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Vagrant Seals Visiting the Coastal Waters of Iceland, in the Period 1989-1994; Hooded Seals (*Cystophora cristata* Erxleben, 1777), Harp Seals (*Phoca groenlandica* Erxleben, 1777), Bearded Seals (*Erignathus barbatus* Erxleben, 1777) and Ringed Seal (*Phoca Hispida* Schreber, 1775)

by

Erlingur Hauksson and Valur Bogason

Marine Research Institute, Skulagata 4, P. O. Box 1390,
121 Reykjavik, Iceland

Abstract

In this paper are published new findings, about the visits of hooded seals (*Cystophora cristata*), harp seals (*Phoca groenlandica*), bearded seals (*Erignathus barbatus*) and ringed seals (*Phoca hispida*) in Icelandic waters. These animals have been entangled in gill-nets for lumpsuckers (*Cyclopterus lumpus*) and cod (*Gadus morhua*), shot by local hunters, or found dead on the shore, in the period of 1989-1994. Majority of the animals are from the North-cost of Iceland, during the spring and summer.

The majority of the hooded seals, are pups and one year old, but older animals occur quite frequently too. Hooded seals' males are more abundant in the catch than females. There seems to be an increase, in the occurrences of hooded seals off the coast of Iceland, from the year 1981 to 1994.

Young seals; pups and one year old animals, are dominating in the catch of harp seals. Males are a little more abundant than females, but hardly significantly. There seems to be an increase, in the frequency of visits of harp seals to Icelandic waters, from the year 1990 to 1994. Harp seals seem now to be more numerous off the North-Coast of Iceland than about a decade ago. However they are probably not as numerous now as in earlier times, especially in years of heavy land-ice and polar-ice, in the 18th and 19th century. Then, one could talk about real seal-invasions.

The ringed seals were mainly caught during the spring and early summer, but the bearded seals were mostly caught in wintertime. The great majority of the bearded seals visiting the Icelandic coast are young immature animals, but the ringed seals are sub-adults and adults.

Introduction

In this paper, are published new findings about the occurrences of hooded *seals (Cystophora cristata)*, harp seals *(Phoca groenlandica)*, ringed seals *(Phoca hispida)* and bearded seals (*Erignathus barbatus*) in Icelandic waters. These animals have either been entangled in gill-nets for catching lumpsuckers (*Cyclopterus lumpus*) and codfishes, found dead on the shore, or shot by local hunters, in the period of 1989-94. These seals are only vagrant seals in Icelandic waters. There are no records of them breeding there (Erlingur Hauksson 1986).

Material and methods

Whole animals or samples of the lower jaws, stomachs and sex-organs, were obtained from local fishers and seal-hunters. This paper is based on information about date, place and catching method of these vagrant seals, the last 5 years.

Age of animals were determined by counting of growth-layers in the cementum of a thin-section (0.5-0.7 mm) of the canine tooth, which was cut traversal with a low speed saw near the base of the root, with use of binocular dissecting microscope 6X to 50X magnification and transmitted light (Laws 1962; Bowen et al. 1983; Lawson et al. 1992).

Sex of animals was determined by investigating the sex organs of the animals. By investigating the ovaries and testes; looking for follicular (corpora lutea and corpora albicantia) and tubular growth it was determined whether animals were mature or not.

Results

Hooded seals

Majority of the animals were caught off the North-Coast (Fig. 1). Only thirteen animals were obtained elsewhere; three from the East-Coast, six from the West-Coast and four from the South-Coast.

Most of hooded seals were caught in May with August in second place. The months of early spring, March and April are in third place (Fig. 2). Visits of hooded seals are rarer in the summer-months June and July, in the moulting period of the animals (see Reeves and Ling 1981). Hooded seals seem to be absent from Icelandic Waters during the winter.

Pups and one year old animals are frequent in the catch, but older animals are also quite common (Fig. 3). Animals twenty years and older are few, but they do occur.

Males are highly dominating in the catch (Table 1). The proportion of males is

much higher than were found for the harp seals.

There is a yearly variation in occurrences of hooded seals. They were caught in much higher numbers in 1992-94 than 1989-91 (Table 2).

Harp seals

Majority of the animals were caught off the North-Coast (Fig. 4). Only few animals were obtained from the East-Coast and the West-Coast. Only one record of harp seal came from the South-Coast.

Harp seals were mainly caught in May. The months, March, April and June are in second place (Fig. 5).

Pups and one year old animals are dominating. They visit the coast of Iceland much more frequently than older animals (Fig. 6). Animals older than two years were rarely caught.

More males than females were caught (Table 3). The proportion of males is however much lower than we found in case of the hooded seals (Table 1).There are annual variations in occurrences of harp seals. Fewer harp seals were caught in the years of 1990-92 than in the years of 1993-94 (Table 4).

Bearded seals

Bearded seals were caught off the North-Coast, the East-Coast and the West-Coast (Fig. 7).

Bearded seals were mainly caught in the wintertime. Eight of the total 16 animals caught are from the period November to January. Others were mainly caught in the period March-June.

Pups and yearlings were dominating in the catch. The oldest seals caught were 3 years old (Table 5).

Ringed seal

Only four ringed seals were obtained. The seals were caught off the North-Coast, the East-Coast and the West-Coast (Fig. 7), during April to December. They were of both sexes, and from 3 to 18 years of age (Table 6).

Discussion

The findings that are presented here are based on samples of seals from fishers and seal hunters, as mentioned earlier. The information can therefore be biased in some respects. Of course seal can only become entangled in gill-nets when such kind of fishing is operated, and seal hunters only catch seals when weather is favourable. Hunting pressure and fishing efforts for lumpsuckers and gadoids; number of gill-nets

in the water, does also vary between years. The weather is seldom favourable in wintertime off the North-Coast. Visits of vagrant seals during the winter could therefore be unnoticed. However, the information from this investigation is, in many respects, similar that can be obtained from old chronicles (annals), when people were on the look-out for seals, because people depended on them for subsistence. This strengthens the findings of this investigation in our opinion.

In earlier times, the hooded seal visited mainly the North-Coast of Iceland. The scientist Bjarni Sæmundsson (1932) mentions that hooded seals were never very common, in comparison with the harp seal, and visited mainly Huna-Bay, Eyjafjordur and to a lesser extent Skjálfandi. They were only rarely seen off the Northwest-Coast and the East-Coast. It was quite variable how many hooded seals visited the coast. One could relate the intensity of their visits to the density of sea-ice of the Northwest- and North-coast of Iceland. In the period 1850-1880 hooded seals seem to be rather rare, except for the winter of the year 1867, when 60 to 100 hooded seal pups were slain on Langanes (Northeast-Iceland). Many hundreds were taken in 1895 on the Northeast-Coast. In the years 1880-1900 hooded seals were common and in the year 1904 it is mentioned as being very abundant, especially in Huna-Bay (Björn Guðmundsson 1944; Lúðvík Kristjánsson 1980).

The frequency of occurrence of hooded seals in the period 1981-84 seems similar as in the period 1989-91 (Erlingur Hauksson 1986). However it seems to be increasing in the most recent years.

The result of this investigation indicates, that hooded seals arrive later to Icelandic waters than the harp seals. Some of the animals seem to arrive not earlier than in August, when most of the harp seals have left. This was also the case in the past, as far as can be seen in annals. The hooded seals arrived later than the harp seals (Bjarni Sæmundsson 1932). This is also in accordance to the migration pattern of the hooded seals, which breed on the ice north of Jan Mayen (see Reeves and Ling 1981). After breeding and mating is over, the animals swim towards the moulting places on the ice edge in the Greenland's Strait, where the moulting takes place in the period of June-July. Part of the stock, mostly juveniles and adult males, visits the Icelandic coast in May to feed on their way to the moulting area. They stay away during moulting in June and July, but may come again to feed in the autumn.

It is quite interesting how many sub-adults and adult males of hooded seals seem

to visit the coast. This is quite different to the age- and sex-structure of the harp seals, whereas the majority of the seals are pups and juveniles.

In these old annals mentioned before we have records of good catches of harp seals, which seem to be the most dominant vagrant seal species in earlier times. In the year of 1718, many harp seals were slain on sea-ice off the Northeast-Coast. In the year of 1817 on the other hand many harp seals were taken off the Northwest-Coast. Two years later were thousands of harp seals taken in the north-eastern and eastern parts of the country. Next winter was good catch in the North and Northwest. In the year 1821 were about 500 harp seals caught in Grímsey (Björn Guðmundsson 1944; Lúðvík Kristjánsson 1980).

In recent times harp seals seem to occur close to the coast of Iceland in the wintertime, but seem to be absent from the coast during the late summer and autumn. At earlier times it was most usual that harp seals visited the North-Coast. They came in the wintertime and stayed until April or May, or even June in some coastal areas. They also occurred off the East-Coast and Northwest-Coast. There is also an evidence for, that they regularly hauled out on the sandy beaches of Öræfi; South-Coast of Iceland (Ragnar Stefánsson† pers. inf.; Björn Guðmundsson 1944; Lúðvík Kristjánsson 1980). This picture of the visits of harp seals in earlier times, is therefore quite similar to that of today.

The information from this study indicates, that harp seal pups and young animals visit the coast of Iceland mainly after the breeding time is over and when they have moulted. The breeding time of the Jan Mayen or Greenland Sea population is in March, mating is shortly afterwards and moulting occurs in April (King 1964). The visit of harp seals to the coast coincides well with the spawning migration of the capelin (*Mallotus villosus*) to the coast of Iceland. The capelin is closer to the shore in the spring than in the late summer and autumn (Hjálmar Vilhjálmsson 1994). The capelin seems to be an important food of harp seals in Icelandic waters (Erlingur Hauksson and Valur Bogason 1995 (unpublished)).

The occurrence of harp seals in Icelandic waters varies somewhat through time. During the period 1750-1790, harp seals seem to be much rarer, than the decade afterwards. Some kind of maximum occurred, in the period 1800-1825. In the middle of the nineteenth century there is a minimum, but afterwards there is an increase again

with a maximum in the period of 1910-1925. After this time, a downward trend begins and catching of harp seals is very little in the year of 1942 (Björn Guðmundsson 1944).

After the second World War, hunting for harp seals in Icelandic waters was not operated. Probably due to fewer seals, but also due to a change in life-style of the people in the farming districts. Sealing was not as important for livelihood as before. During the years of the second World War, abundance of harp seal increased off the North-Coast. This did, however, not lead to any increase in sealing, because then no home-market was for the seal-products in Iceland (Guðmundur Þorsteinsson 1964).

In those years when harp seal catches are high, the ice-edge is usually close to the coast for 1 month or more (Páll Bergþórsson 1969). The only exception from this rule is the period 1750-60, when sea-ice is close to shore for over 4 month in the North, but in spite of that seal catches are low.

In later years, number of harp seals in Icelandic waters seems to have increased. They are more numerous in 1993 and 1994, than the periods of 1990-92 and 1981-84 (Erlingur Hauksson 1986).

Contrary to the hooded seal the harp seals visiting the Icelandic coast seem to be pups and sub-adults. They also seem to have a different age-distribution, in favour of young animals, than the harp seals caught in Norwegian Waters during the seal invasion in the years 1987 and 1988 (Haug et al. 1991).

In old annals there are records of good catches of ringed seals, in the years of 1700-1725, when many ringed seals were slain on sea-ice in Eyjafjörður, North-Iceland. In the year 1896 there seems to have been a real invasion of ringed seals to Öxarfjörður Northeast-Iceland (Björn Guðmundsson 1944). Occurrences of ringed seals and especially bearded seals seem to have been much rarer, than visits of harp seals and hooded seals. They show up only occasionally. According to annals, the ringed seals came to the North-Coast after mid-winter and stayed until spring. -Just recently a few ringed seals were caught in Eyjafjörður North-Iceland (March 1995). They were most abundant off the North-Coast, but visited also the East- and West-Coast (Erlingur Hauksson 1982).

The bearded seals visited most frequently the Northwest part of the country, but went to other parts of the coast as well (Bjarni Sæmundsson 1932). According to our newest findings they still do that (Table 5).

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TABLE 1. Sex-ratio of hooded seals (*Cystophora cristata*) caught off the coast of Iceland in the period 1989-1994.

Sex	Number of animals	Percentage
Females	19	26.0%
Males	54	74.0%

TABLE 2. Occurrence of hooded seals (*Cystophora cristata*) off the coast of Iceland in different years, in the period 1989-1994.

Year	Number of hooded seals caught
1989	1
1990	2
1991	5
1992	63
1993	29
1994	70

TABLE 3. Sex-ratio of harp seals (*Phoca groenlandica*) caught off the coast of Iceland in the period 1990-94.

Sex	Number of animals	Percentage
Females	24	42.1%
Males	33	57.9%

TABLE 4. Occurrence of harp seals (*Phoca groenlandica*) off the coast of Iceland in different years, in the period 1990-94.

Year	Number of harp seals caught
1990	1
1991	0
1992	26
1993	78
1994	78

TABLE 5. Occurrences of bearded seals (*Erignathus barbatus*) off the coast of Iceland, in the period of 1990-94; IM immature (see Fig. 5 for catching locations).

Catching site	Year	Coastal area	Month	Sex	Age	Maturity
Eskifjörður	1990	East	Dec.	Male	3	IM
Skagaströnd	1992	North	Jan.	Male	3	IM
Siglufjörður	1992	N-East	Apr.	?	1	IM
Hælavík	1992	N-West	May	Male	1	IM
?	1992	N-West	Nov.	?	0	IM
Skjálfandi	1993	N-East	March	Female	1	IM
Krossvík	1993	N-West	Apr.	Female	1	IM
Hornvík	1993	N-West	Apr.	?	1	IM
Hali	1993	N-West	Dec.	?	0	IM
Hali	1993	N-West	Dec.	?	0	IM
Kópanesgrunn	1993	N-West	Dec.	Female	0	IM
Seyðisfjörður	1993	East	Dec.	?	0	IM
Seyðisfjörður	1993	East	Dec.	Male	0	IM
Arnafjörður	1994	N-West	March	Female	?	?
Drangar	1994	N-West	May	?	0	IM
Víkingavatn	1994	N-East	Aug.	?	0	IM

TABLE 6. Occurrence of ringed seals (*Phoca hispida*) off the coast of Iceland, in the period 1990-94; IM immature and M mature (see Fig. 1 for catching locations).

Catching site	Year	Coastal area	Month	Sex	Age	Maturity
Strandir	1991	N-West	June	?	3	IM
Eskifjörður	1990	East	Dec.	?	?	?
Skjálfandi	1994	N-East	Aug.	Male	6	?
Húnaflói	1993	N-West	Apr.	Female	18	M

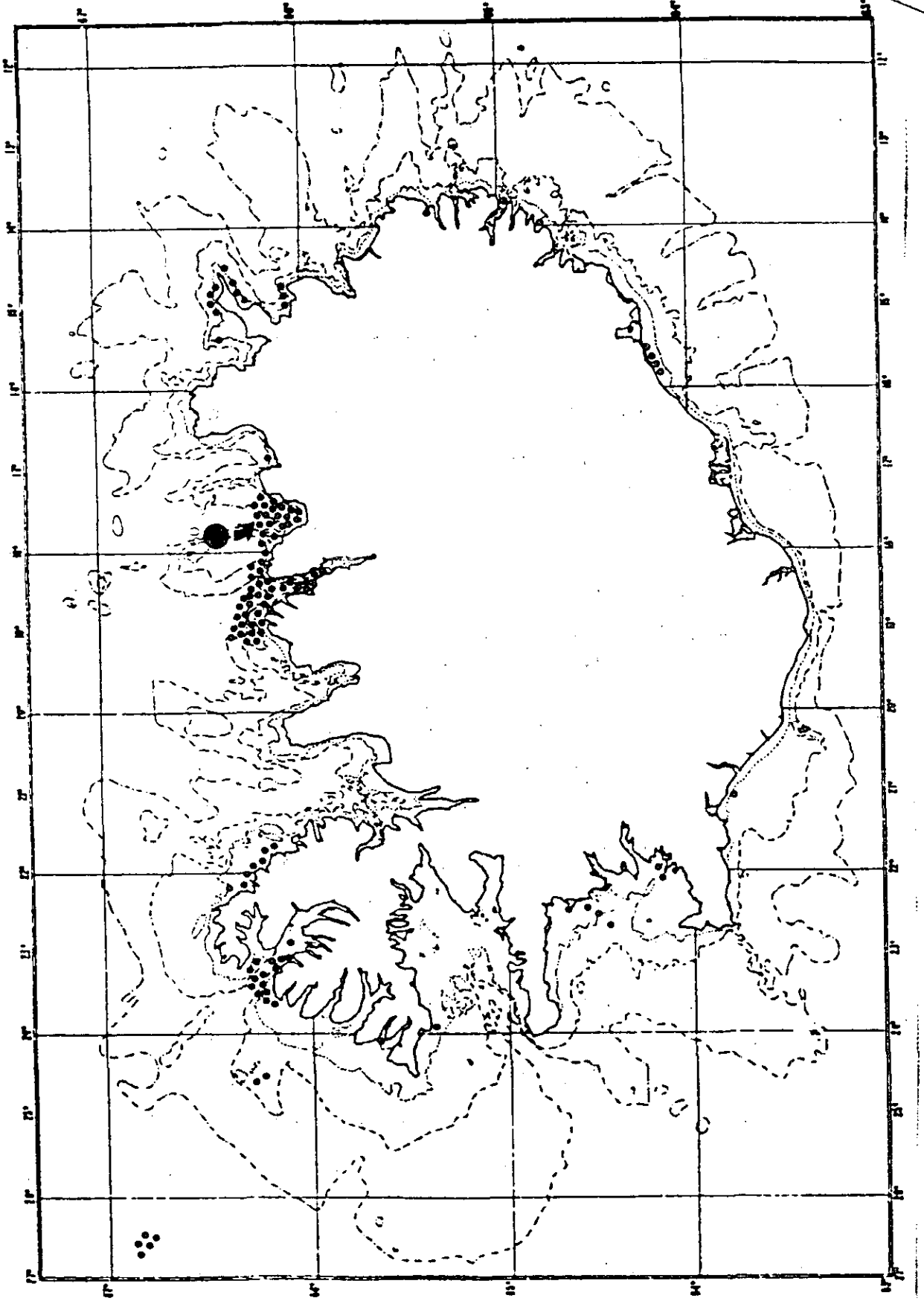

Fig. 1. Distribution of the hooded seals (*Cystophora cristata*) caught off the coast of Iceland in the period 1989-94. One big dot indicates at total of 50 hooded seals, other dots indicate one animal caught.

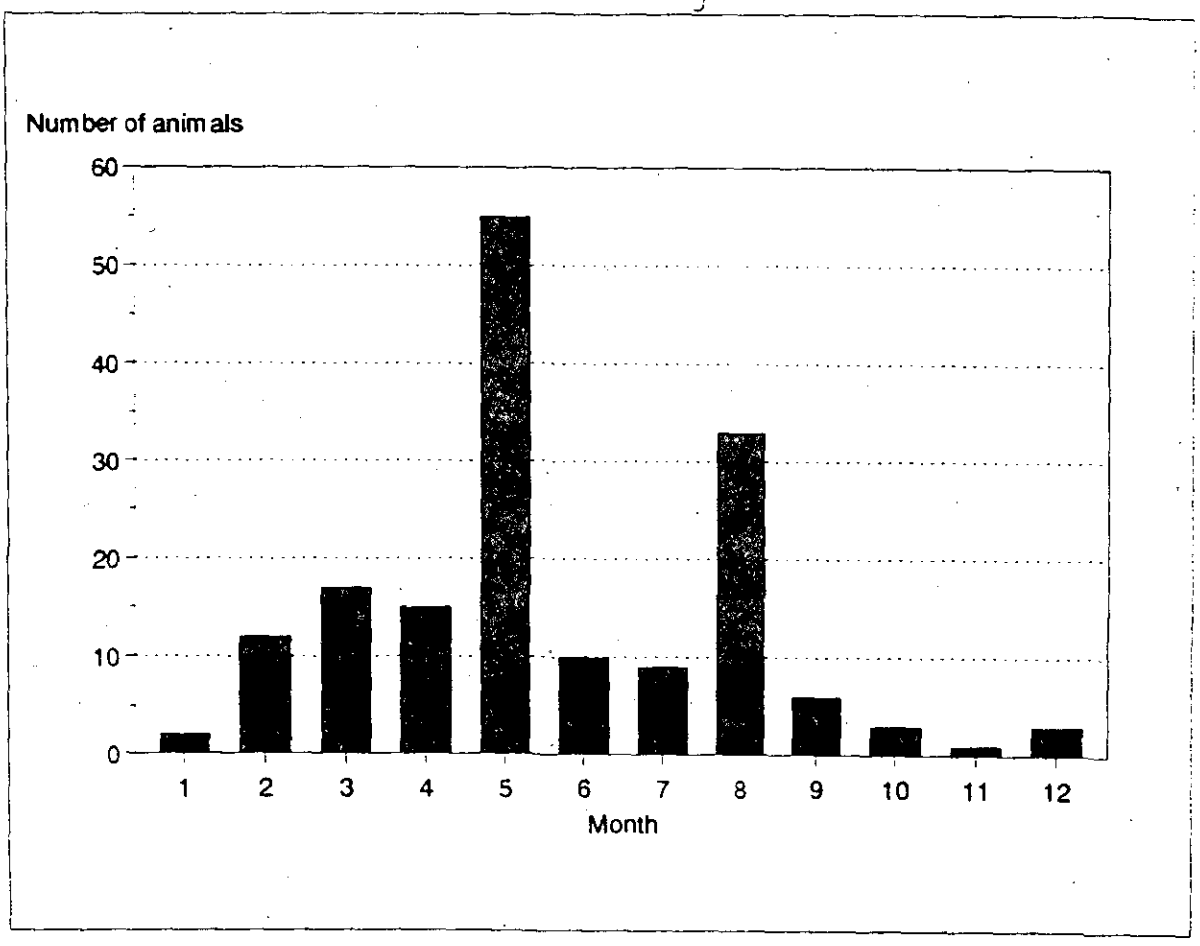

Fig. 2. Months of catch, of hooded seals (*Cystophora cristata*) off the coast of Iceland, in the period of 1989-94.

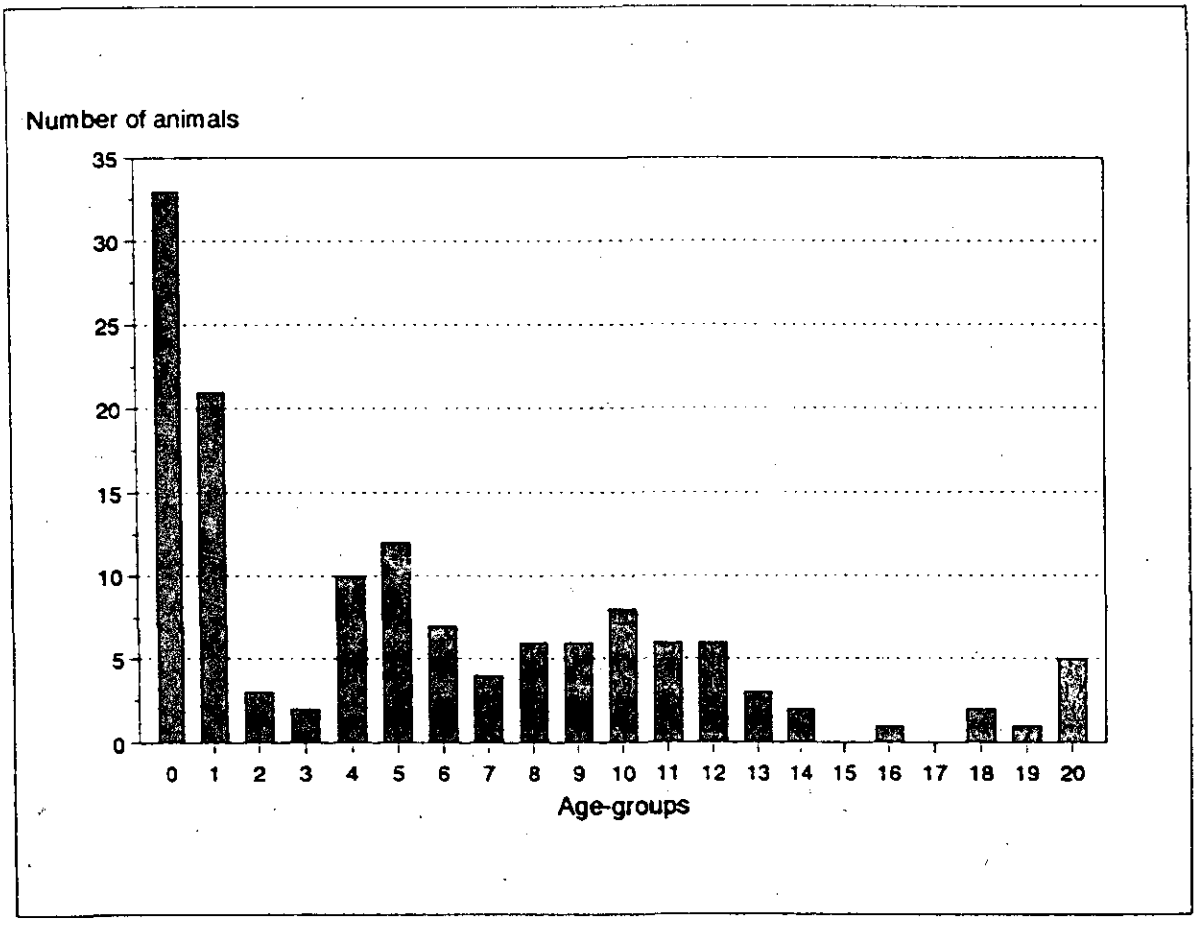

Fig. 3. Age-distribution of hooded seals (*Cystophora cristata*) caught off the coast of Iceland in the period of 1989-94.

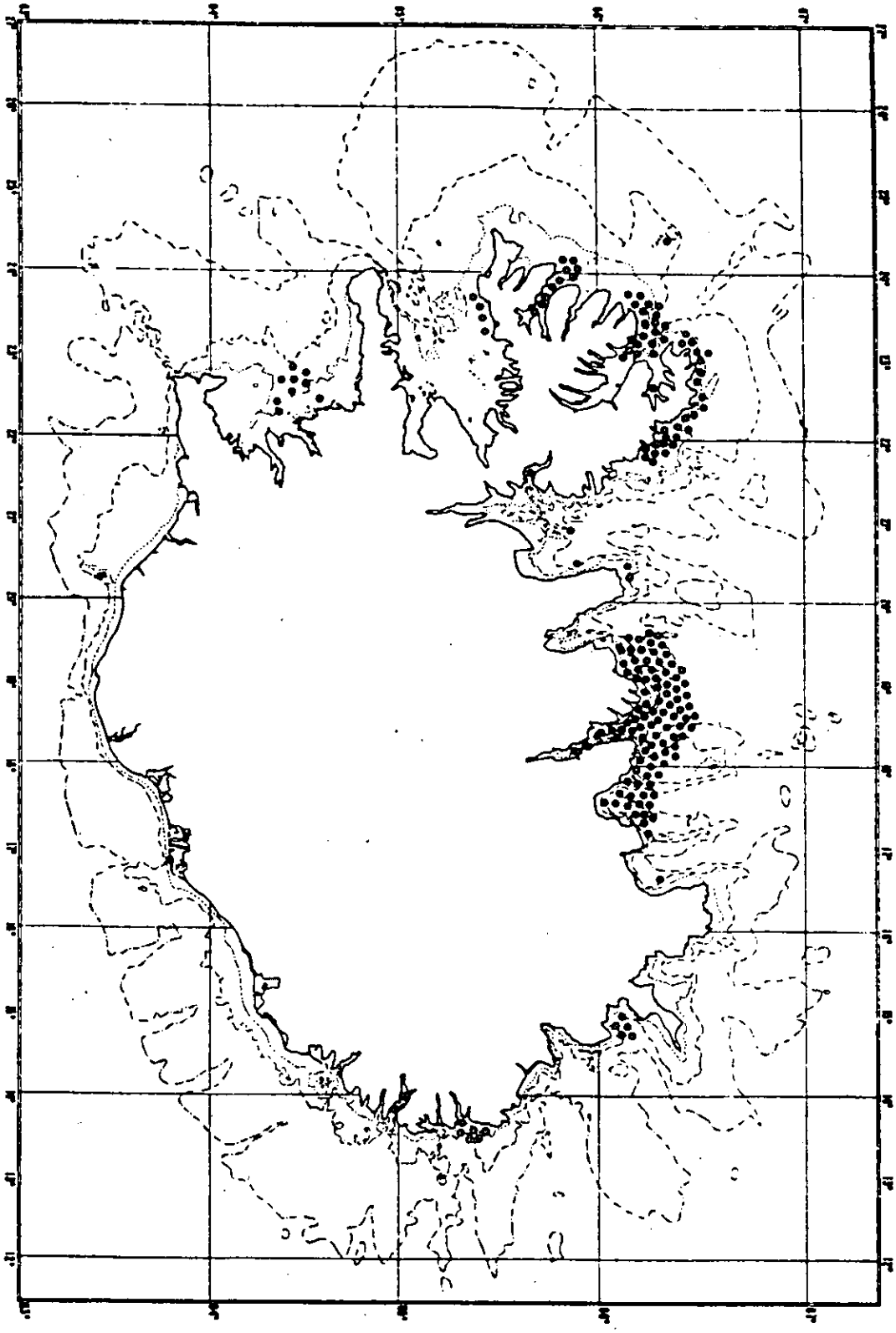

Fig. 4. Catch locations of harp seals (*Phoca groenlandica*) off the coast of Iceland in the period 1990-94.

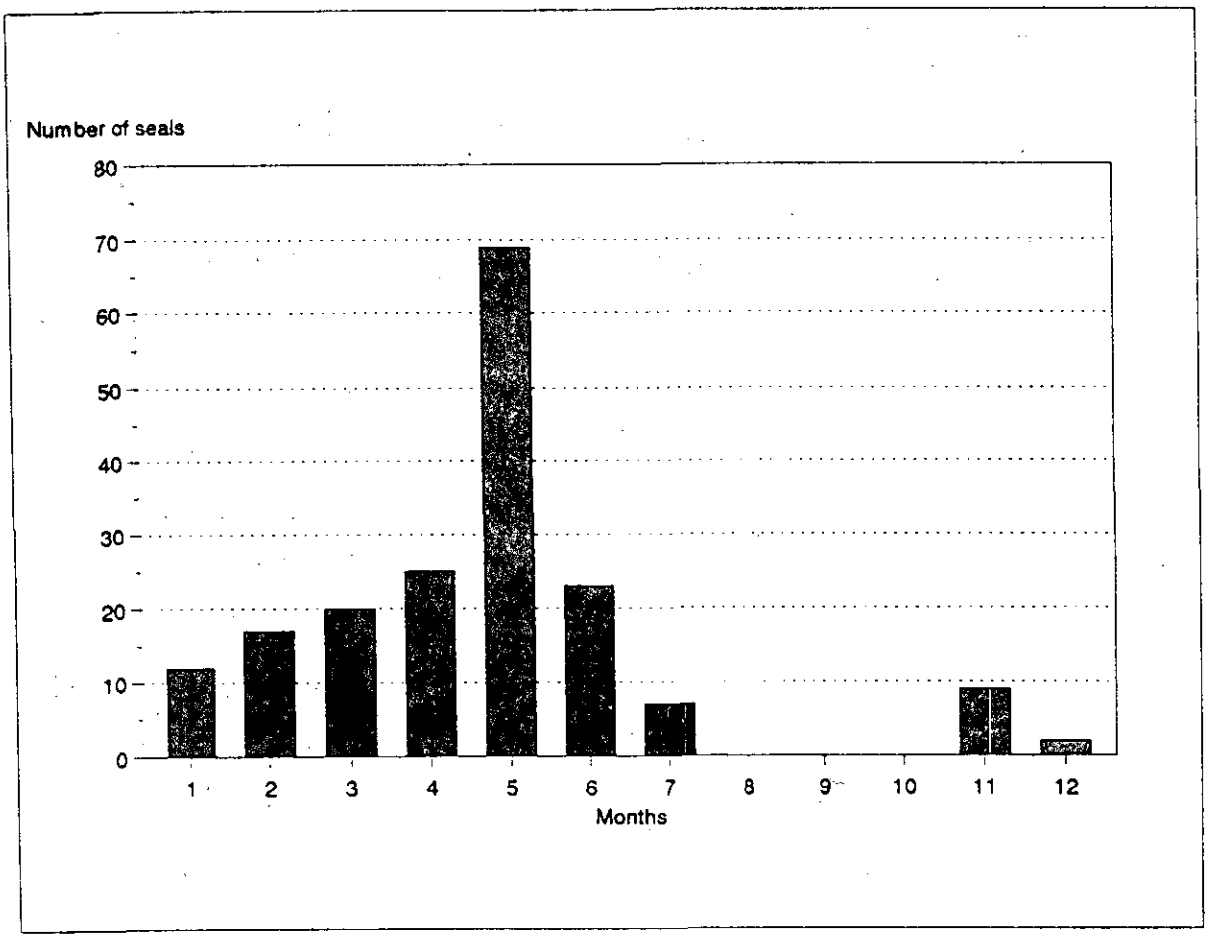

Fig. 5. Distribution of the months of capture for harp seals (*Phoca groenlandica*) caught off the coast of Iceland, in the period of 1990-94.

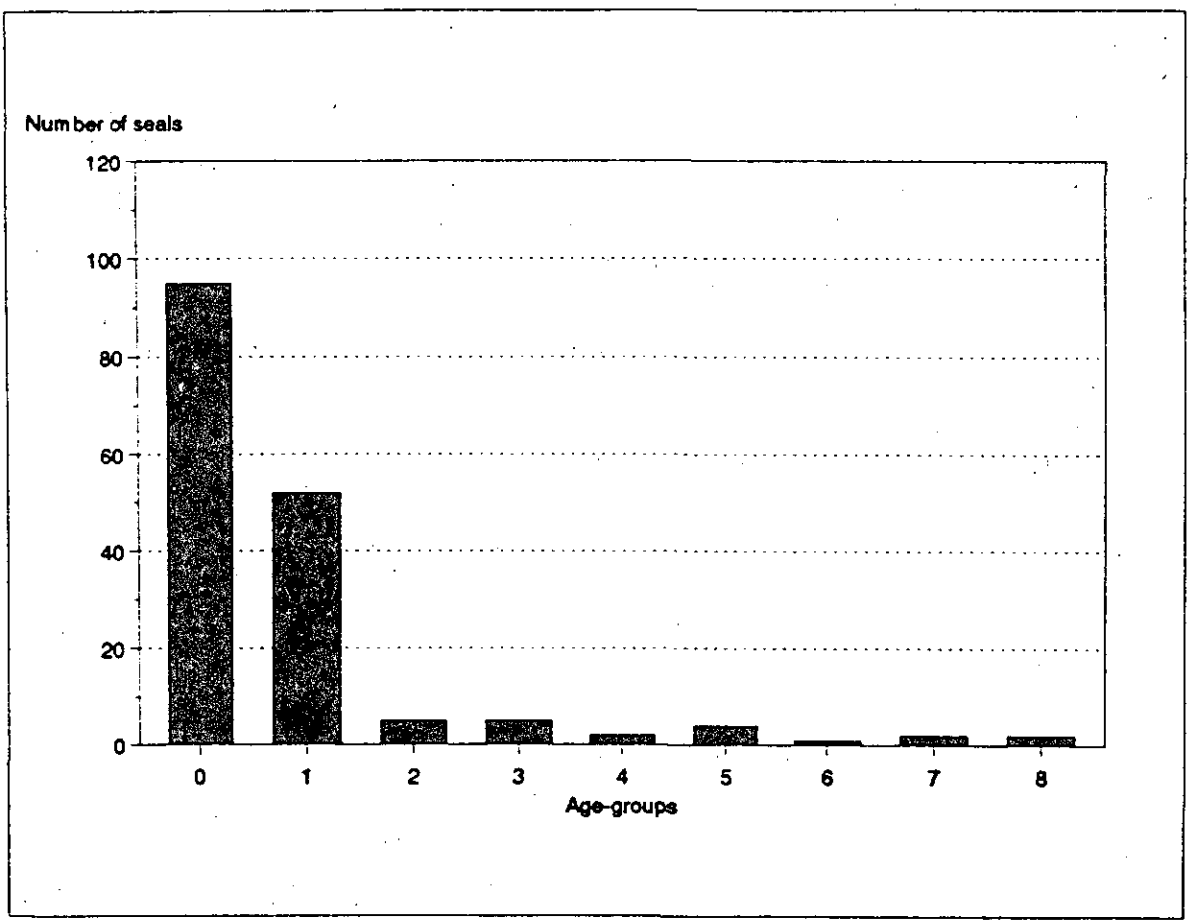

Fig. 6. Age-distribution of harp seals (*Phoca groenlandica*) caught off the coast of Iceland, in the period of 1990-94.

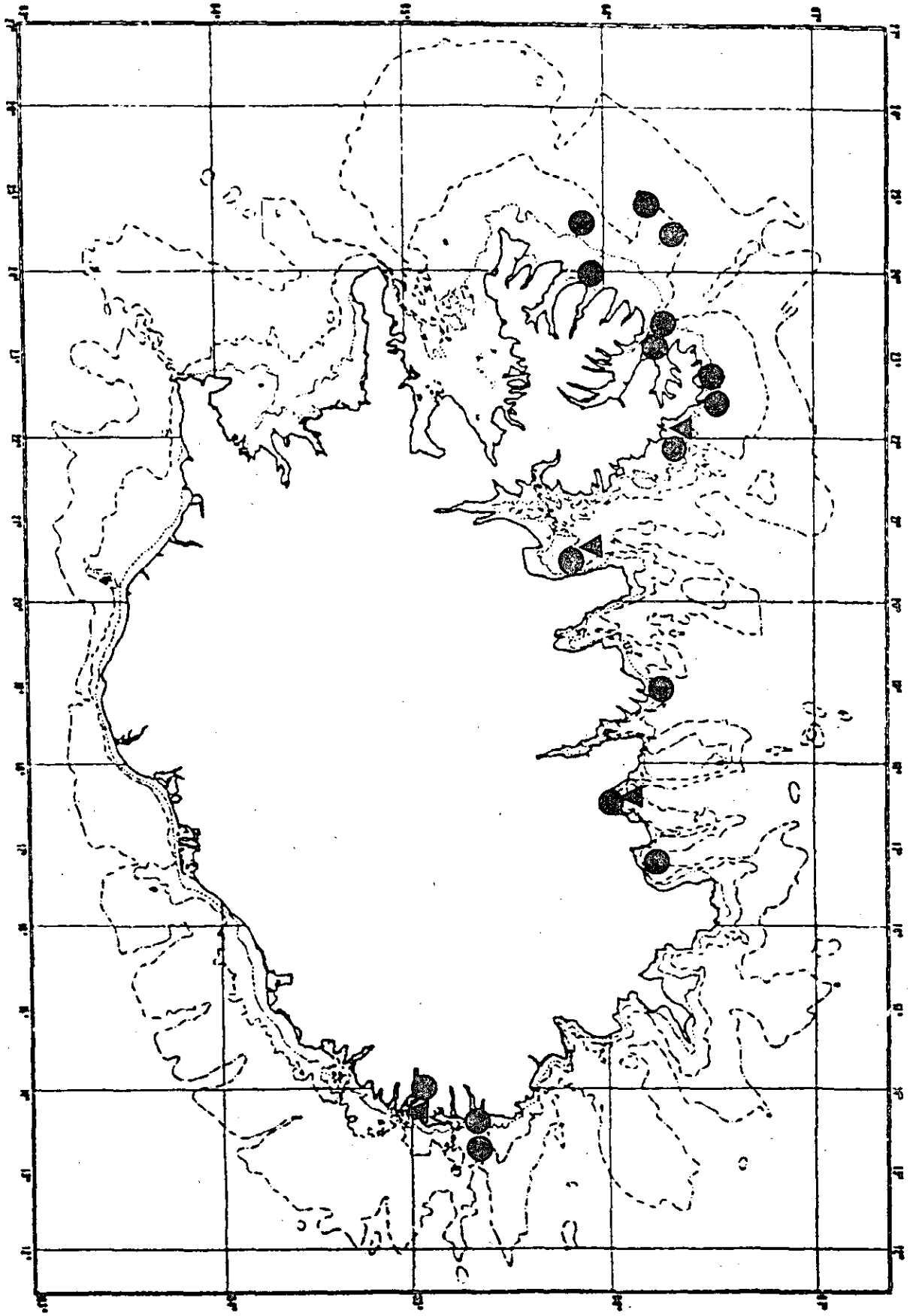

Fig. 7. Catching sites of bearded (*Erignathus barbatus*) (O) and ringed seals (*Phoca hispida*) (V) caught off the coast of Iceland in the period 1990-94. Each dot represents one seal.