



ANNUAL MEETING - JUNE 1966

Canadian Research Report on Harp and Hood Seals
of the Northwest Atlantic

by D. E. Sergeant

1. Introduction. This is a preliminary document, since the results of intensive research carried out in March-April, 1966, are not yet fully worked up, statistics for 1965 are not fully analyzed and those for 1966 not fully known. Nevertheless the report summarizes 18 seasons of work, begun by H. D. Fisher and continued by the present author, and including the observations of many other researchers and the long experience of many sealing men. I am particularly indebted to A. W. Mansfield of the Arctic Biological Station of the Fisheries Research Board, and to Captain Harold Maró of M.V. "Theron", Christiansen Canadian Enterprises Ltd.

2. Background. Harp Seals Pagophilus groenlandicus (Erxleben) form the basis of the hunting, with subsidiary numbers of Hood Seals Cystophora cristata Erxleben. Both species aggregate to whelp and to shed their hair, and can be profitably hunted by ships (and aircraft) at such times, though Hood Seals are now protected during their hair-shedding period, in June-July off southeast Greenland.

A. Harp Seals of the Northwest Atlantic are almost or entirely distinct from Harp Seals occurring east of Kap Farvel, Greenland. The published evidence comes from studies of body and skull proportions (Khuzin, 1963; Iablokov and Sergeant, 1963), and from absence of mixing of marked individuals (Rasmussen and Øritsland, 1954; Sergeant, 1965); serological studies are understood to be under way in Norway.

The Northwest Atlantic herds of Harp Seals appear to segregate with constancy into two main herds, one entering the Gulf of St. Lawrence and the other remaining off eastern Labrador and Newfoundland (Sergeant, 1965). Young of the Gulf herd are born mainly in early March on ice in ICNAF Division 4T, with smaller herds in 4K and 4S. Young of the Front (eastern Newfoundland) herd are born a few days later than in the Gulf on drift ice in Divisions 2J and 3K. Usually the Front ice drifts south and may enter and even pass through the Strait of Belle Isle, that is, 4R.

The main spring hunt is based on young from 3 to 10 days old which retain a hair-fast foetal pelage (whitecoat); pelts of fully-moulted young or beaters also command a good price, and are available from about the end of March. Hair-fast adults, especially the unscarred females are also sought after, and are available as females attending young, and males waiting to fertilize the females. The females, however, were never taken in large numbers and are now protected at this period. Hair-fast animals are also available from shore-based net fisheries, which take about the same number of immatures as adults. Adult and immature animals shed the hair coat on the ice from mid-April to mid-May; they then form aggregations and are sought after, but most pelts are loose-haired and have a low value. All pelts are made into furs except for the last which are used for leather.

B. Hood Seals of the Northwest Atlantic occur mainly on the Front, with smaller numbers in the Gulf. Unknown numbers occur along the ice border northward to Davis Strait and Kap Farvel, and these stocks may be linked to the large one occurring east of Greenland. Evidence includes one mark recovery (Rasmussen and Øritsland, 1964), synchronous whelping in mid-March in all areas (Rasmussen, 1960), and a greater random dispersal of young than seen in Harp Seals, suggesting less efficient orientation (unpublished data of the author).

Stock Assessment.

A. Harp Seals. Stock, catches and sustained yield estimates are shown in Table 1.

Direct counts by aerial survey and photography have been more successful with whelping adults and newborn young (Sergeant and Fisher, 1960) than with hair-shedding adults and immatures (unpublished data of the author). Such survey, however, produces under-estimates due

to: adults in the water, young hidden by ice, dispersal of the original whelping ice, and disturbance by sealing.

The start of sealing, formerly 5 March in the Gulf and 10 March on the Front, is now set at 7 March in the Gulf and 12 March on the Front. Observations made in 1966 suggest that estimates of young based on counts made before these dates should be multiplied perhaps by 1.2 or 1.3 to allow for late-born young. The greatest error, however, comes from groups of seals which are not discovered at all.

The same limitations apply to mark-and-recapture experiments, which were successfully carried out in the Gulf in 1964 from a land-based helicopter and on the Front in 1966 from an icebreaker-based helicopter. Young seals were marked before hunting began, and marks were returned by sealers hunting from ships, aircraft (Gulf only); small craft and on foot.

Nowadays an estimate of young born on the Front can be obtained from maximum total catch of young, because in many years the catch of young on the Front is very intensive, leaving few survivors.

Year-class survival can be studied from age samples of the population. The mixed population has been sampled irregularly from summer catches in the arctic and from shore catches in Labrador. The Front population has also been sampled irregularly from ships' catches of aggregated hair-shedding seals. Because of heavy, sometimes selective, catching of immature seals on the Front, study of survival following the variable annual catch of young is only valid when based on 1-year-old immatures. In the Gulf, age samples have been obtained from the January net fishery for 13 out of 14 consecutive seasons. These have proved valuable for studying catch and survival. The animals appear fully only at 4 years of age, since some younger immatures apparently remain late or permanently in the arctic. However since the Gulf catch of Harp Seals is composed almost entirely of young seals, survival should not vary greatly after the catch of young seals has been taken.

Life tables were calculated from parameters described by Sergeant and Fisher (1960). The least well-known parameter is the natural mortality at age 0. Young pups are killed by ice pressure against the coast, particularly in years of easterly or northerly winds. In such years, ships' catches are generally low because of the same risk, so the net result is probably to even out total mortality rates of the young from year to year.

In life table calculations it has been assumed that the industry desires a certain number of immature and adult pelts. This catch is arbitrarily considered to be 1/5 the number of young pelts that are taken. To the biometrician, it does not matter whether the young are taken as whitecoats at 1 week of age or beaters at 1 month. However a sealing industry spokesman states that the stable market for young pelts is some 150,000 whitecoats and 30,000 beaters annually.

An important density-dependent variable is the reproductive rate (Sergeant, 1966). From life tables so far calculated, and taking into account a subsidiary catch of adults and immatures as described above, maximum sustained yield of young is estimated at 0.36 of total young born. At higher stock densities this figure declines, that is, proportionately fewer young are born, while with higher intensities of catch, the population is steadily reduced.

In practice, hunting at the Front has been excessive, both for young and for adults and immatures. The population estimate obtained by H. D. Fisher in 1950 and 1951 was 430,000 young born; in 1960 the author obtained some 250,000 (Sergeant and Fisher, 1960, revised by the author to allow for late-born young, but possibly still an under-estimate). In 1966, ships' catches and subsequent reports by industry survey suggest that practically all young seals were taken, indicating a production on the Front close to 200,000. A catch of 94,000 young in 1965 resulted in good survival of 1-year-old immatures in 1966, but this catch was unusually low (Table 2).

The author earlier concluded that a decline had taken place in the number of young born in the Gulf, based on results of surveys made in the southern Gulf in 1959 and 1960, compared with those made by H. D. Fisher in 1950 and 1951. It is possible that some shift of whelping animals occurred from the southern to the northern Gulf in the interim, or the number of whelping females, which are among the adult animals actually censused, may actually have decreased, while increased reproductive rates produced no decline of young. At any rate, the author and others aboard sealing ships sighted a patch of hair-shedding adults and immatures about 20 x 6 miles in size, and probably representing a large proportion of the Gulf patch, in mid-April 1966, which indicated no scarcity of Gulf seals. Moreover, studies indicate a lesser increase of reproductive rate (Sergeant, 1966), and thus a lower intensity of hunting in the Gulf than on the Front. This is in line with a slowly increasing catch in the Gulf of about 80,000 young and a few thousand adult and immature seals annually (Table 2). An increase

of catch was prevented by a quota set for ships and aircraft in 1965. Assuming that over-exploitation has not taken place in the Gulf, one would not expect survival to be inversely correlated with catch except at the highest catches. This seems to be the case. From life tables, and allowing for absent immatures, balanced survival at 4 years is calculated to be about 10% of the January age samples (actual survival at 4 years may be 20% of the sample). Table 3 shows that survival at less than 10% of the age sample, in more than 50% of separate samples, has not occurred until the catch has reached the level of 80,000-99,000 young. This empirical evidence, which will be checked by further age samples, agrees broadly with H. D. Fisher's 1950 and 1951 aerial surveys (Sergeant and Fisher, 1960) which gave a production of about 215,000 young annually for the southern Gulf. This should be somewhat more for the whole Gulf, perhaps 250,000 in all. Then $250,000 \times 0.36 = 90,000$. Present catches in the Gulf are close to this figure (Table 2), though some small increase may still be possible.

B. Hood Seals. The stock in the Gulf numbers only a few hundred or thousand and is now totally protected. In 1966, Hood Seals were seen in both the southern and northern Gulf. The stock on the Front provided in 1966 a catch of some 15,000, of which about 8,000 will have been young, 5,000 adult females, and 2,000 adult males. An excess of adult males was noted both in the Gulf and at the Front, most likely resulting from the type of hunting. The population of Hood Seals at the Front in 1966 is thus estimated at about 10,000 families, since the ships easily penetrated the ice to the seals.

A sample of teeth and reproductive tracts was collected from some 130 female Hood Seals in March 1966. It is intended to compare this with a sample of the same size collected jointly by H. D. Fisher and the author in 1953, in order particularly to determine whether any reduction has occurred in age at maturity, as found for Harp Seals when the stock has been thinned (Sergeant, 1966). Also, hopefully, the sample is large enough that the year-class strengths may be compared with those of Hood Seals collected east of Greenland by Norwegian or Soviet investigators in 1966, in order to test possible linkage between the populations. Annual variability of catch of Hood Seals at the Front is greater than for Harp Seals, suggesting a variable movement of Hood Seals south to this catching field in different years.

4. Work in Progress comprises analysis of the mark-and-recapture experiment on the Front, and of age and reproductive samples collected at the Front in March, 1966 from 130 female and 40 male Hood Seals and 25 hair-shedding Harp Seals and similar samples collected in the Gulf in April, 1966 from 750 hair-shedding Harp Seals. Analyses also continue of an age sample and reproductive sample collected from Harp Seals entering the Gulf in January, 1966.

Following an analysis of this material, a full account of the population dynamics of the Harp Seals is planned, as well as an account of available information on the Hood Seal stocks.

Some 1500 young Harp Seals were marked in the Gulf in March 1966, after the industrial fishery there had ended. Later returns are expected to throw light on the question of whether Gulf-born seals may move to the Front. Previous marking, carried out in 1950-53, showed no such movement (Sergeant, 1965), but the thinning of the Front population has made it more likely, and the number of seals recently marked was larger.

5. Work Planned in 1967 is chiefly an aerial photographic survey of the whole Gulf, together with another routine analysis of a Gulf sample which it is planned to collect in January 1967.

6. Summary. Production of young Harp Seals east of Newfoundland (Front area of hunting) has fallen from an estimated 430,000 or more in 1950 to an estimated 200,000 in 1966, under heavy catching of both young and older seals.

In contrast, the herds of Harp Seals whelping in the Gulf of St. Lawrence are in good condition and the sustained yield is estimated at about 90,000 young annually with about 15,000 adult and immatures besides. Present catches, controlled by a quota for the industrial hunting, as well as by a restricted season of hunting, are very close to this level.

Hood Seals in the Gulf are scarce and are now protected. A heavy catch of adult female as well as of young Hood Seals east of Newfoundland in most of the recent years appears to be the cause of an observed excess of adult males. The species probably arrives in the catch area in varying numbers from year to year, whereas constancy of return to home area is shown by Harp Seals.

7. Bibliography.

Iablokov, A. V., and D. E. Sergeant. 1963. Izmeneniya krainologicheskikh priznakov grenlandskovo tyuleniya (Pagophilus groenlandicus, Erxleben 1777). Zoologicheskii Zhurnal 42(12): 1857-1865.

- Khuzin, R. Sh. 1964. Morfo-ekologicheskaya kharakteristika grenlandskogo tyulanya Yanmayenskogo stada. (Morpheocological characters of harp seals of the Jan Mayen stock.) Materialy sessii uchenogo soveta PINRO po rezul'tatam issledovaniy v 1962-1963, p. 226-234. Murmansk.
- Rasmussen, B. 1960. Om Klappmyssbestanden i det nordlige Atlanterhav. Fiskeridirektoratets Skrifter, (Bergen), No. 1.
- Rasmussen, B., and T. Øritsland. 1964. Norwegian tagging of Harp Seals and Hooded Seals in north Atlantic waters. Fiskeridirektoratets Skrifter 13(7): 43-45.
- Sergeant, D. E. 1965. Migrations of harp seals Pagophilus groenlandicus (Erxleben) in the Northwest Atlantic. J. Fish. Res. Bd. Canada, 22(2): 433-464.
1966. Reproductive rates of Harp Seals Pagophilus groenlandicus (Erxleben). J. Fish. Res. Bd. Canada, 23(5):
- Sergeant, D. E., and H. D. Fisher. 1960. Harp seal populations in the western North Atlantic from 1950 to 1960. Fish. Res. Bd. Canada, Arctic Unit, Cir. No. 5, 58 pp.

Additional Canadian Bibliography

(not cited in text)

- Fisher, H. D. 1955. Utilization of Atlantic Harp Seal Populations. Trans. 20th N. Amer. Wildl. Cong. March 14, 15 and 16, 1955. Wildl Mgmt. Inst., Wire Building, Washington 5, D.C.
- Sergeant, David. 1963. Harp Seals and the Sealing Industry. Canadian Audubon, Toronto, 25(2): 29-35.
- Sergeant, D. E. 1965. Exploitation and Conservation of Harp and Hood Seals. Polar Record 12(80): 541-551.

Table 1. Believed Approximate Status of Harp Seal Stocks.

		Total Stock (Young born)		Actual Catch		Sustained Yield Catch	
				Young	Old	Young	Old
<u>Front</u>	1950	2 X 10 ⁶ (400,000)	1950-59	154,000 ¹⁾	67,000 ¹⁾	144,000	29,000
	1960	1.25 X 10 ⁶ (250,000)	1960-65	143,000	65,000	90,000	18,000
	1966	0.8 X 10 ⁶ (200,000)	1966	180,000	30,000?	72,000	14,000
<hr/>							
<u>Gulf</u>	1950	1.5 X 10 ⁶ (250,000)	1950-59	70,000 ²⁾	9,000 ²⁾	90,000	18,000
	1960	1.25 X 10 ⁶ ³⁾ (250,000)	1960-65	79,000	14,000	90,000 ³⁾	18,000
	1966	1.0 X 10 ⁶ (250,000)	1966	85,000	18,000	90,000	18,000

-) Landsmen's catch, not available for 1950-53, will raise actual catch for 1950-59.
-) Landsmen's catch, not fully subdivided up to 1959, will raise actual catch for 1950-59.
-) More efficient reproduction comes into effect, raising sustained yield catch as per cent of young born and of total stock.

Table 2. Approximate catches of Harp Seals in the western North Atlantic from 1950 to 1966, in thousands of pelts. (Figures subject to revision, especially for earlier years. 1966 figures preliminary.)

Year	Gulf of St. Lawrence		East of Newfoundland (Front)	
	Young	Immature and Adult	Young	Immature and Adult
1950	31*	14*	146*	28*
1951	90*	16*	250*	52*
1952	63*	15*	147*	77*
1953	32*	—*	157*	62*
1954	74*	2*	114	62
1955	94*	8*	160	67
1956	93*	14*	249	34
1957	74*	4*	80	75
1958	90*	11*	60	135
1959	62*	7*	180	74
1960	84	16	93	112
1961	43	6 ⁺	133	12 ⁺
1962	90	16	163	97
1963	95	21 ^o	197	64 ^o
1964	81	17	178	63
1965	83	10 ^x	94	42
1966	85	18	180	30?

Landsmen's catches not fully documented.

Closing date of May 5 came into effect.

Closing date of April 30 came into effect.

-Closing date of April 25 came into effect (Gulf only).

Table 3. Catch and Survival of Young Harp Seals in the Gulf of St. Lawrence.

Catch of Young Seals in Gulf of St. Lawrence	Number and Per cent of Years in which four-year old Seals entering the Gulf:			
	- exceeded 10% of sample		- were less than 10% of sample	
	<u>Number</u>	<u>Per cent</u>	<u>Number</u>	<u>Per cent</u>
20,000 - 39,000	1	100	0	0
40,000 - 59,000	2	100	0	0
60,000 - 79,000	3	75	1	25
80,000 - 99,000	3	50	3	50