

EFFETS DES PHOQUES SUR LES PECHERIES

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Scannaire

On présente l'information concernant les effets des phoques sur les ressources en poisson exploitées et les pêcheries relatives à celles-ci dans les eaux écossaises (en s'intéressant particulièrement au saumon) au cours de la période de 1959 à 1975. On estime que la quantité totale de poissons consommée annuellement par le cheptel actuel de phoques gris et de phoques communs se reproduisant dans les eaux écossaises s'élève à quelque 195 000 tonnes, total sur lequel il est probable que les espèces exploitées commercialement représentent aux alentours de 130 000 tonnes. Ceci équivaut à une perte de prise éventuelle des pêcheries de quelque 65 000 tonnes par an soit 5-10% de la prise totale de toutes les espèces prises à l'intérieur des limites de pêches maintenant élargies du Royaume-Uni.

Le présent mémoire présente l'information concernant le préjudice subi par les pêcheries du fait des phoques en la groupant sous les rubriques principales ci-dessous :

1. Dommages directs subis par les engins de pêche et les poissons de la prise.
2. Les phoques prédateurs s'attaquant au poisson en mer.
3. Les effets des parasites dont le phoque est l'hôte final sur la survie et/ou la "qualité" du poisson.

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### EFFECTS OF SEALS ON FISHERIES

by

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#### Summary

Information is presented on the effects of seals on exploited fish resources, and the fisheries on them in Scottish waters (with special reference to salmon) during the period 1959-1975. It is estimated that the total quantity of fish consumed annually by the present grey and common seal stocks breeding in Scottish waters amounts to about 195 000 tonnes, of which about 130 000 tonnes is likely to comprise commercially exploited species. This is equivalent to a loss in potential annual fishery catch of about 65 000 tonnes, which is 5-10% of the total catch of all species taken within the UK's extended fishery limits.

This note presents information on the damage to fisheries by seals following main headings:-

1. Direct damage to fishing gear and to fish in the catch.
2. Predation by seals of fish in the sea.
3. Effects on the survival and/or "quality" of fish by parasites of which the seal is the final host.

#### 1. Direct damage to fishing gear and catch

##### a) Fishing gear damage

Information on the incidence of damage to bag and stake nets in the Scottish east coast salmon fishery, in the years 1959-75, based on returns from salmon fishermen are given in Table 1. They show that at almost all of the stations along the Scottish east coast for which regular information is available the incidence of damage decreased markedly during the 1960s and by the mid 1970s no, or very little, net damage was reported by salmon netmen. This decrease was attributed to the progressive use, starting in the early 1960s, of synthetic twines in net construction. Such twines are stronger, smoother and more elastic than the natural fibre twines used previously, and hence are less liable to be torn by seals. Thus, seal damage to fixed salmon nets does not appear to constitute a serious problem in the Scottish east coast area although it remains a nuisance and cost factor at a few netting stations (eg Boddin in the vicinity of Montrose and Mhorrich in the upper reaches of the Moray Firth).

##### b) Damage to catch

Information for the years 1964-76 again based on regular reports from salmon netmen, of the incidence of salmon (salmon and grilse combined) in catches taken at Scottish east coast netting stations, suffering seal bite or claw damage are given in Table 2. They are given separately for the period up to the end of May and from the beginning of June to the end of the salmon fishing season respectively.

These data show that at most of the netting stations from which reports were recorded the incidence of damaged salmon is highest in the first half of the fishing season which corresponds with the spring run of the larger, higher-priced salmon. This is also confirmed by independent observations of damaged salmon presented for sale at Aberdeen fish market.

The data show considerable differences in the incidence of fish damage between netting stations (some of them neighbouring ones) within a year, and between years at individual netting stations, although at some stations the incidence was relatively high (eg at Boddin and Woodston (fly)) and at others relatively low (eg Rossie, Watermouth and Nairn - except in 1976) throughout the period. Although it is known that the total seal population breeding around the Scottish coasts increased markedly during the period, no significant upward trend in the incidence of damaged salmon is evident from the data for either part of the fishing season - although it has increased since 1970 at the stations in the upper reaches of the Moray Firth. This suggests that this source of damage is largely unrelated to total seal population size, but is attributable to a small number of "rogue" seals, which enter, and remain in, inshore waters early in their feeding season (possibly in pursuit of salmon migrating to the coast). This explanation is also supported by estimates of the average numbers of seals observed per week by netsmen at various netting stations. Again these show no clear upward trend during the period.

The extent of the damage caused to individual salmon by seals varies widely from slight claw marks, which reduces the marketable value of the fish to only a very small extent, to complete mutilation, which renders it completely unmarketable. On the basis of detailed observations made at some netting stations in the vicinity of Montrose, and at Aberdeen fish market, the loss of value per damaged fish is, on average, unlikely to exceed 10-20 per cent (10-20p in the £). This indicates a loss in annual value from this cause of less than 1 per cent for the Scottish salmon fishery as a whole, although it is considerably greater than this at some fishing stations each year. This estimate does not, however, include the losses of fish in the nets which are consumed completely by the seals and for which no remains are left. No measure of these losses is available but it may be considerable at some stations, especially during the grilse season, when the fish are smaller. In addition the estimate does not take account of fish which are diverted from the fixed nets by the activities of seals and prevented from being caught, again for which no measure is available.

## 2. Predation by Seals of Fish in the Sea

One of the main effects of seals on fisheries is through their direct predation on fish species which are exploited by the commercial fisheries. It is well known that fish of a size suitable for fishery utilisation form a major part of the diet of both grey and common seals (Rae, 1968) and that exploited species (salmonids, gadoids, clupeoids and pleuronectids) are the main species eaten (indeed most stocks of fish in the northern North Sea and neighbouring areas are now exploited and utilised for either human consumption or fish meal). The fish consumed by the seals constitute a loss to the exploited stocks which would otherwise be available to the fisheries.

On the basis of an estimated average weight of fish consumed per day of 15 lbs by a grey seal and of 11 lbs per day for a common seal, Rae (1968)



estimated that, in the mid 1960s, the annual consumption of all species of fish combined by the total seal population of about 20 000 grey seals and 18 000 common seals, breeding around the British coasts, amounted to around 80 000 tons, about 80% of which were probably eaten in waters adjacent to the Scottish coasts. Since that time the total seal population in British waters has increased markedly, due to the population explosion in grey seals (the common seal population has, in fact, decreased slightly since the mid 1960s). The latest estimates of the all age population sizes of grey and common seals breeding in British waters, supplied by the Seals Research Division, are 69 000 for grey seals and around 15 000 for common seals. Using these data and Rae's figures of 15 lbs and 11 lbs for the average daily food consumption of grey and common seals respectively (they are at the lower end of the range of daily feeding rates estimated by Keyes, 1968), the annual food consumption by the total seal population now breeding around the British Isles is estimated to amount to 195 000 tons, of which 168 000 tons are taken by grey seals. Although, as indicated above, fish constitute the main component of the food of grey seals, they are not the only one; invertebrates, especially species of molluscs and crustacea, are also known to be eaten by both species. On the basis of the information which is available, the proportion of fish is estimated conservatively to be not less than two-thirds of the diet, almost all of which consists of species subject to fishery exploitation, giving a total annual consumption of exploitable fish of around 130 000 tons, of which 112 000 tons is consumed by grey seals.

These estimates represent the quantities of fish which would, if not eaten by seals, be available for capture (assuming no compensatory, density dependent natural mortality mechanism). At present, the average rate of exploitation by the fisheries operating in the waters adjacent to the British Isles is high. Using a conservative value of 0.5, the above estimate of 130 000 tons represents a loss in potential annual fishery catch of about 65 000 tons, having an estimated market value of £15-20 million (using the average market price of cod landed in Scotland in 1974 as an index). This tonnage is equivalent to between 1 and 2 per cent of the total fish catch taken by all countries in the waters surrounding the British Isles (North Sea, north and west of Scotland - including Rockall, Irish Sea, English Channel and west of Ireland) in 1975 (the latest year for which full statistics are available), but to 5-10 per cent of the total catch taken within the UK's extended fishery limits, which is probably the main area within which the seals feed.

### 3. Effects on the Survival and/or Quality of fish by Parasites of which the Seal is the final host

A large increase during the 1960s in the incidence of infestation of cod in Scottish waters by the larval stages of the parasite nematode Phocanema decipiens (Porrocaecum decipiens) of which the grey seal is the final host was recorded by Rae (1963, 1972). Since that time, the incidence of this parasite has been monitored at the Marine Laboratory Aberdeen, the results of which show that the incidence of infestation of cod by Phocanema has remained at approximately the same level as during the 1960s and there is no evidence that it has increased or that infestation by the parasite affects adversely the physiology or causes death to the fish. But the presence of the worms does present problems, and increases cost, in the handling and processing of cod caught in some areas and on occasions has reduced their marketability.

In addition to Phocanema, the incidence of infestation of the closely related nematode parasite Anisakis has been monitored in a number of fish

species (particularly cod, whiting, herring, haddock and blue whiting) exploited in Scottish waters. Its incidence in these species has increased markedly during the past ten years but this cannot be attributed to the growth of the grey seal population; recent studies show that it does not occur very commonly in grey (or common) seals, its principal final hosts being other species of marine mammals.

#### REFERENCES

- Rae, B.B. 1963 The incidence of larvae of Porrocaecum decipiens in the flesh of cod. Mar. Res. 1963(2) pp 28.
- Rae, B.B. 1968 The food of seals in Scottish waters. Mar. Res. 1968(2) pp 23.
- Rae, B.B. 1972 A review of the cod-worm problem in the North Sea and in western Scottish waters. Mar. Res. 1972(2) pp 24.
- Keyes, M.C. 1968 Nutrition of Pinnepeds: in Behaviour and Physiology of Pinnepeds. Pub. by Appleton, Century, Crofts. NY. pp 359-395.

#### 3. Effects on the survival and/or quality of fish by parasites of which the seal is the final host

A large increase during the 1960s in the incidence of infestation of cod in Scottish waters by the larval stages of the parasite nematode Phococercum decipiens (formerly Phococercum decipiens) of which the grey seal is the final host was recorded by Rae (1963, 1972). Since that time the incidence of this parasite has been monitored at the Marine Laboratory Aberdeen, the results of which show that the incidence of infestation of cod by Phococercum decipiens has remained at approximately the same level as during the 1960s and there is no evidence that it has increased or that infestation by the parasite affects adversely the physiology or causes death to the fish. But the presence of the worms does present problems and increases cost, in the handling and processing of cod caught in some areas and on occasions has reduced their marketability.

In addition to Phococercum decipiens, the incidence of infestation of the closely related nematode parasite Anisakis has been monitored in a number of fish



Table 1. The annual number of nets damaged, expressed as a percentage of the total number of net-fishings (i.e. nets x fishings) during the seasons 1959-1975

Area	Station	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	
EAST COAST	Boddin	5.8 <sup>a</sup>	6.8	7.7	4.3	6.0	7.5	3.3	2.5	1.3	3.3	2.8	1.5	3.4	3.4	1.9	2.3	5.1	
	Rossie	-	-	0	0	+	0.1	0	0	0.04	0.03	0	0	0.1	0	0.03	0.1	0	
	"	Charleton	-	2.0	3.2	2.1	0.3	0.1	0	0	0	0.2	0.1	0	0	0	0	0	0
	"	Watermouth	4.6 <sup>a</sup>	5.6	3.9	4.2	0.1	0.8	0	0	0	0.08	0	0	0.1	0	0.1	0	0
	"	Woodston (fly)	-	0	0	0	0	1.0	0	0.06	0.06	0	0	0	0	0	0	0	0
	"	Woodston (bag)	-	1.2	0.5	0.4	0.1	0.2	0	0	0	0.3	0	0	0	0	0	0.1	0
	"	Rockhall	2.2 <sup>a</sup>	3.0	3.1	4.1	2.1	0.8	0.6	1.0	0.3	1.1	0.7	1.3	0.4	0.2	0.04	0	0
	"	Johnshaven	-	3.0	4.4	1.4	0.5	0.2	0.2	0.3	0.1	0.5	0.1	0	0.2	0	0	0	0
	"	Cruden Bay	35.8 <sup>a</sup>	18.7	12.7	14.0	29.1	17.1	2.2 <sup>a</sup>	19.1 <sup>a</sup>	-	6.0 <sup>a</sup>	1.5 <sup>a</sup>	0.2 <sup>a</sup>	2.3 <sup>a</sup>	0.8 <sup>a</sup>	0.1	0.2	0
MORAY FIRTH	Pennan	15.3 <sup>a</sup>	20.1 <sup>a</sup>	12.8 <sup>a</sup>	-	-	8.2 <sup>a</sup> )	0.3	1.1	0.3	2.9	3.6	3.2	2.9	1.4	0.4	0.9	0	
	Gardenstown	2.2 <sup>a</sup>	5.3 <sup>a</sup>	6.4 <sup>a</sup>	2.4 <sup>a</sup>	1.4	1.3												
	"	Nairn	-	2.1	2.3	2.1	1.7	0.7	1.2	0.6	0	0	0.2	0	0.2	0.1	0	0	0
	"	East Delnies	-	11.0	9.5	14.0	6.7	10.5	0.3	0.1	0.1	0.2)	0.4	0	0	0	0.1 <sup>a</sup>	0.3	0.1
	"	West Delnies	-	10.8	9.2	7.5	5.0	1.8	0.5	0	0	0							
	"	Mhorrich	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.1	7.5	10.8

- Indicates no record

a Based on returns for part of season

b Data no longer comparable

Table 2. The percentage of seal damaged salmon (salmon and grilse combined) in catches at netting stations 1964-1976

		A. Up to 31 May												
Area	Station	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
EAST COAST	Boddin	6.6	8.8	8.5	8.3	12.9	10.3	10.0	8.3	13.2	10.3	11.4	7.1	11.7
	Rossie	0.3	1.0	3.6	1.0	3.9	2.3	0.8	1.6	3.2	3.5	3.1	0.1	0
	" Charleton	4.5	4.0	3.8	12.5	15.4	0.0	5.3	1.4	2.7	2.7	1.1	0.6	7.5
	" Watermouth	4.3	3.4	0.9	7.0	1.8	4.0	2.2	0.4	2.1	1.3	2.8	3.8	0
	" Woodston (fly)	7.2	7.6	9.3	5.6	8.9	11.9	14.9	10.3	10.6	6.4	8.7	8.1	5.0
	" Woodston (bag)	1.8	2.9	10.3	6.7	5.3	2.0	2.4	3.7	4.9	2.6	2.2	3.1	1.6
	" Rockhall	1.1	3.4	6.8	2.3	4.0	8.1	4.4	5.9	6.8	3.9	5.4	2.6	1.6
	" Johnshaven	0.6	3.9	1.5	4.8	2.9	2.5	3.3	13.9	2.9	9.6	3.6	8.0	b
MORAY FIRTH	Gardenstown and Pennan	-	1.1	3.0	3.3	21.3	11.2	11.0	7.0	1.8	3.4	0.5	5.9	2.2
"	Nairn	0.3	0.0	1.4	0.0	0.0	0.0	0.0	7.9	0.0	0.0	4.3	3.3	12.5
"	East Delnies	1.9	0.0	0.0	2.1	0.0	0.0	0.0	0.0	11.0	5.6	6.1	3.2	5.3
"	West Delnies	0.4	0.0	0.0	0.0	0.0								
		B. From 1 June to end of fishing season												
EAST COAST	Boddin	5.3	2.8	1.8	0.8	2.7	0.6	1.4	3.5	1.9	1.9	3.0	3.1	4.5
	Rossie	0.0	0.3	0.9	0.6	0.3	0.5	0.0	0.4	0.5	0.3	0.2	0	<0.1
	" Charleton	0.3	0.6	1.8	7.4	6.9	0.3	0.8	0.4	0.1	0.5	0.7	0.7	0.4
	" Watermouth	0.1	0.1	0.3	0.1	0.1	0.1	0.3	0.4	0.2	0.2	0.1	0.6	0.2
	" Woodston (fly)	2.4	5.5	5.3	3.3	6.3	4.5	5.2	5.0	4.2	3.4	3.7	4.6	4.1
	" Woodston (bag)	0.1	0.0	2.6	0.6	1.7	0.5	1.6	2.3	1.5	2.0	1.5	1.6	1.4
	" Rockhall	<0.1	1.6	1.5	1.3	4.8	3.1	3.4	4.2	2.8	2.7	2.9	3.1	2.4
	" Johnshaven	0.2	2.0	1.3	1.1	1.8	0.6	0.9	0.3	1.2	2.1	2.1	0.2	b
MORAY FIRTH	Gardenstown and Pennan	0.5	0.1	0.1	0.2	1.8	0.4	0.3	0.6	0.0	0.1	0	0	0.2
"	Nairn	0.0	0.0	0.0	0.0	0.0	0.5	0.8	0.4	0.0	0.1	0.4	1.5	0.6
"	East Delnies	0.7	0.5	0.1	0.4	1.0	2.5	1.9	2.0	1.1	1.2 <sup>a</sup>	6.0	4.1	0.9 <sup>a</sup>
"	West Delnies	0.1	0.1	0.1	0.9	2.1								

- Indicates no return

a Based on returns from part of season

b Station not fished