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NOAA Technical Memorandum NMFS-F/NEC-60

Antarctic Marine Living Resources Program

**Survey of Antarctic Fur Seals
in the South Shetland Islands,
Antarctica, during the 1986-1987
Austral Summer**

**U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole, Massachusetts**

September 1988

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BIBLIOGRAPHIC INFORMATION

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Abstract: A survey of Antarctic fur seals in the South Shetland Islands, Antarctica, during the 1986/87 austral summer indicated that this species is continuing its population recovery and recolonization of rookery sites following 19th Century commercial exploitation. Twelve fur seal pupping sites were identified, some of which had not previously been reported. The largest pupping sites are at Telmo Island and Cape Shirreff on the north coast of Livingston Island. Total fur seal pup production in the South Shetland Islands in 1986/87 is estimated to be approximately 4000 individuals. Notes on other pinniped species observed during the survey are presented. The optimal sites for combined fur seal and penguin monitoring activities, as part of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Ecosystem Monitoring Program, are recommended as Seal Island, Elephant Island; Stigant Point, King George Island; and Cape Shirreff/Telmo Island, Livingston Island.



NOAA Technical Memorandum NMFS-F/NEC-60

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Antarctic Marine Living Resources Program

Survey of Antarctic Fur Seals in the South Shetland Islands, Antarctica, during the 1986-1987 Austral Summer

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Woods Hole, Massachusetts

September 1988

PROGRAM STATEMENT

The U.S. Antarctic Marine Living Resources (AMLR) Program supports U.S. policy regarding the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). The CCAMLR is an international agreement that supports an ecosystem approach to the conservation and management of living resources found in ocean areas surrounding the continent of Antarctica. The Convention mandates a management regime committed to applying measures to ensure that harvesting of Antarctic marine living resources, such as finfish and krill, is conducted in a manner that considers ecological relationships among dependent and related species. Member countries of CCAMLR are: Argentina, Australia, Belgium, Brazil, Chile, European Economic Community, France, German Democratic Republic, Federal Republic of Germany, India, Japan, Korea, New Zealand, Norway, Poland, South Africa, Spain, USSR, United Kingdom, and United States.

U.S. objectives for the CCAMLR were established with the signing into law of the Antarctic Marine Living Resources Convention Act of 1984 (P.L. 98-623). The legislation charges the Secretary of Commerce with the design, conduct and implementation of directed scientific research in support of U.S. objectives in the CCAMLR. Responsibility for these activities has been delegated to the National Fisheries Service (NMFS) of NOAA.

The U.S. AMLR Program supports the CCAMLR need for information through analysis of commercial fisheries data and directed research on key species groups in the Antarctic marine ecosystem. This information, along with research done by other member countries, is used by the CCAMLR to detect and record significant changes in critical components of the Antarctic ecosystem. The Scientific Committee of the CCAMLR then makes conservation recommendations to the Commission, which establishes required conservation measures.

The U.S. AMLR Program focuses its field research activities in the southwest Atlantic Ocean, Scotia Arc, and Antarctic Peninsula. Special attention is directed to the vicinity of Bransfield Strait, South Shetland Islands, and the Palmer Archipelago. In addition, the AMLR Program conducts field work in other areas, as needed, to provide comparative data.

ABSTRACT

← A survey of Antarctic fur seals in the South Shetland Islands, Antarctica, during the 1986/87 austral summer indicated that this species is continuing its population recovery and recolonization of rookery sites following 19th Century commercial exploitation. Twelve fur seal pupping sites were identified, some of which had not previously been reported. The largest pupping sites are at Telmo Island and Cape Shirreff on the north coast of Livingston Island. Total fur seal pup production in the South Shetland Islands in 1986/87 is estimated to be approximately 4000 individuals. Notes on other pinniped species observed during the survey are presented. The optimal sites for combined fur seal and penguin monitoring activities, as part of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Ecosystem Monitoring Program, are recommended as Seal Island, Elephant Island; Stigant Point, King George Island; and Cape Shirreff/Telmo Island, Livingston Island.

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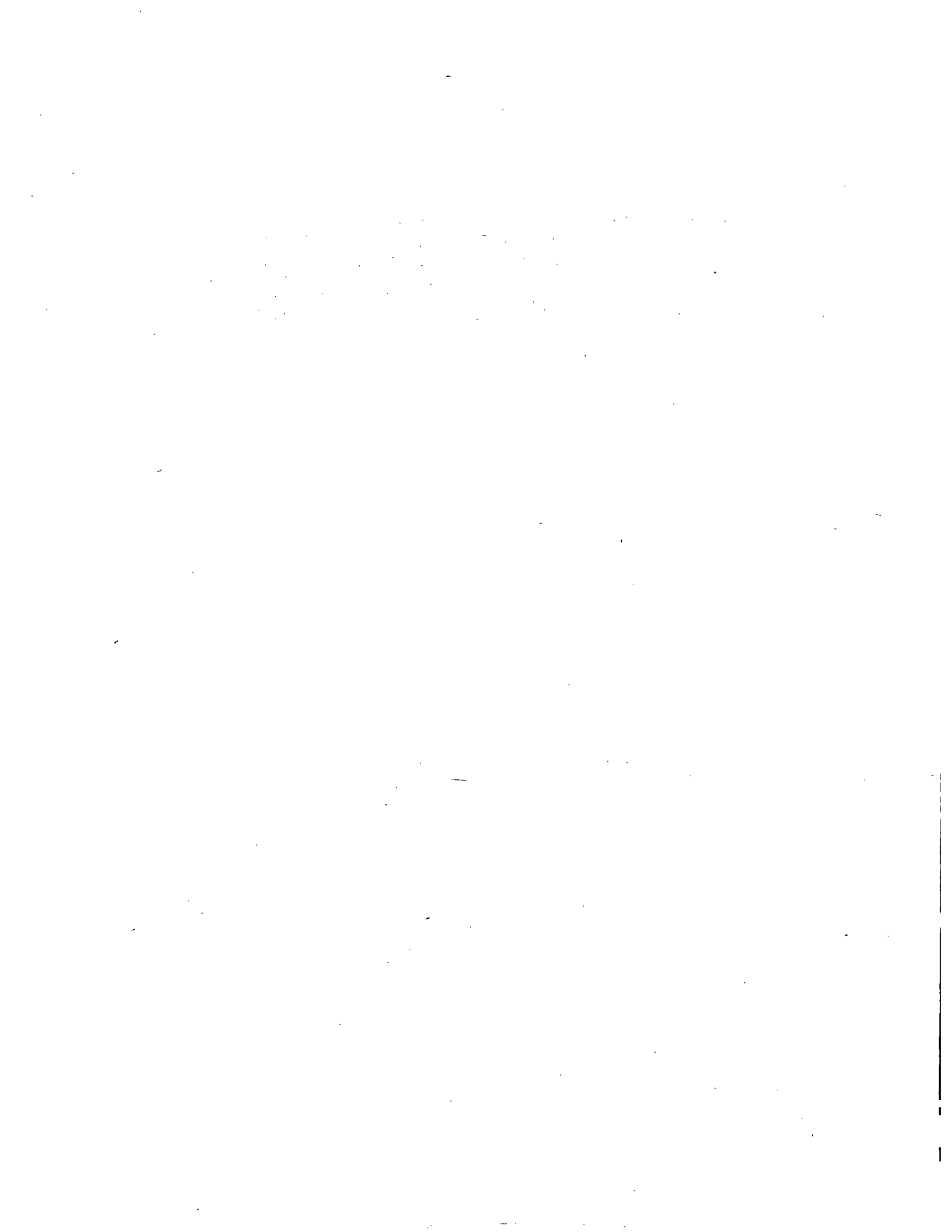
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INTRODUCTION

Antarctic fur seals, Arctocephalus gazella, were commercially harvested and nearly exterminated in the 19th century. In the 1930's small numbers of fur seals (tens of individuals) were once again seen at Bird Island, South Georgia (Bonner, 1968). Since 1956, when censuses were begun in the South Georgia vicinity, the number of pups born at Bird Island and South Georgia increased to a population estimated in the early 1980's at just under one million (Payne, 1977; Bonner, 1981; Laws, 1984). At present, the majority of Antarctic fur seal pups are born at Bird Island, South Georgia, and the Willis Island, although daughter rookeries have been re-established during the past several decades throughout the Scotia Arc and elsewhere (Bonner, 1968; Laws, 1984).

Surveys have been made during the breeding season at several of these sites, but census coverage has been incomplete. Fur seals in the South Shetland Islands have been censused sporadically over the past 80 years, with the first post-exploitation record of successful pup production being reported by O'Gorman (1961) at Cape Shirreff, Livingston Island, in January of 1958. However, no attempts to census the entire archipelago have been made since 1965/66 when Aguayo and Torres (1967) surveyed fur seal abundance.

The survey reported here focused on the South Shetland Islands and had three principal objectives: 1) to document the recolonization and current distribution of Antarctic fur seal rookeries, 2) to estimate the current annual pup production in the archipelago, and 3) to identify fur seal rookeries suitable as potential monitoring sites in the land-based network of the CCAMLR Ecosystem Monitoring Program.

METHODS

Surveys, which were conducted between 23 December 1986 and 12 February 1987 during research cruises aboard the USCGC Glacier, were used to survey all coastlines of the Elephant Island group, including the Seal Islands, Cornwallis, Clarence, Gibbs, Aspland, and O'Brien Islands (Figure 1). Surveys were flown at approximately 100 m altitude, with photographs taken of large groups to assist in estimating group size (e.g., southern elephant seals, Mirounga leonina). Although the survey focused on Antarctic fur seals, all pinnipeds observed hauled out on land were counted. Species which routinely haul out on ice (e.g., crabeater seals, Lobodon carcinophagus, and leopard seals, Hydrurga leptonyx), were sighted on land only infrequently whereas southern elephant seals (hauled out on beaches for their annual molting period) were sighted often. Counts of all pinnipeds were tallied by species, with no differentiation made between age and sex classes except for fur seals. At sites where fur seal pups were present, observers counted living and dead pups by censusing colonies on foot.

Surveys from the R/V Prof. Siedlecki were conducted between 25 January to 12 February 1987 and were performed by navigating inflatable boats near shore. All ice-free coasts of the South Shetland Islands between Low and Smith Islands and King George Island were examined in this fashion (Figure 1). Where fur seals were observed in abundance, observers landed to search for pups by walking through haulout areas.

RESULTS

A total of 12 Antarctic fur seal pupping sites were identified, some of which were not known prior to this survey (Tables 1 and 2). Numbers of Antarctic fur seal pups at various sites ranged between a single pup each at Fildes Peninsula, Desolation Island, and Smith Island, to 1,875 pups (including 215 dead pups) at the Telmo Island north of Livingston Island. Most pupping sites were located on or near King George, Livingston, or Elephant Islands. Only bachelor male fur seals were observed at other sites. No pupping sites were located on the southern coasts of islands along the Bransfield Strait.

Even though the fur seal population is increasing in the South Shetland Islands, not all of the islands known to have had fur seal rookeries prior to exploitation are currently occupied. Our census revealed that although fur seal colonies are being re-established successfully along the northern coastlines of the South Shetland Islands, recolonization of the southern coasts has not yet begun. Southern coasts are known to have been the sites of large fur seal rookeries which were subjected to heavy commercial exploitation in the 1820/21 and 1821/22 seasons (Stackpole, 1955; Bertrand, 1971). In addition, no fur seals were observed at Cornwallis, Clarence, Gibbs, Aspland, or O'Brien Islands. The absence of animals at these islands conforms to previous survey data which indicated few Antarctic fur seals in these areas (Aguayo and Torres, 1967; Hunt 1973; Aguayo, 1978).

DISCUSSION

Our survey results indicate that both the pup production and the distribution of Antarctic fur seals are continuing to increase in the South Shetland Islands (Table 3). Even for those sites in years when data on the number of pups are not available, the total number of individuals observed appears to be increasing in most areas.

The reason for the differences in growth rates of rookery size between the three islands listed in Table 3 is unknown. Whereas rookeries at Elephant and Livingston Islands have expanded significantly over the past two decades, the number of pups born at Stigant Point, King George Island, has remained essentially unchanged. To the human observer, there appears to be sufficient space on the Stigant Point beaches for rookery growth. These areas are currently utilized as haulout areas by bachelor males. Determining the extent to which potential differences in habitat and local prey resources between these sites may influence pup survival and rookery expansion requires further study.

Three fur seal pupping sites were identified as potentially good locations for incorporation into CCAMLR Ecosystem Monitoring Program network: 1) Seal Island, Elephant Island, 2) Stigant Point, King George Island, and 3) Cape Shirreff, Livingston Island. Each of these sites meets the following criteria which are considered important for establishing a field camp for monitoring purposes: 1) at least 100 fur seal pups born annually, 2) at least 10,000 nesting Chinstrap Penguins, *Pygoscelis antarctica*, available for similar monitoring studies, and 3) a suitable camp site available for a field team. Cape Shirreff and Seal Island are particularly well suited as monitoring sites because of their abundance of fur seals and geographic

position in relation to krill fishing areas. The relative advantages of establishing a monitoring program at these sites will be considered further national programs and within the Working Group for the CCAMLR Ecosystem Monitoring Program.

LITERATURE CITED

- Aguayo, L. A. 1978. Present status of the Antarctic fur seal Arctocephalus gazella at South Shetland Islands. *Polar Rec.* 19:167-173.
- Aguayo, L. A., and D. Torres. 1967. Observaciones sobre mamíferos marinos durante la Vigésima Comisión Antártica Chilena. *Rev. Biol. Mar.* 13:1-57.
- Bertrand, K. J. 1971. *Americans in Antarctica, 1775-1948.* Am. Geogr. Soc., New York.
- Bonner, W. N. 1968. The fur seal of South Georgia. *Sci. Rep. Brit. Antarc. Surv.* 56:1-81.
- Bonner, W. N. 1968. Southern fur seals, Arctocephalus (Geoffroy Saint-Hilaire and Cuvier, 1826). Pp. 161-208 in S. H. Ridgway and R. J. Harrison, (Eds.) *Handbook of Marine Mammals*, Vol. 1. Academic Press, London and New York.
- Cattan, P. E., J. V. Yáñez, D. N. Gajardo, and J. C. Cárdenas. 1982. Censo, marcaje y estructura poblacional del lobo fino antártico Arctocephalus gazella (Peters, 1875) en las islas Shetland del Sur, Chile. *Publ. INACH Ser. Cie.* 29:31-38.
- Hunt, J. F. 1973. Observations on the seals of Elephant Island, South Shetland Islands, 1970-71. *Brit. Antarc. Surv. Bull.* 36:99-104.
- Laws, R. M. 1984. Seals. Pp. 621-715 in R. M. Laws, (Ed.) *Antarctic Ecology*, Vol. 2, Academic Press, London and New York.
- Llano, G. A. 1971. Frontispiece. In W. H. Burt, (Ed.) *Antarctic Pinnipedia Antarctic Research Series, Volume 18.* Am. Geophys. Union, Acad. Sci., Nat. Res. Council.
- O'Gorman, F. A. 1961. Fur seals breeding in the Falkland Islands Dependencies. *Nature* 192:914-916.
- Oliva, D. L., L. R. Duran, D. Torres, and M. Gajardo. 1986. Changes in the population structure and growth of the fur seal Arctocephalus gazella (Peters, 1875) in South Shetland Islands. Unpubl. ms.
- Payne, M. R. 1977. Growth of a fur seal population. *Phil. Trans. Roy. Soc. Lond. (B: Biol. Sci.)* 279:67-79.
- Stackpole, E. A. 1955. *The voyage of the Huron and the Huntress.* The Marine Historical Association, No. 29, Mystic, Conn.

Table 1. Pinniped census in the South Shetland Islands, Antarctica, during the 1986/87 austral summer (E=elephant seal, W=Weddell seal, C=crabeater seal, L=leopard seal).

Location	Male	Female	Pups		E	W	C	L
			Alive	Dead				
King George Island	3,339	147	146	12	3,599	456	2	1
Nelson Island	173	0	0	0	403	362	1	1
Robert Island	194	0	0	0	353	141	0	2
Greenwich Island	235	0	0	0	423	40	0	0
Livingston Island	1,974	129	298	0	4,898	264	1	1
Cape Shirreff	1,586	844	673	45	885	134	1	0
Telmo Island	1,607	2,299	1,660	215	3	3	0	0
Snow Island	652	0	0	0	1,494	157	5	0
Smith Island	105	2	1	0	0	8	0	0
Low Island	418	0	0	0	251	34	0	0
Deception Island	520	0	0	0	3	48	1	0
Elephant Island	158	191	235	15	1,315	0	21	4
Seal Island	66	178	241	8	232	4	1	3
Large Leap Island	73	167	254	21	0	0	0	0
Total	11,100	3,957	3,508	316	13,859	1,651	33	12

Table 2. Summary of Antarctic fur seal pup production in the South Shetland Islands, Antarctica, in 1986/87.

Location	Live	Dead	Total
Seal Island (Elephant Island)	241	8	249
Large Leap Island (Elephant Island)	254	21	275
Cape Valentine (Elephant Island)	42	3	45
Cape Lindsey (Elephant Island)	191	12	203
Stinker Point (King George Island)	2	0	2
Stigant Point (King George Island)	145	12	157
Fildes Peninsula (King George Island)	1	0	1
Desolation Island (Livingston Island)	1	0	1
Cape Shirreff (Livingston Island)	673	45	718
Telmo Island (Livingston Island)	1,660	215	1,875
Window Island (Livingston Island)	297	0	297
Smith Island	1	0	1
Total	3,508	316	3,824

Table 3. Changes in Antarctic fur seal pup production at important rookery sites in the South Shetland Islands, Antarctica. Sites listed are for those areas for which there are past census data comparable with the 1986/87 survey.

Location	Date	Pups ¹	Total ²	Source
<u>ELEPHANT ISLAND</u>				
Seal Island ³	7 Jan 66	0	20	Aguayo, 1978
	13 Dec 70	16	62	Hunt, 1973
	24-31 Dec 86	249	493	1986/87 survey
Cape Valentine	16 Feb 66	2	30	Aguayo, 1978
	9 Feb 71	3	100+	Hunt, 1973
	23 Dec 86	45	127	1986/87 survey
Cape Lindsey	16 Feb 66	3	70	Aguayo, 1978
	Feb 71	0	30	Hunt, 1973
	30 Jan 87	203	468	1986/87 survey
<u>KING GEORGE ISLAND</u>				
Stigant Point	Jan 66	0	0	Aguayo, 1978
	16 Jan 70	123	213	Llano, 1971
	Feb 73	80	250	Aguayo, 1978
	Jan 82	168	293	Cattan et al., 1982
	1982/83	123	367	Oliva et al., 1986
	31 Jan 87	157	507	1986/87 survey
<u>LIVINGSTON ISLAND</u>				
Cape Shirreff	14 Jan 58	0	27	O'Gorman, 1961
	3 Feb 59	2	11	O'Gorman, 1961
	1 Jan 66	12	50	Aguayo, 1978
	Feb 71	27	201	Aguayo, 1978
	25 Jan 73	300	1,741	Aguayo, 1978
	Jan 82	180	532	Cattan et al., 1982
	1982/83	--	564	Oliva et al., 1986
	1983/84	248	969	Oliva et al., 1986
	1984/85	384	1,590	Oliva et al., 1986
	2 Feb 87	718	3,148	1986/87 survey
Window Island	21 Jan 66	50	150	Aguayo, 1978
	25 Jan 73	70	320	Aguayo, 1978
	3 Feb 87	297	646	1986/87 survey

¹Includes both living and dead pups.

²Total Antarctic fur seals, including pups.

³Compares censuses only at the largest of the Seal Islands.

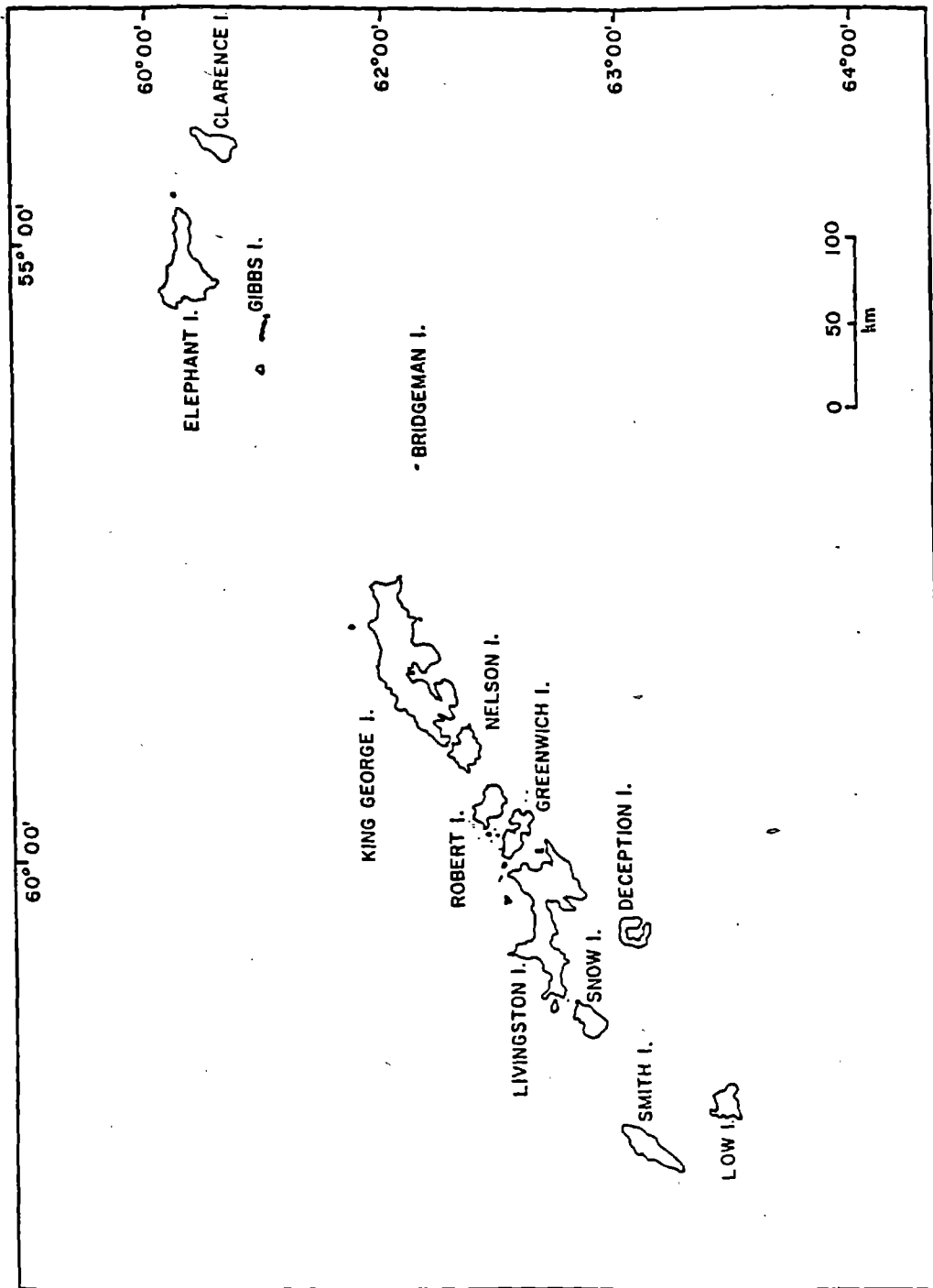


Figure 1. South Shetland Islands, Antarctica study area.

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47. **MARMAP Surveys of the Continental Shelf from Cape Hatteras, North Carolina, to Cape Sable, Nova Scotia (1977-1984). Atlas No. 2. Annual Distribution Patterns of Fish Larvae.** By Wallace W. Morse, Michael P. Fahay, and Wallace G. Smith. May 1987. viii + 215 p., 27 figs., 2 tables. NTIS Access. No. PB87-232831/AS.
48. **Indexed Bibliography of the Bay Scallop (*Argopecten irradians*).** By Barbara D. Sabo (Gibson) and Edwin W. Rhodes. May 1987. iii + 85 p. NTIS Access. No. PB87-231411/AS.
49. **Northeast Fisheries Center Framework for Inshore Research.** By Research Planning & Coordination Staff, Northeast Fisheries Center. July 1987. vi + 44 p., 2 figs., 2 tables. NTIS Access. No. PB87-232286/AS.
50. **Status of the Fishery Resources Off the Northeastern United States for 1987.** By Conservation & Utilization Division, Northeast Fisheries Center. October 1987. iii + 132 p., 48 figs., 50 tables. NTIS Access. No. PB88-148549.
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