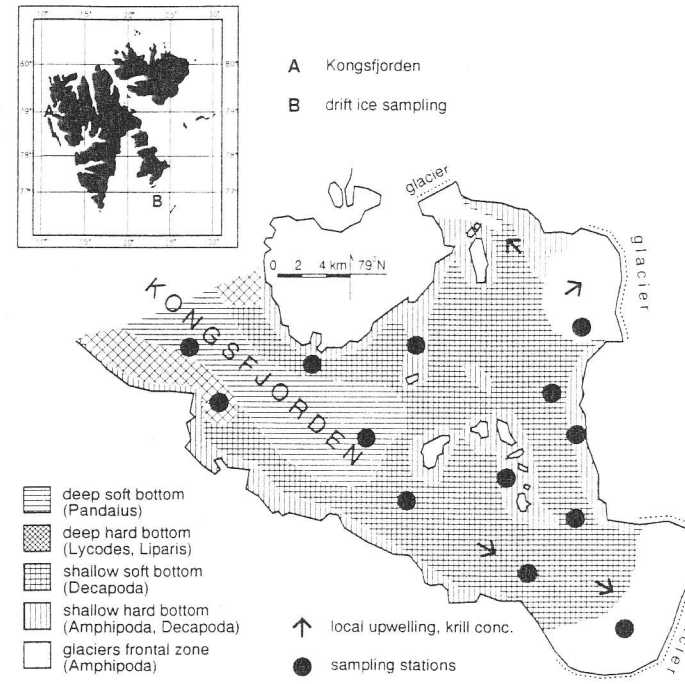

FIG. 1. Distribution of major faunal assemblages in Kongsfjorden. Dots indicate sampling stations. Inserted map shows study areas — A) Kongsfjorden, B) drift ice.

The bottom consists of reddish glacier clay sediments in the deeper parts of the fjord and a hard, rocky bottom on the shallows (Weslawski *et al.*, 1991). Sea ice conditions are variable, but fast ice usually persists from December until the begining of June in the inner part of the fjord. In summer large amounts of glacier ice may occur as growlers and minor icebergs. In 1985 only the inner part of the fjord was ice covered during the sampling period. In 1986 the fast ice

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was very extensive, and the entire fjord was ice covered during most of the winter. In 1987 there was very little ice in February and the first part of March, and most of the seals were shot about one week after freeze-up in the middle of March.

We sampled invertebrates and fish twice in Kongsfjorden — once in August 1988 from a research vessel, and once from the fast ice in March 1989. Plankton was sampled with WP-2 nets (0.6 m opening diameter, 200 μm mesh size) hauled vertically, and benthos with triplicate use of a Van Venn grab sampler (0.16 m^2 sampling area) and a dredge (0.3 per 1 m frame with 1 mm mesh size). Twelve stations were sampled in 1988 and two in 1989. Results from hydrology and plankton hauls are presented in a separate paper (Weslawski *et al.*, 1991). Specimens were identified to the lowest possible taxon. Samples of each species were weighed and energy content measured by a microbomb calorimetry (method described in Szaniawska and Wolowicz, 1986). Characteristic dimensions were measured and weight/dimension relationships established.

From the end of February to mid-September in three consecutive years (1985-87), 134 seals were shot. Of these, 115 were collected in Kongsfjorden and 19 in the drift ice in the sea east of Svalbard (between Edgeøya [77°30′N, 20°E] and Hopen [76°37′N, 24°40′E]). In Kongsfjorden the approximate location was noted, and the locations were classified as outer, central and inner fjord basins. The inner basins for a large part are close to glacier fronts (Fig. 1).

The animals were weighed and standard measurements were taken (American Society of Mammalogists, 1967). The animals were aged by the annular growth layers of the dentine of one canine (Smith, 1987). Reproductive status of females was determined by inspection of the uteri, nulliparous females being classified as sexually immature. Males were classified as mature if they had a blackened face and scent characteristic of a breeding ringed seal male (McLaren, 1958; Hardy *et al.*, 1991), or in some cases when this was not recorded if they were more than seven years old (Smith, 1987).

The contents of the stomach and intestines were removed and frozen for later analysis. After thawing, the contents were mixed, weighed and washed on a 0.5 mm sieve and reweighed. The food remains were classified to the lowest possible taxon. Identifiable remains were counted, measured and when possible weighed. The otoliths were measured along the longest axis, crustaceans were measured from the tip of the rostrum to the end of telson (total length). When only animal fragments were found, the measurements of carapax or telson were taken. Conversion from the length of fragments to the total length was made using the empiric equations from the whole animals.

To obtain pre-ingestion weights, lengths and energy content of the food items, we used coefficients calculated on the basis of specimens collected in Kongsfjorden (see above). Back calculations of fish lengths from the otoliths were done following formulas given by Härkönen (1986).

Small meiofaunal animals such as *Calanus finmarchicus*, harpacticoid copepods, small shells of gastropods and bivalves were regarded as remains of food of fishes that had been eaten by the seals. The numerous parasites found belonged to three groups: seal parasites (acanthocephalans, nematodes and cestodes), fish parasites (copepods) and crustacean parasites (isopods). They are not considered further in this study.

In descriptions of seasonal changes, we define spring as April, May and June, summer as July and August, autumn as September and winter as February and March. These somewhat arbitrary divisions reflect our sampling schedule.

RESULTS

Kongsfjorden Sampling

Kongsfjorden consists of various habitats, each with its characteristic invertebrate community (Fig. 1). The relatively deep (30-200 m), soft bottom with *Pandalus borealis* as a dominant species, followed by some small Decapoda (*Eualus gaimardii*, *Lebbeus polaris*) and Amphipoda (*Paroediceros lynceus*, *Anonyx nugax*), occupies the major part of the fjord. The highest biomass occurred on deep, hard bottom at the entrance to the fjord, where we found large sea urchins, fishes and clams. Shallow areas with hard bottom were covered with laminariae forming a phytal zone with abundant fauna. On shallow (below 20 m), soft bottom we found only a small number of amphipods. In the innermost brackish basins of the fjord, swarms of macroplankton (*Thysanoessa inermis*, *Themisto libellula*) aggregated at glacier cliffs (Fig. 1). Here krill was sampled in densities of 0.1-3 individuals/m^3, and shoals observed from the rubber boat indicated densities exceeding 10 individuals/m^3. The outer basin was richer in mesozooplankton (*Calanus*, *Pseudocalanus*) but no concentrations were observed there.

We only list animals exceeding 10 mm in length from the marine biological surveys as potential prey species, as it seems to be the lower length limit for food items for ringed seals (McLaren, 1958; Fedoseev, 1965; Bradstreet and Cross, 1982; Lowry *et al.*, 1980; Smith, 1987; Siegstad, 1988). Thirty such species were found in the surveys (Table 1). Among the 24 benthic species were 4 fishes, 6 decapods and 12 amphipods. Pelagic forms were represented by 1 fish, 3 crustaceans, a chaetognath and a sea snail. Their sizes ranged from 10 mm *Ischyrocerus* to 250 mm long arctic cod (*Boreogadus saida*), with individual weights 15 mg to 250 g respectively (Table 1; Fig. 2). Energy densities ranged from 12 kJ/g dry mass in spiny crustaceans (*Caprella septentrionalis*) to 24.2 kJ/g dry mass in arctic cod.

For large mobile species we can only give relative abundances as seen in dredge hauls. The most common benthic species were the amphipod *Anonyx nugax* and schizopod *Mysis oculata*, which occurred in 50% of the hauls. Next was *Paroediceros lynceus*, which made up to 45% of all animals from the dredge samples, and its density was estimated to be more than 100 individuals/m^2 in some places. Of pelagic forms, chaetognaths were found in all samples, ranging from 2 to 10 specimens/m^3. Only single specimens of arctic cod were found in any haul.

Contents of Seals' Gastrointestines

A total of 24 prey species was found in the gastrointestinal contents of seals; 15 occurred in less than 10% of the samples

TABLE 1. Characteristics of potential food items sampled in Kongsfjorden[1]

Taxon	Wet weight g	Length mm	Energy Content kJ/g d.w.	F(%)
Benthic and hyperbenthic fauna				
Amphipoda				
Anonyx nugax	0.8	30	14.52	50
Onisimus edwardsi	0.25	20	14.86	8
Stegocephalus inflatus	0.5	20	—	8
Weyprechtia pinguis	0.5	25	16.99	33
Halirages fulvocinctus	0.2	15	13.98	25
Ischyrocerus spp.	0.5	10	13.02	17
Ampelisca spp.	0.5	25	—	8
Atylus carinatus	0.5	25	—	8
Paroediceros lynceus	0.25	20	—	33
Acanthostepheia malmgreni	1	35	—	8
Gammarus setosus	0.5	25	15.4	8
Caprella septentrionalis	0.1	15	12.3	25
Decapoda				
Pandalus borealis	6	70	—	33
Eualus gaimardii	1	45	17.29	25
Lebbeus polaris	1	45	16.12	8
Sabinea septemcarinata	0.7	52	15.7	33
Spirontocaris turgida	0.7	40	14.65	17
Sclerocrangon ferox	0.7	52	14.03	8
Mysidacea				
Mysis oculata	0.12	15	21.1	50
Isopoda				
Synidotea nodulosa	0.12	10	—	8
Pisces				
Agonus decagonus	2	60	—	17
Careproctus reinhardti	10	80	—	8
Leptoclinus maculatus	20	60	—	17
Lycodes sp.	10	150	—	8
Pelagic organisms				
Crustacea				
Thysanoessa inermis	0.25	19	—	69
Themisto libellula	0.45	23	16.71	83
Mysis oculata	0.12	15	21.1	14
Mollusca				
Clione limacina	0.4	15	—	3
Chaetognatha				
Sagitta elegans arctica	0.1	30	20.64	100
Pisces				
Boreogadus saida	8	80	24.2	50

[1]Weights and lengths are mean values. Energy contents are duplicate determinations on pooled samples for each species. F(%) — percent occurrence in samples.

or were represented only by single specimens (Table 2). The more common prey were the decapods *P. borealis* and *Sabinea septemcarinata*, euphausids *Thysanoessa inermis*, amphipods *Themisto libellula*, *Gammarus wilkitzkii*, arctic cod *B. saida*, young redfish *Sebastes* sp., other fish-like *Lycodes* spp. and two species of Lumpenidae.

Of the samples containing the shrimp *P. borealis*, 64% contained 1 or 2 shrimps; only 1% of the samples contained more than 100 specimens. Most of the shrimps were eaten in spring and in the outer part of the fjord. The distribution of *P. borealis*, as judged from the marine biological surveys, is restricted to the outer and deepest parts of Kongsfjorden (Fig. 1).

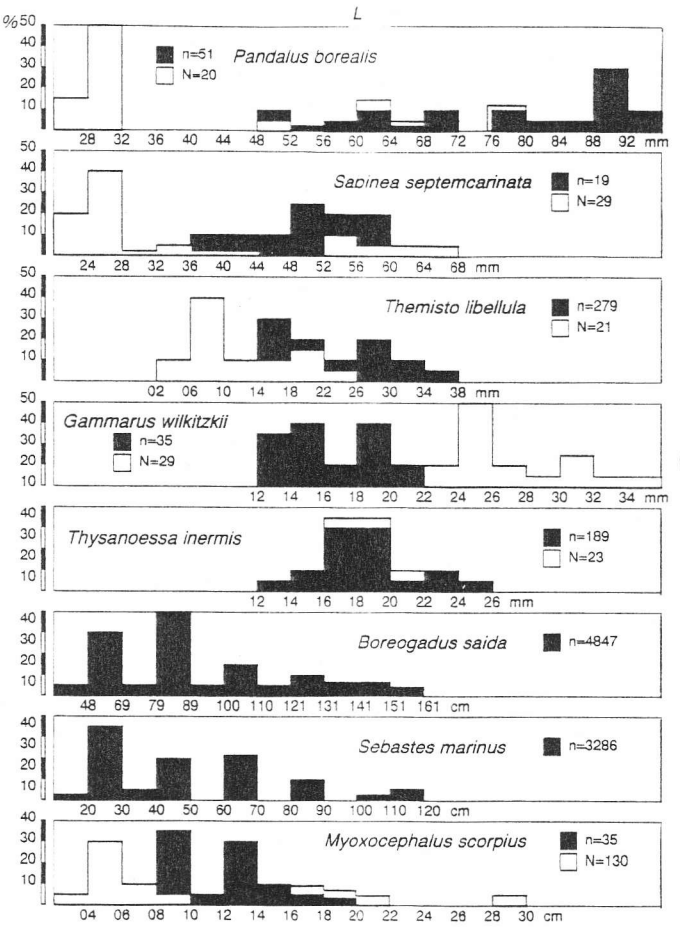

FIG. 2. Comparison of length frequencies of prey items in the gastrointestinal tracts of ringed seals (solid bars) and from samples in Kongsfjorden (open bars).

Of the samples containing *T. inermis*, 60% contained more than 10 and 35% more than 100 specimens. Most of the euphausids were found in seals shot in summer and mainly in the central and inner parts of the fjord. Aggregations of *T. inermis* in Kongsfjorden were found during our summer survey near local upwellings in the vicinity of sills and nearby glacier cliffs (Fig. 1). Most individuals (80%) were found in surface waters. Along the West Svalbard coast (and Kongsfjorden) shoals of *T. inermis* used to appear in summer and early autumn but rarely in other seasons (JMW, pers. obs.).

From 10 to 100 specimens of *Themisto libellula* were found in most of the stomachs sampled. *T. libellula* was found in the same group of samples as *T. inermis* — mainly in summer and in the inner part of the fjord. In Kongsfjorden, *T. libellula* was much more common in the August than in the March survey. It was distributed all over the area, but most frequently near the surface in the inner part of the fjord.

All but two specimens of *Gammarus wilkitzkii* were found in samples collected in May from the sea east of Svalbard.

TABLE 2. Food items found in the gastrointestinal contents of ringed seal (Kongsfjorden and drift ice material)[1]

Species	n	F(%)
Euphausiacea		
Thysanoessa inermis	9912	34
Thysanoessa longicaudata	1	1
Meganyctiphanes norvegica	1	1
Mysidacea		
Mysis oculata	3	1
Decapoda		
Pandalus borealis	344	44
Sabinea septemcarinata	33	12
Eualus gaimardii	8	5
Sclerocrangon boreas	3	1
Amphipoda		
Gammarus wilkitzkii	112	4
Gammarus setosus	2	1
Melita sp.	1	1
Ischyrocerus sp.	1	1
Onisimus littoralis	1	1
Themisto libellula	1215	48
Polychaeta		
indet. *Nereis* sp.?	5	3
Mollusca		
indet. *Gonatus* sp.?	8	8
Pisces		
Boreogadus saida	4827	97
Sebastes marinus	3782	53
Liparidae	10	5
Lumpenidae	197	10
Lycodes sp.	69	14
Gadus morhua	10	6
Mallotus villosus	6	6
Myoxocephalus scorpius	37	15

[1]N — total number of individuals. F(%) — percent frequency of occurrence.

The remaining two specimens were found in seals shot in spring in Kongsfjorden. No *G. wilkitzkii* were found during our August survey in Kongsfjorden, but this species was abundant in March 1989.

Single specimens of *Sabinea septemcarinata* were found in most of the samples containing this species (70%). It occurred in gastrointestinal samples from all Kongsfjorden localities and seasons. The distribution of *S. septemcarinata* in Kongsfjorden was restricted to moderate depths (10-70 m) and diversified bottom (Fig. 1).

Arctic cod (*B. saida*) of 0 age group (<1 year old) were found in seals shot in the outer fjord basin and mainly in spring, while older (1-year-old) fish were found in summer in the central and inner fjord basins. During sampling in summer 1988 and spring 1989 numerous small arctic cod were observed close to the sea ice, but only a few specimens were caught.

Almost all specimens of redfish *Sebastes* sp. were found in spring samples from the outer part of Kongsfjorden. No redfish were found during our field studies in Kongsfjorden. Benthic fish *Lycodes* were taken by seals in all seasons, mostly in the outer part of the fjord. Judging from the dredgings, the most common species in Kongsfjorden was *Lycodes vahlii*, ranging in length from 6 to 15 cm, caught in the deep, outer fjord in August 1988. Identification to species level of *Lycodes* specimens from seal stomachs was difficult since all otoliths came from young specimens and were eroded. The two species of Lumpenidae found were most likely *Anisarchus medius* and *Lumpenus lampraeteformis*. Lumpenidae were eaten in small amounts, not more than 15 fishes per sample, mostly in samples from the inner part of the fjord. In the marine biological surveys *A. medius* occurred commonly in moderately deep basins of the fjord.

Most of the food items listed in Table 1 were also common in the gastrointestinal contents of the seals (Table 2). The exception was the chaetognath *Sagitta elegans arctica* and some amphipods from the shallow, hard bottom (mostly *Weyprechtia pinguis*), all with relatively high density and energy content.

Most of the seals (65%) contained remains of two or three different prey species. Fifteen percent contained only one prey species; 20% contained four to seven species.

Back calculating from otolith lengths, the heaviest single prey item was a cod (*Gadus morhua*) of 18 cm length and about 70 g weight. The longest was an eelpout (*Lycodes* sp.) of 21 cm length and 22 g weight. The smallest regularly eaten prey were amphipods of 10-15 mm length. The seals were feeding on the largest available length classes of invertebrates, while the 0+ or 1+ age groups were the most commonly taken fish (Fig. 2). The length of arctic cod taken by seals increased from early spring (102 mm ±15 SD in February-May) to autumn (109 mm ±20 SD in June-September), which reflects growth and the absence of 0 group individuals in the fall.

Results from Drift Ice Samples

Our material came from two different regions, the drift ice east of Svalbard and a west Svalbard fjord. Because of seasonal differences in diet, we compare only samples collected in spring from the two areas (Fig. 3). Arctic cod and *Sebastes* sp. predominate in both places. Benthic fishes were more important in the diet of seals from the drift ice than from Kongsfjorden. As seen in Figure 3, "other fish," *Lumpenus* spp. and herring (*Clupea harengus*) were the most common. Seals in the drift ice took more pelagic (sympagic *G. wilkitzkii*) crustaceans than those in the fjord.

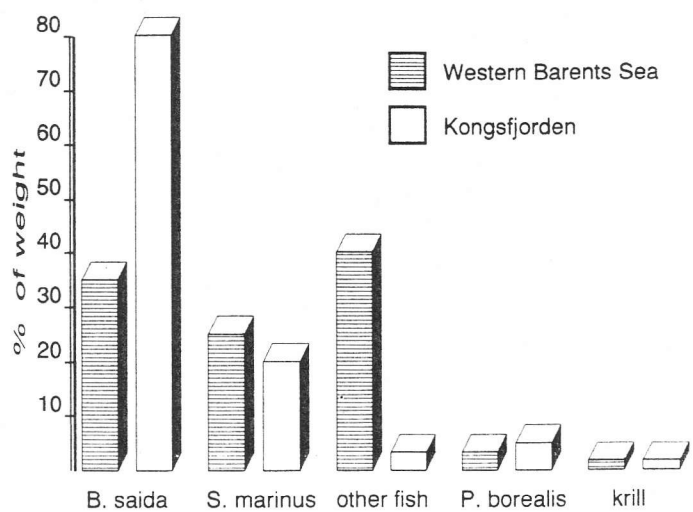

FIG. 3. Major prey items in the gastrointestinal tracts of ringed seals from Kongsfjorden and Western Barents Sea.

From the fjord and drift ice sampling, it is clear that in both localities fish were predominant in terms of mass and energy intake. *B. saida* was the most constant and energetically most important part of the diet. *Sebastes* was an important food item in spring but was negligible in summer and autumn. Benthic fish (*Liparis liparis*, *Myoxocephalus scorpius*) were found throughout the year but seemed to be more commonly eaten in spring. Weight rate of invertebrates in the diet varied from 0.2% in winter to 2.5% in autumn. Among the invertebrates, benthic crustaceans (*P. borealis*, *S. septemcarinata*) were predominant in spring and pelagic organisms (*T. inermis*, *T. libellula*) in summer (Table 3).

DISCUSSION

Availability of Prey

Ringed seals were far better samplers than the authors using various nets and dredges. Some species, like *Sebastes*, were easily collected by seals but were absent in our collection; others, such as *Boreogadus*, were underrepresented. The faunal composition of Kongsfjorden is typical for arctic, glacier-fed fjords. The benthic biomass was highest at the mouth of the fjord, decreasing towards the inner basins. The outer part of the fjord is influenced by oceanic plankton, while the inner is inhabited by small brackish water species (Gorlich *et al.*, 1987).

Small crustaceans such as amphipods, mysids and euphausids have been commonly observed in swarms at glacier bays in arctic fjords, forming important feeding areas for seabirds and seals (Hartley and Fisher, 1936; Dunbar, 1941).

Arctic cod and young *Sebastes* have been observed in abundance along the west Svalbard fjords, including the outer parts of Kongsfjorden (Lonne and Gulliksen, 1989; Berger and Cheremesina, 1974). This area is also well known as a commercial fishing ground for cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinnus*), deep-sea shrimp (*Pandalus borealis*) and redfish (*Sebastes mentella*, *S. marinus*). In winter and spring there is little pelagic biomass in the west Svalbard fjords, because ice-associated fauna is poor in those Atlantic/subarctic waters (Weslawski and Adamski, 1987; Weslawski and Kulinski, 1989). Most benthic prey items are species that live 2-5 years and are therefore available all year round in similar amounts. The energy content of benthic invertebrates does not change significantly in the course of the year in Svalbard (Szaniawska and Wolowicz, 1986). On the other hand, pelagic animals are highly seasonal. Their energy content is highest in late summer and lowest in spring (A. Szaniawska, pers. comm. 1992). Euphausiids are migrants from Atlantic waters and do not breed in the investigated area (Lomakina, 1978). They are therefore common only in summer and autumn. In winter and early spring small size classes of arctic cod and *Sebastes* occur associated with the fast ice on the fjord.

Ice-associated crustaceans are rare in Kongsfjorden. In spring 1989, an inflow of arctic water to the West Svalbard fjords was reflected in our finding of numerous *Gammarus wilkitzkii* and *Onisimus littoralis* in the survey samples, but this is not normal for the area (Weslawski and Adamski, 1987). The length frequency of *G. wilkitzkii* sampled in Kongsfjorden shows that only adult specimens were present, confirming the immigrant character of the species in this location.

TABLE 3. Seasonal changes in the relative occurrence of invertebrates in the gastrointestinal tract of ringed seals from Kongsfjorden[1]

	Spring		Summer		Autumn		Winter	
	n(%)	wt(%)	n(%)	wt(%)	n(%)	wt(%)	n(%)	wt(%)
T. inermis	12	4	92	46	88	80	54	37
T. libellula	30	6	4	4	10	16	23	14
P. borealis	52	92	4	50	2	6	13	42

[1]n(%) — percent rate of numerical invertebrates abundance. wt(%) — percent rate of total invertebrate weight.

The Diet of Ringed Seals

More than 60 species of invertebrates and 10 fishes have been reported as the prey of ringed seals from various localities in the Arctic, and it has been suggested that ringed seals take any available prey of suitable size (Fedoseev, 1965). Judging from published reports, the most common prey size is 5-10 cm for fish and 2-6 cm for crustaceans, with a maximum size of about 20 cm (Dunbar, 1941; McLaren, 1958; Bradstreet and Cross, 1982; Smith, 1987). This corresponds well with the prey size found by us (Fig. 2). Some authors report the presence of very small prey items such as copepods and ostracods (Fedoseev, 1965; Bradstreet and Cross, 1982), but never as abundant prey. Such small species may well be the remains of the food of fishes eaten by the seals.

Ringed seals in any one area rarely prey upon more than 10-15 species (up to 40 in Ungava Bay, according to McLaren, 1958), and not more than 2-4 species are considered as important prey (Fedoseev, 1965; Bradstreet and Cross, 1982; Lowry *et al.*, 1980; Smith, 1987; Siegstad, 1988). This indicates that ringed seals depend strongly on a few key species in any area. The most common key taxa are arctic cod, pelagic amphipods and mysids. The only important benthic taxon is shrimp, which is found in the stomach samples in 50% of the localities described in the literature. Fish, often arctic cod, are the dominant prey in most localities. In Kongsfjorden arctic cod was definitely the most important prey throughout the year. Ringed seal feeding on *Sebastes*, as was found in the present study, was also observed by Siegstad (1988). This boreal species was rare in Svalbard prior to 1935 but became more common with the warming up of the area (Hognestad, 1961). We found only one size group of *Sebastes* in the diet of ringed seals, and in spring only. Apparently those were fish accompanying swarms of 0 age group arctic cod close to the fast ice edge. There are no indications that ringed seals are exploring new biota to feed on *Sebastes*.

In the permanent presence of drift ice, the sympagic (ice-associated) biocenosis becomes the most important feeding ground in high arctic latitudes (McLaren, 1958; Bradstreet and Cross, 1982). This is not the situation in Kongsfjorden, where seals feeding at the fast ice edge were able to feed

on benthic biota as well. Benthos seemed to be more important in winter and early spring, possibly because at this time there is less biomass in the open sea and many pelagic invertebrates have a low energy content. Whether arctic cod are near benthic in Kongsfjorden in winter is not known; the species is sometimes found in the open sea and sometimes among the benthos (Bradstreet *et al.*, 1986). At localities with shallow water and differentiated bottom, small decapods, amphipods and mysids are important (Dunbar, 1941; McLaren, 1958). Compared to seals observed in Hornsund (Svalbard west coast, 77°N) by Lydersen *et al.* (1985), seals in Kongsfjorden took far more euphausids. This reflects the rare occurrence of euphausids in Hornsund, where they are replaced by mysids (Weslawski *et al.*, 1991).

The ringed seals in Kongsfjorden did not exploit all available food resources. Most notably, pelagic mysids, chaetognaths and some large amphipods from the hard, shallow bottom were rare or absent in the gastrointestinal content, although they were common or even abundant in the fjord. Feeding on small hyperbenthic crustaceans and benthic fishes on the laminaria-covered shallow, hard bottom might be relatively inefficient, since it requires active searching for prey that are dispersed, difficult to spot and of low energy content.

In summary, fish (*Boreogadus*, *Sebastes*) were most important in terms of energy aquisition. Swarming krill and larger crustaceans such as *Pandalus* and *Themisto* were auxiliary energy sources. There seems to be a seasonally dependent selection for feeding habitats. In winter more benthic prey is taken; during ice break up and in the open water period the seals prefer pelagic prey. This may be a reflection of the seasonality of the pelagic invertebrate community. The seals apparently preferred the larger age classes of invertebrates. It also appeared that the smaller length classes of *Myoxocephalus* were not taken by the seals. Some species, such as mysids and chaetognaths, were not taken, although they were abundant in the fjord and of relatively high energy density.

ACKNOWLEDGEMENTS

The present work was supported financially by the Norwegian Council for Science and the Humanities, the Norwegian Polar Institute (grants no. 18/85, 12/86 and 11/87) and the Norwegian Fisheries Research Council. The Norwegian Polar Institute and King's Bay Kull Company supplied the logistic help during the field work. Chris Cuyler, Ian Gjertz, Bjorn Haukelidsaether, Slawek Kwasniewski, Oystein Sigde and Tom Warren helped with the field work. Dr. Anna Szaniawska kindly provided caloric measurements of our material. We would also like to thank the crew of r/v *Oceania*.

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