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Further observations on the food of seals

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(With 1 figure in the text)

Studies of the food of seals on Scottish coasts were continued at the Marine Laboratory from 1967 to 1971. In general the results confirmed those of 1958-66 in stressing the supreme importance of fish, particularly species of economic value, in the food of both the Grey and Common seals. Four families of fish—salmonids, gadoids, clupeoids and pleuronectids—were again prominent in the food of both species of seal although the frequencies with which they appeared in the stomachs varied from one period to another. Grey seals preyed more heavily on salmonids and gadoids and Common seals on gadoids and clupeoids. Changes in the diet of seals from one year to another would appear to arise from the sampling of the seals for examination and to the availability of the species of fish preyed upon, depending on seasonal movements and natural fluctuations in their age-groups.

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Introduction, materials and methods

The food of seals in the Scottish area was studied by the examination of the stomach contents of 368 Grey seals, *Halichoerus grypus*, and 175 Common seals. *Phoca vitulina*, during the years 1958-1966 (Rae, 1968). From the beginning of January 1967, seals drowned in fishing nets, or killed by hunters or by fishermen, continued to be received at the Marine Laboratory; in some instances only the head and stomach with its contents were received when it was inconvenient to send the whole animal. The results of the examination of these specimens are summarized in this paper and compared with the data for the earlier years.

From January 1967 to the end of June 1971, 241 Grey seals were examined (Table I). These were obtained by the following means—drowned or killed in salmon nets 119, drowned in whitefish and herring nets 13 and and shot in the sea or on shore 109. In addition, 78 Common seals were obtained as follows—nine from salmon nets, four from whitefish gear and 65 by shooting. The decline in the number of Common seals examined is explained partly by the growing scarcity of this species on the Scottish east coast over the years and by the absence of sampling in localities such as the Firth of Tay, from which most of the specimens were received in 1958–1966, and the Dornoch Firth, where the greatest concentration of this seal on the east coast of the Scottish mainland is located.

TABLE I

Numbers of seals examined monthly at the Marine Laboratory, 1967–1971

	Grey seals						Common seals					
	1967	1968	1969	1970	1971	Totals	1967	1968	1969	1970	1971	Totals
January	2	5	5	3	2	17	—	—	2	—	—	2
February	—	10	1	8	10	29	1	—	1	—	—	2
March	2	5	7	14	4	32	—	—	15	4	2	21
April	1	7	7	10	9	34	1	1	2	2	1	7
May	2	3	6	4	10	25	—	2	1	—	—	3
June	2	7	5	10	6	30	1	2	—	2	—	5
July	4	15	6	5	—	30	—	—	—	—	—	—
August	—	3	11	10	—	24	1	—	—	21	—	22
September	—	1	—	1	—	2	—	—	1	1	—	2
October	—	1	—	—	—	1	1	—	1	2	—	4
November	—	3	—	7	—	10	—	—	2	1	—	3
December	2	1	4	—	—	7	—	—	6	1	—	7
Totals	15	61	52	72	41	241	5	5	31	34	3	78

The length frequencies of the seals are given in Table II. The Grey seals ranged in length from 36 to 108 in (91–274 cm) and Common seals from 34 to 70 in (86–178 cm). The numbers suggest that sampling was reasonably representative of the length range of both species although younger Common seals were certainly fewer than in 1958–1966.

TABLE II

Length frequencies of seals examined in groups of 10 inches

Inches cm	34–40 86–102	41–50 104–127	51–60 129–152	61–70 155–178	71–80 180–203	81–90 206–229	91–100 231–254	101–108 257–274	Not measured	Total
Grey seals	9	83	45	42	22	9	6	1	24	241
Common seals	5	17	23	12	—	—	—	—	21	78

Efforts were made to collect seals from as many sections of the coast as possible, including the islands of the north and west, but the size and weight of individual seals, and the inaccessibility of the places in which they were killed, presented difficulties in the recovery of the bodies and their transport to the laboratory. This prevented representative sampling.

The numbers of seals examined from the different sections of the coast are given in Table III. As in the earlier investigation, most of the Grey seals came from the east coast between the Firth of Forth and the inner Moray Firth, but 20 were collected on special expeditions to the west coast of Ross-shire and 13 were taken in Orkney, some of them adult seals shot during the breeding season, when the stomachs were almost invariably empty. Although the sampling of Common seals was disappointing, useful samples of 18 were nevertheless obtained from both Mull in Argyllshire and from Orkney.

The food of the Grey seal

The results of the analysis of the stomach contents of the Grey seals are summarized in Table IV. The proportion with no food was high, as in the previous investigations, and fish again proved to be the predominant food type, being present in more than 90 % of the stomachs containing food. Salmonids (mostly salmon) had been eaten by 30 % of the seals, and a variety of gadoids (in which saithe, cod and whiting were prominent) by 45 %. Crustaceans and molluscs occurred in rather fewer stomachs than in 1958–1966 but the deficiency was offset to some extent by a slight increase in the numbers of unusual items, such as polychaetes, sea weed and on one occasion part of the flesh and feathers of a bird. In order to permit easy comparison, the frequencies with which the different food types occurred in the food of Grey and Common seals in the two periods are presented in Fig. 1.

TABLE III

Place of origin and numbers of seals examined at the Marine Laboratory 1967–1971

	Grey seals	Common seals		Grey seals	Common seals
Firth of Tay (Fife coast)	19	5	Wester Ross	20	6
Angus	45	5	Skye	1	1
Kincardineshire	81	4	Argyllshire (Mull)	1	18
Aberdeenshire	18	3	Firth of Clyde (Ayrshire)	2	4
Banffshire	31	1	Solway Firth	1	1
Moray and Nairn	5	10	Outer Hebrides (Gaskeir)	2	—
Dornoch Firth	1	1	Orkney	13	18
Caithness	1	1	Totals	241	78

Among the individual species preyed upon, salmon was identified in more than 26 % and cod and whiting each in 11 %. Since the proportion of Grey seals feeding on salmon in the earlier investigations was also 26 %, these results again suggest strongly that this fish is the most important single species in the diet of the Grey seal along the greater part of the Scottish mainland. Reports by fishermen sent in with seal carcases quite frequently referred to partly eaten or mutilated salmon found in the net along with the seal. Examination of the stomach contents of these seals do not, however, always reveal the presence of salmon flesh. Looking at this problem in more detail it was found that 18 seals which had died in salmon nets, in which the remains of salmon were also found, had salmon flesh in their stomachs. On the other hand 16 seals which were also taken from nets containing the remains of salmon and sea trout (on one occasion) had no traces of salmon (or sea trout) in their stomachs. This evidence, together with the occasional reports of the presence of chunks of regurgitated salmon in the nets, suggests that the proportion of seals eating salmon among those drowned or killed in salmon nets is probably higher than that estimated from the numbers actually found with salmon in their stomachs. Assuming, therefore, that the 16 seals referred to above had indeed eaten salmon and sea trout, as the evidence from the nets indicated, this would alter the proportion of seals feeding on salmonids to 42·4 %, on salmon to 38·1 % and on sea trout to 2·9 % (Table IV).

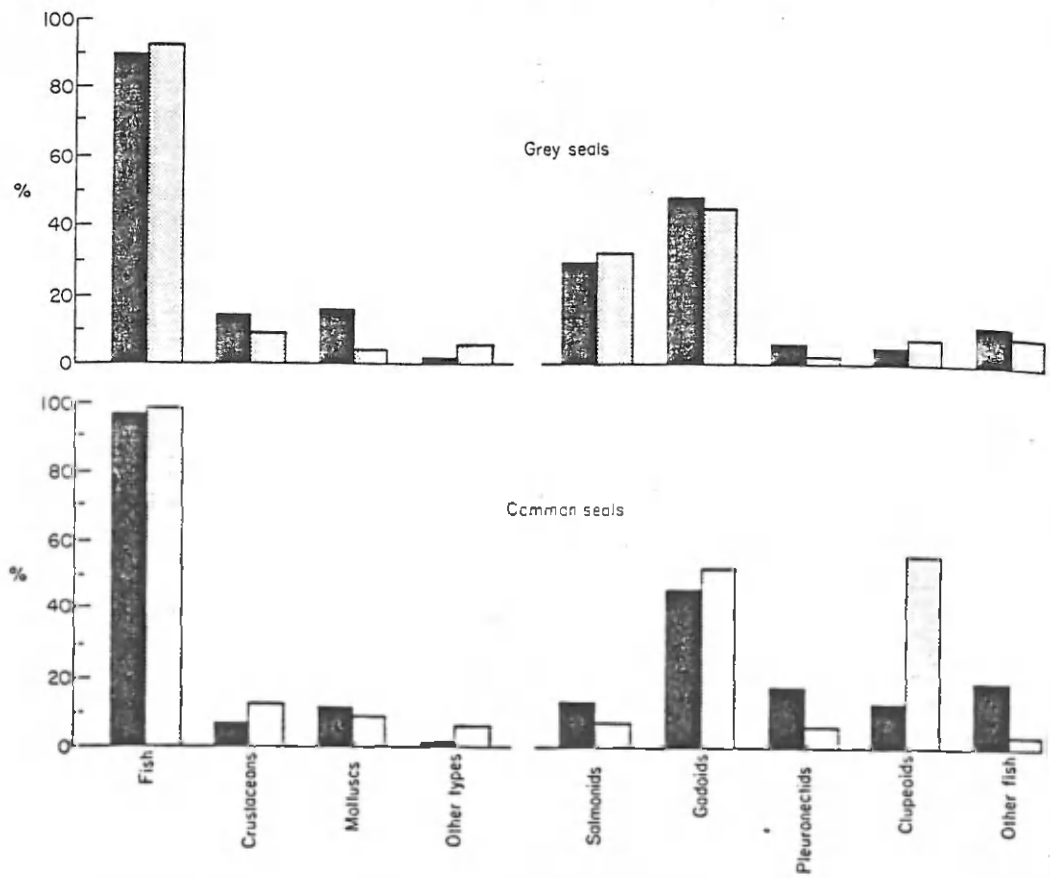

FIG. 1. Diagramatic representation of frequency of occurrence of food types in Grey seals and Common seals, 1958–1966 (Black), 1967–1961 (Stippled).

It has been suggested that obtaining so many seal specimens from or near salmon nets tends to give a higher proportion feeding on salmonids than would be so under more representative sampling. In order to assess this possibility, seals obtained from salmon nets and those from shooting in the sea or on shore have been considered separately. Of the 74 seals obtained from salmon nets during the fishing season, from the beginning of February to the beginning of September, 27 (36·5 %) had been eating salmon, and of the 49 seals shot far from salmon nets in the same period, 16 (32·7 %) had been feeding on salmon. This particular problem was also examined, although in a slightly different manner, in 1958–1966, when seals killed in the open sea less than five miles from nets were distinguished from those killed five miles or more from the nets. This revealed that in the former group 12 out of 29 (41·4 %) of the seals had eaten salmon and in the latter seven out of 18 (38·9 %) had done so. These assessments show a slightly higher frequency of predation on salmon both from the presence of seals in the nets and from their capture in relative proximity to the nets, but the difference in each set of figures is not significant.

It could also be argued that the preponderance of seals examined from the east coast of Scotland, from which 80 % of the Scottish salmon catch is derived, could also help to

TABLE IV

The food of the Grey seal in the Scottish area 1967–1971

No. of stomachs examined	241				
No. empty	101 = 41·9%				
No. with recognizable food	139 = 57·7%				
No. feeding on:		%			%
FISH	127	91·4	CRUSTACEANS	12	8·6
Salmonidae	43	30·9	Decapoda	8	5·8
Salmo salar (Salmon)	37	26·6	*Cancer pagurus* (Edible crab)	1	0·7
Salmo trutta (Sea trout)	3	2·2	*Hyas* sp.	1	0·7
Gadidae	63	45·3	*Eupagurus* sp. (Hermit crab)	1	0·7
Gadus morhua (Cod)	15	10·8	*Crangon* sp. (Shrimp)	2	1·4
Melanogrammus aeglefinus (Haddock)	4	2·9	*Lernaeocera* sp.	2	1·4
Trisopterus luscus (Pout)	1	0·7	MOLLUSCS		
Trisopterus minutus (Poor cod)	1	0·7	Cephalopoda	4	2·9
Trisopterus esmarkii (Norway pout)	3	2·2	*Eledone cirrhosa* (Curled octopus)	1	0·7
Merlangius merlangus (Whiting)	15	10·8	Squid	1	0·7
Pollachius virens (Saithe)	24	17·3	POLYCHAETES		
Molva molva (Ling)	1	0·7	*Aphrodite*	2	1·4
Pleuronectidae	2	1·4	Sea Weed, *Fucus serratus*	4	2·9
Pleuronectes platessa (Plaice)	1	0·7	?Sea bird (part with feathers)	1	0·7
Platichthys flesus (Flounder)	1	0·7			
Clupeidae	8	5·8			
Clupea harengus (Herring)	3	2·2			
Other species					
Anarhichas lupus (Catfish)	1	0·7			
Callionymus lyra (Dragonet)	1	0·7			
Cyclopterus lumpus (Lumpsucker)	5	3·6			
Anguilla anguilla (Common eel)	1	0·7			
Trachurus trachurus (Horse mackerel)	1	0·7			
Raia sp. (Skate)	3	2·2			
Unidentified white fish	19	13·7			

show an exceptionally high predation on salmon. Of the 25 Grey seals examined from the west coast from 1967 to 1971, 15 had food in their stomachs and of these four (26·7%) had eaten salmon. This percentage is interesting since it is almost identical with the corresponding figure of 26·6% for the whole area (Table IV). From 1958 to 1966, seven of 14 feeding seals from the north and west coasts of Scotland had eaten salmonids, five of them (35·7%) including salmon.

Furthermore, the 11 Grey seals containing salmon or salmonid remains over the period 1958-71 were obtained from a wide area on the western grounds, including two from the Summer Isles, one from Achiltibuie, one from Gairloch (all from Wester Ross), two from Ardnamurchan (Argyll), two from the Firth of Clyde (Ayrshire), two from the Solway Firth and one from North Wales. From these western grounds, seals with recognisable food in their stomachs were obtained from January to September, and salmonids were identified from April to July. In addition, in the same period, reports of seal predation on salmon have been received from the Solway Firth, the Firth of Clyde, the Ross of Mull,

Loch Etive, Skye, Loch Torridon, Gairloch, Loch Ewe, Achiltibuie, and at least three localities in the Outer Hebrides.

It seems reasonable, therefore, to conclude that seal predation on salmon on the west and north coasts is not significantly different from that on the east coast. This may appear surprising in view of the mere 20 % of the Scottish salmon catch from the north and west coasts, but it must be borne in mind that a far larger proportion than 20 %, if not all, of the Scottish salmon stock approaches these coasts before skirting them during the migration of the salmon from their feeding grounds in the north-west Atlantic to their spawning grounds in the rivers entering the North Sea. It is clear, therefore, that the stocks of salmon passing along the north and west coasts must be greater than the annual catch from these areas suggests. Consequently there is no strong reason for believing that the *proportion* of Grey seals preying on salmon on the north and west coasts is *less* than it is on the east coast simply because the catch in the north and west is only one-fifth of that on the east coast.

TABLE V

Quantitative measurement of contents of Grey seal stomachs

Species of fish	No. of stomachs	Total weight g	Species of fish	No. of stomachs	Total weight g
Salmon	32	74,600	Gadoids and skate	1	2000
Herring	3	6350	Lumpsucker	2	1920
Cod	2	4850	White fish (unidentified)	2	1850
Ling (1) and Plaice (3)	1	2470	Horse mackerel	1	554
Gadoids (various)	2	2040	Common eel	1	545
Catfish	1	2000			

The difficulties experienced in assessing the weight or volume of the food in the stomachs was expressed in the account of the earlier investigations. In addition to the large number of empty stomachs many contained only small quantities or traces of food, fortunately sometimes in the form of recognisable otoliths or bones. This absence or scarcity of food has been put down to the regurgitation of the stomach contents of the trapped or shot seal. Reliable estimation of the quantity of food in such stomachs was therefore considered impracticable. However, appreciable quantities of recognisable food were found in a number of stomachs, although even here it is doubtful whether all the contents were retained when the seal died. Table V gives the species or types of fish identified in seal stomachs and the total weights of each type. The results are rather surprising in showing 75 % by weight of the recognisable food to consist of salmon. This proportion is far in excess of the frequency of occurrence of salmon in the stomachs, i.e. in 26·6 %; the prominence of salmon in certain stomachs was also observed in the 1958–1966 observations (Rae, 1968: 12). Of the 32 stomachs containing salmon almost exclusively, only three contained measurable quantities of other food—two small quantities (10 and 20 g) of clupeoid remains and one 258 g of lumpsucker. The frequency with which stomachs contained only one item of food (apart from traces of others in the form of otoliths) is also surprising, but the explanation may be that the comparatively large size of the prey often provides sufficient food for one meal, but if this is so why should cod and saithe,

which are comparable in size with the salmon when fully grown and more abundant than all salmonids in Scottish coastal waters, be so rarely represented in the full stomachs? It is difficult to suggest a satisfactory answer, but it should be noted that cod and saithe are frequently recognised in the stomach contents by the presence of their otoliths, thus indicating that many of these fish are small enough to be eaten whole. Furthermore, the speed of digestion in the seal stomachs may also reduce small fish more quickly to the soup-like consistency of the contents so characteristic of many stomachs. It is also possible that large cod and saithe swim at greater depths than do salmon and thus may be less vulnerable to seals. Another factor which may ensure the prominence of salmon in many stomachs is the salmon fishing practice of visiting fixed nets in the morning, when seals are frequently seen around the fixed nets, so that some animals are killed during or immediately after their first meal. The approximate time of death was ascertained in 17 of the 32 seals which had eaten appreciable quantities of salmon. Twelve died between 06.00 and 09.15 hours, three between 13.00 and 13.30 hours and two between 17.00 and 17.30 hours. Seals also tend to feed with the tide, and two of the 32 were reported as killed at "high water". Moreover, salmon fishing is frequently dependent on the state of the tide. Relatively few seal carcases were sent to the laboratory by purely marine fishermen and without exception these died by drowning in nets or on hooks. Consequently most of the stomachs contained little or no food, no doubt as a result of regurgitation, so that the lack of seals shot at sea may be the most plausible explanation of the relatively small quantities of whitefish such as cod, saithe and whiting found in seal stomachs.

The weight of salmon in the 32 stomachs ranged from 224 g (0·5 lb) to 9·98 kg (22 lb). The latter weight represents the greatest quantity of food ever recorded from a single seal stomach at the Marine Laboratory. It was taken from a male Grey seal, 94 inches (239 cm) long (snout to the tip of hind flippers) and weighing 5·5 cwt (279·7 kg), which was shot in the sea off the Angus coast on 20 August 1969. It consisted almost entirely of the flesh and bones of at least two salmon, with only traces of skin, and included no heads or tail fins. Obviously the total weight of the fish destroyed must have been greater than the contents of the stomach—probably in the region of 26 lb (11·8 kg). This record helps to confirm the view expressed in an earlier paper (Rae, 1967) that the quantity of fish destroyed by seals is greater than the amount they eat.

As regards the amount of food consumed by a seal at one meal, Ivarsson (1963) recorded the stomach contents of a Grey seal killed in the Baltic in May 1962 as consisting of not less than 30 eels of different sizes. As some of the eels had been partly digested the exact weight could not be obtained but was calculated as being about 15 kg (approx. 33 lb).

The food of the Common seal

The results of the analysis of the contents of the Common seal stomachs are summarized in Table VI and the proportions of the main items in the food represented in Fig. 1. The analysis again indicates a high proportion of empty stomachs and the predominance of fish in the diet. Compared with those of 1958–1966 the results of 1967–1971 reveal a lower incidence of salmonids, flatfishes and mixed species of minor importance, but this was offset by a marked increase in the numbers of common seals feeding on clupeoids and by a slight increase in the predation on small gadoids. These differences in the proportions feeding on the various fish groups would appear to arise largely from the localities where

most of the specimens were obtained, i.e. Loch Scridain and the Ross of Mull in Argyllshire and Eynhallow and Holm of Scockness in Orkney. In none of these places were salmonids identified in the stomachs, although a netsman reported seal damage to salmon in the Ross of Mull. Small gadoids and clupeoids were the predominant food types in the Argyllshire area in March and December and in Orkney waters in April. Young herring and/or sprats were also observed in the food of Common seals from three places on the east coast (the Aberdeenshire coast, Findhorn and the Dornoch Firth) from October to March and from two on the west side, Loch Ewe in March and the Summer Isles in April. It would appear, therefore, that the higher incidence of clupeoids in the food of Common seals in 1967–1971 was a direct consequence of the larger numbers of seal specimens obtained in lochs, firths and other inshore areas from late autumn to early spring, when shoals of young clupeoids are concentrated there. Similarly, the lower incidence of salmonids and flatfishes (pleuronectids) in the stomachs would almost certainly be owing to the poorer sampling of Common seals from the Firth of Tay and other estuarine waters and sandy bays of the east coast in the same period.

TABLE VI

The food of the Common seal in the Scottish area 1967–1971

		%			%
No. of stomachs examined	78				
No. empty	34 = 43·6				
No. with recognizable food	41 = 52·6				
No. feeding on:					
FISH	40	97·6	CRUSTACEANS	5	12·2
Salmonidae	3	7·3	Amphipoda	3	7·3
Salmo salar (Salmon)	2	4·9	*Pandalus*	1	2·4
Gadidae	21	51·2	*Cirolana*	1	2·4
Gadus morhua (Cod)	2	4·9	*Lernaeocera*	2	4·9
Melanogrammus aeglefinus (Haddock)	2	4·9	MOLLUSCS		
Trisopterus esmarkii (Norway pout)	3	7·3	Cephalopoda	4	9·8
Merlangius merlangus (Whiting)	9	22·2	HOLOTHURIANS	1	2·4
Pollachius virens (Saithe)	7	17·1	SEA WEED	1	2·4
Pleuronectidae	2	4·9			
Platichthys flesus (Flounder)	1	2·4			
Clupeidae	23	56·1			
Clupea harengus (Herring)	5	12·2			
Sprattus sprattus (Sprat)	3	7·3			
Other species					
Scomber scombrus (Mackerel)	1	2·4			
Unidentified white fish	4	9·8			

Figure 1 shows the relatively unimportant role of crustaceans and molluscs in the food of both species of seal in Scottish waters, although it is appreciated that both food types are of greater importance to very young animals. It should be explained, however, that in Tables V and VI each trace of food, whether represented by a claw or leg of a crab, a single shrimp or isopod, the beak of a cephalopod or a stage of a parasitic copepod, is

regarded as a single record and given equality with a stomach full of cod or salmon. Clearly, therefore, the frequency of occurrence of individual items in stomachs can be somewhat misleading by overstressing the importance of these "trace" types, particularly, as was pointed out in the earlier paper on seal food, since they are all features in the stomach contents of cod and other white fish and could easily have been eaten by the fish, which later were taken by the seals.

The full importance of fish in the diet of seals could of course by demonstrated more effectively if it were possible to carry out an accurate quantitative assessment of their food, but as already indicated in relation to grey seals, this is hampered by the high proportions of empty stomachs, by the losses through regurgitation and by the rapid digestion which reduces the contents to the liquid condition so characteristic of so many seal stomachs.

Like the Grey seal, relatively few dead Common seals retained appreciable or measurable quantities of their last meal. In the material collected from 1967 to 1971 the contents of 16 Common seal stomachs were identified and weighed (Table VII). These again indicated that the contents consisted of one item, although Common seals would appear to be more partial to mixed meals, of gadoids and clupeoids for example, than Grey seals. This latter observation would seem to agree with an earlier statement (Rae, 1968) that in general Common seals prey on smaller fish than the Grey.

TABLE VII

Weights of stomach contents of Common seals

Species of fish	No. of stomachs	Total weight of contents (g)	
Gadoids and clupeoids	4	3147	including whiting, saithe and amphipods
Clupeoids	4	1595	including one cephalopod beak
Sprats	2	1798	including 41 gadoid otoliths
Salmon	1	1959	
Salmon, herring, flounder	1	1412	posterior part of salmon, 12 herring, 2 flounders and gadoid otoliths
Saithe and other fish	1	1762	
Herring	1	908	7 small herring
Saithe	1	762	including one *Pandalus* and few amphipods
Unidentified fish	1	82	including remains of holothurian

Discussion

Following the studies of the food of the Grey and Common seals in the Scottish area from 1958 to 1966 and from published accounts of similar investigations in this country, on the continent and particularly in Canada, certain conclusions were reached (Rae, 1968). In the first place the food was shown to consist predominantly of fish and especially of representatives of four families of fish—salmonids, gadoids, pleuronectids and clupeoids—all of major commercial importance. Secondly, the belief, frequently advanced in defence of seals, that they prey largely on fish of little or no economic value, has been shown

to be erroneous. Species such as saithe, lythe, sprats, mackerel, dogfish, squids etc., formerly of relatively small commercial importance, are now sought after, particularly when the more desirable species are in short supply and to satisfy new demands on the market since the last war, for example for squid to meet export requirements, and sprats, sandeels and other so-called "trash" fish for manufacture into fish meal. It has also been recognized that seals prey on the most numerous and most obvious species as regards size, hence the frequency in the stomachs of whiting and young clupeoids on the one hand and salmon, cod and saithe on the other.

The recent observations confirm these earlier conclusions. Because of their size and their habits salmon are preferred by seals all round the Scottish mainland and throughout the year but particularly from January to September, by which time adult Grey seals have begun to withdraw to their various breeding grounds (Rae, 1960: 18–20). Salmon would appear to be of relatively minor importance to seals in Orkney and Shetland, but it is doubtful whether the examination of seals from these islands has been sufficient, both in time and place, to permit a reliable assessment of their food. On the basis of reports by local fishermen and anglers it seems possible that seal predation on sea trout may be greater than sampling has shown so far. The latest observations in Orkney and, in some small measure, on the west coast, have helped to confirm that Grey seals take little or no food while on the breeding grounds, but there is no available evidence to show how long this fast continues.

Gadoids as a family would appear to provide the bulk of the food for both species of seal on all Scottish coasts. Considering their abundance this is not surprising, and because of their length range from small whiting to large cod and saithe they provide food for all sizes of both species of seal. Natural seasonal movements, annual fluctuations in year-class strength and distribution of the various gadoid species would also appear to influence the frequency with which they are eaten by seals. For example, these factors could perhaps explain the frequency with which cod were eaten in 1958–1966 and their replacement to some extent by saithe from 1967 to 1971.

The more local distribution and the relative scarcity of flatfishes such as plaice, dab and flounders compared with gadoids and clupeoids naturally tends to restrict predation on these species to firths, bays and river mouths where environmental conditions are more suitable for the Common seal.

The high incidence of small clupeoids, probably a mixture of young herring and sprats, in the stomachs of common seals from 1967 to 1971, reflects the presence of these fish together with young whiting in certain western sea lochs from late autumn to early spring and provides an example of local and seasonal feeding. Marked local predation on the Curled octopus, *Eledone cirrhosa*, by the Grey seal was also evident in certain localities in Orkney, and on sandeels, *Ammodytes* sp., off south-west Shetland in the years 1958–1966, but it is not known whether these represent permanent features of the food of Grey seals in these localities or simply the resuts of exceptional concentrations of the food types concerned.

It seems appropriate to refer to Swedish studies of the food of seals in the Baltic Sea by Ivarsson (1963) and Söderberg (1971). After describing the three species of seal native to the Baltic as fish eaters on an extensive scale, Ivarsson stated that the Grey seal especially lives from only a few months old completely on fish of different kinds. In his analysis of the stomach contents of 175 Grey seals Söderberg found the food to consist almost entirely

of fish, mainly economically important species. His frequency of occurrence table reveals 15% of the seals feeding on flatfishes (dab, turbot, plaice, flounder), 21% on gadoids (entirely cod), 27% on clupeoids (herring, sprat) and 20% on salmonids (salmon, sea trout). Considering the differences in the physical and biological environment the similarity in the food of the Grey seals of the two regions is remarkably close.

These investigations of the food of seals have demonstrated at least two essentials to an understanding of the subject in addition to a knowledge of the distribution of the seals. The first is a knowledge of the fish fauna, particularly of coastal waters, and of the natural brood fluctuations, stock movements and the availability of the more important species throughout the year. Secondly, some knowledge of fishing practice, particularly of fixed gear, in the different fisheries and of recent developments within the industry is also necessary. Only then can a proper appreciation be obtained of the impact of the expanded seal stocks on our fisheries.

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