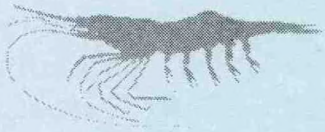
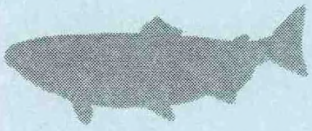
National Marine Fisheries Service
SOUTHWEST REGION
300 S. Ferry Street
Terminal Island, CA 90731

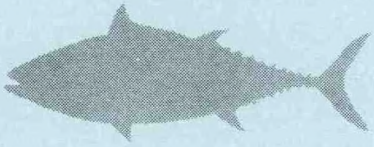




THE GUADALUPE FUR SEAL: A STATUS REVIEW

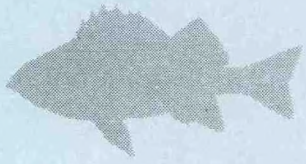
by

Dana J. Seagars



OCTOBER 1984

ADMINISTRATIVE REPORT SWR-84-6



THE GUADALUPE FUR SEAL: A STATUS REVIEW

Prepared pursuant to Section 4(b)(1)(A) of the
Endangered Species Act of 1973, as amended.

Dana J. Seagars
Wildlife Biologist
Southwest Region
National Marine Fisheries Service
300 South Ferry Street
Terminal Island, CA 90731

ADMINISTRATIVE REPORT SWR-84-6

October 1984

TABLE OF CONTENTS

THE GUADALUPE FUR SEAL: A STATUS REVIEW

Prepared by

Dana J. Seagars, NMFS, Southwest Region

INTRODUCTION

Background

The Seal Rescue Fund (SRF), Center for Environmental Education submitted a petition to the National Marine Fisheries Service (NMFS) on November 21, 1983, to list the Guadalupe fur seal (*Arctocephalus townsendi*, Merriam 1897) as an endangered species pursuant to the Endangered Species Act of 1973, as amended (ESA). On January 30, 1984 the Assistant Administrator for Fisheries, NMFS accepted this petition as presenting substantial information indicating that the petitioned action may be warranted. The ESA requires the NMFS to conduct a review of the status of the species subsequent to such a determination (Section 4(b)(1)(A)). The intent of this paper is to satisfy this requirement. It is based on a review of the scientific literature, correspondence in NMFS files, and information submitted to the NMFS in response to a request announced in the *Federal Register* on February 8, 1984.

Current Legal Status

The species was listed on Appendix II of the Convention on International Trade in Endangered Species (CITES) until 1979, when it was moved to Appendix I at the request of the United States. The Convention regulates trade in listed species through a system of import and export permits and enforcement. Trade is more strictly controlled for Appendix I species, which are considered to be threatened with extinction by CITES.

The Guadalupe fur seal was listed pursuant to the Endangered Species Protection Act of 1966 (ESPA) as threatened with extinction. When an amended list was published in 1970 (35 FR 16047), the species was omitted from the list without explanation. Subsequent lists have not included the Guadalupe fur seal.

As a member of the order Pinnipedia, the Guadalupe fur seal is included within the provisions of the Marine Mammal Protection Act of 1972, as amended (MMPA). The MMPA established a moratorium on the taking and importation of marine mammals, their parts, and products. Exceptions to this moratorium may be authorized by permit for research, public display, taking incidental to commercial fishing, or for small numbers taken incidentally in the process of a short-term specified activities.

The State of California includes the Guadalupe fur seal as a "rare" species in its list of "rare or endangered" species (CAC 14 Sec. 670.5(7)(H)). In addition, the species is listed as a "protected marine mammal" (Chapter 5 §§ 4500) and a "fully protected mammal" (Chapter 3, §§ 4700).

Guadalupe Island, located about 140 nautical miles west of Baja California, Mexico (Figure 1) was designated a wildlife refuge and sanctuary by the Mexican government in 1928. However, Fleischer (1978a) noted "this proclamation was not enforced and had little effect on preserving wildlife on the island." In July 1967, the Mexican government permanently banned the hunting of the Guadalupe fur seal and northern elephant seal. In December 1983, the government set a fine of 1.5 million pesos for illegally capturing or killing a specimen; there are no exceptions except for government authorized scientific investigations or to help preserve the species (U.S. State Department pers. comm.).

San Miguel Island, the primary habitat in the United States and a probable former rookery site, is part of Channel Islands National Park. The waters surrounding this island are designated as a National Marine Sanctuary. The National Park Service restricts entry into pinniped haulout areas; access is limited to NMFS-permitted scientific research. San Nicolas and San Clemente Islands, two other islands in Southern California where Guadalupe fur seals have been observed, are under U.S. Navy jurisdiction. Access to these two islands is restricted by Naval regulations; however, sporadic intrusion into marine mammal haulout areas occurs by Navy personnel seeking recreational fishing and wildlife viewing experiences (R. Dow, J. Larsen, C. Oliver, and B. Stewart pers. comm.).

LIFE HISTORY AND ECOLOGY

The Guadalupe fur seal is a small to medium sized otariid. The species is sexually dimorphic; adult males (about 160 kg) are approximately three to four times the size of females (about 50 kg) (Fleischer 1978b). The coat of both sexes is grey-brown when dry and nearly black when wet. The mane of adult males takes on a bleached and grizzled appearance with increased age (Bonnell et al. 1980).

Guadalupe fur seals are distinguished from five other sympatric pinniped species by such external characteristics as size, pelage type, and color. Diagnostic details used to separate the Guadalupe fur seal from the similar appearing northern fur seal (Callorhinus ursinus) include a flat-topped, collie-like muzzle, relatively shorter hind flippers and fur on the dorsum of the foreflippers that extends past the wrist (Repenning et al. 1971).

The similarity in appearance of the various fur seals (genera Arctocephalus and Callorhinus) confounded identification by early taxonomists and sealers alike. The species was first described by Merriam (1897) from skulls collected on Guadalupe Island by C.H. Townsend. Disputes over the taxonomic status of the species were largely resolved by Repenning et al. (1971). Most investigators now accept that the Guadalupe fur seal merits specific classification as Arctocephalus townsendi, the only member of the genus to reside in the northern hemisphere (King 1983).

Virtually nothing is known about the food habits of the Guadalupe fur seal. It is likely that this species feeds on prey similar to that utilized by other small otariids such as the northern fur seal (eg. - deep water species of cephalopods and small schooling fish).

Reproductive behavior is similar to that of other species in the genus Arctocephalus (Pierson 1978). During the May through July breeding season, adult males establish and defend territories on remote, precipitous stretches along the east side of Guadalupe Island, Baja California. Rocky caves and crevices are occupied before more open areas; this results in visual isolation of adjacent males. Females begin arriving in early June with the major influx of females arriving on the rookery during the second and third weeks of that month (Pierson 1978). The peak of pupping is about the third week of June. Copulation generally occurs about 7 days after the birth of a single pup, with the peak of mating near the beginning of July. Females nurse only their own pup. Female feeding forays initially are two to six days in duration. Nursing may last at least eight months; however, nursing is probably terminated shortly after that period as female-yearling pairs have not been

observed. Adult males probably begin to leave the rookery by late July or early August (Pierson 1978). Subadult males and other juvenile animals are generally excluded from the rookery during the breeding season.

Fleischer (1978a) states the maximum life span of the species is between 17 and 20 years. Heavy surf may contribute to the mortality of young pups (Fleischer 1978a). No further information on mortality is available for this species. Guadalupe fur seals have not been reported to interact with fisheries in California (D. DeMaster pers. comm.) or Mexico (R.L. DeLong pers. comm.). Incidental mortality due to entanglement in net debris has not been reported to date. Data concerning stranding rates of A. townsendi outside of California are not available.

The thick fur of the Guadalupe fur seal constitutes the principal element of their thermoregulatory mechanism; a system that carefully regulates heat loss to the cold surrounding marine environment. Kooyman, Gentry, and McAlister (1976) found that in northern fur seals, Callorhinus ursinus, a light oiling of about 30 percent of the pelt surface resulted in a 1.5 fold increase in the metabolic rate of seals in water. Since A. townsendi relys on a similar coat for insulation, a similar response would be expected.

DISTRIBUTION AND MOVEMENTS

The distribution of Guadalupe fur seals prior to the early 19th century exploitation by European man is not well documented. Analyses of skeletal material exhumed from coastal middens of native Americans and sketchy accounts from early California explorers and sealers suggest that the species may have ranged approximately 1300 miles from the Revillagigedo Islands, Mexico (18°N; Townsend 1924, Hamilton 1951) north to Monterey Bay, CA (37°N; Repenning in litt.) (Figure 1). Breeding likely occurred in the California Channel Islands

from San Miguel (Walker and Craig 1978, Lyon 1937) south to Guadalupe, the San Benitos and Cedros Islands, and perhaps as far south as Socorro Island (one of the Revillagigedo Islands), approximately 300 miles south of Cabo San Lucas, Baja California, Mexico. Some authors have speculated that the fur seals reportedly harvested in the 19th century from the Farallon Islands (38°N) differed from the fur seals (C. ursinus) harvested in Alaska (Ogden 1933) and therefore considered them to be A. townsendi (Starks 1922; Townsend 1924, 1931; King 1954; Hubbs 1956b; Peterson and LeBoeuf 1969). However, a re-examination of mid 1800's midden material from Southeast Farallon first identified (Riddell 1955) as A. townsendi, confirmed this material to be of the California sea lion, Zalophus californianus and C. ursinus (Schonewald in litt., Repenning et al. 1971). The composition of the Southeast Farallon pinniped population prior to this period remains unknown.

Guadalupe fur seals currently are known to breed only on the eastern shore of Guadalupe Island (Fleischer 1978b, Pierson 1978). A few non-breeding individuals have been observed hauled out at Pt. Bennett, San Miguel Island each year since 1969 during the breeding season (Antonelis and DeLong pers. comm.). Individual Guadalupe fur seals have been sighted occasionally at San Nicolas (Bartholomew 1950, Stewart 1981, Stewart and Yochem pers. comm.) and at San Clemente Island (Bonnell et al. 1980). There are only three confirmed records of Guadalupe fur seals north of Point Conception: three young males were sighted on Piedras Blancas, San Luis Obispo County in late June, 1938 (Bonnot et al. 1938); an immature male was sighted in Monterey County between Fort Ord and Sand City on April 25, 1977 (M. Webber and J. Schoenwald, pers. comm.); and a female yearling stranded near Pillar Point, Princeton, San Mateo County on May 19, 1984 (J. Roletto, pers. comm.). There are three pelagic records of individual Guadalupe fur seals from the Southern California Bight

since 1967 (Brownell and DeLong 1968, Bonnell et al. 1980) and one report of three Guadalupe fur seals near Cedros Island in February 1965 (Rice et al. 1965).

No studies of movements or migration have been conducted for the Guadalupe fur seal. Based on the above sightings and phenology of age-class distribution at Guadalupe Island, it seems evident that Guadalupe fur seals spend portions of the year living pelagically (Peterson et al. 1968). There seems to be some synchrony in these pelagic movements within various age classes. Based on the few observations of Guadalupe fur seals at sea, it seems probable that they travel either as individuals or only in very small groups (<5) during this period. Movements of at least 600 km are likely, based on pelagic observations of adult individuals in the Southern California Bight.

ABUNDANCE, EXPLOITATION, AND MANAGEMENT

Pre-exploitation population size at Guadalupe Island has been estimated as follows: 20,000 (Fleisher 1978a,b), 30,000 (Hamilton 1951), 100,000 (Wedgeforth 1928), and 200,000 animals (Hubbs 1979). These estimates are based on assumptions that consider historic size of available habitat, seal hunting records, and comparisons with the population growth and density of closely related species rebounding in the southern hemisphere. As the literature is inadequate with regard to pre-exploitation levels, a sound estimate of the pre-exploitation population size cannot be made. However, the literature suggests that at the minimum the population included at least 30,000 fur seals, based on the size of the assumed habitat (accommodating 20,000 at Guadalupe Island and 10,000 elsewhere) and on the large numbers reported taken by 19th century sealing vessels.

Exploitation of A. townsendi by fur sealers apparently began in the early 19th century when one vessel took over 8,300 fur seals from the San Benito Islands (Townsend 1924). During the early decades of this period, the islands of California and Mexico were visited frequently - first by Russian vessels (with Aleuts) and later by American fur hunters and sealers. The record is unclear due to the inability of hunters to distinguish species in the field and in the logbook entries of multi-purpose vessels that hunted for two species of fur seals (furs), elephant seals (oil), and sea lions (both). The commercial hunting of the Guadalupe fur seal apparently ended with its presumed extinction, even before the species was scientifically described in 1897. A chronology of events during this period is provided in Table 1.

The Guadalupe fur seal was presumed extinct until a fisherman reported a small herd of between 35-60 animals on Guadalupe Island in 1926. He was contracted and brought two males to the San Diego Zoo in 1928 (Townsend 1928, Wedgeforth 1928). In a dispute over payment, he returned to the island, promising to kill the remaining herd (Hubbs 1956a,b). The Guadalupe fur seal was presumed extinct again for two decades. The discovery of an adult male on San Nicolas Island in 1949 (Bartholomew 1950) prompted several searches resulting in the discovery of a small herd of 14 animals on Guadalupe Island in 1954 (Hubbs 1956a,b). Since that time, periodic trips have been made to census the population (Table 2).

The timing of census trips to Guadalupe Island has not been consistent - nor have surveys always been designed to assess the population when peak numbers would be present. The fur seals' preference for small, dark, isolated caves adds to the difficulty of conducting an accurate census. Nevertheless, it is apparent that the population is experiencing continued growth. Fleischer (1978b) counted 1073 animals at Guadalupe Island in 1977. A

thorough foot census of the east side of Guadalupe Island (National Marine Mammal Laboratory, pers. comm.) counted 1597 A. townsendi between 10 and 16 August 1984. The NMFS does not have documentation of any surveys to Socorro Island to search for and count Guadalupe fur seals in modern times, and no fur seals have been observed on numerous expeditions to other Mexican islands. A few individuals have been observed on several California Channel Islands; however, no breeding or pupping has been observed to date. Table 3 summarizes the available data for these islands. Recognizing the limitations associated with survey techniques, the 1984 count of about 1600 animals is the best available scientific data and can be used as a valid estimate of the current minimum population size.

Comparison of the 1977 and 1984 census results is difficult because the two surveys were conducted in different periods of the breeding season. The 1977 survey likely represents an underestimate of the population as probably not all pregnant females had arrived, nor had all pups been born. The 1984 census was scheduled to count maximum numbers of pups but likely undercounted females which were at sea feeding and adult males that had left territories. Despite the inconsistencies between survey timing, it is apparent that the Guadalupe fur seal population has increased in the period between the 1977 and 1984 censuses. In addition, the 1984 survey results indicated that 1984 was a good year for pup production (649 live pups) and that pups were in good physical condition (only 3 found dead). The current annual rate of population growth cannot be figured exactly but is probably at least 5 percent. This rate is similar to the maximum rate for the northern fur seal, but slower than growth rates of other pinnipeds whose stocks were substantially reduced, such as southern fur seals in the Antarctic or the sympatric northern elephant seal, Mirounga angustirostris. The recovery rate is likely to have been

influenced by the history of exploitation (nearly exterminated three times), by the species' reproductive biology, genetic makeup, or by other unknown factors.

EVALUATION OF STATUS RELATIVE TO LISTING CRITERIA

Section 4(a) of the ESA provides that the Secretary of the Interior or Commerce, depending upon the species involved, shall, by regulation, determine if any species is endangered or threatened based upon any one or a combination of the following factors: (1) present or threatened destruction, modification or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; (5) or other natural or manmade factors affecting its continued existence. The ESA requires that such determinations are to be made "solely on the basis of the best scientific and commercial data available" and must take into account any efforts being made to protect the species under consideration (Section 4(b)). The factors and their relation to A. townsendi are discussed below.

(1) The present or threatened destruction, modification or curtailment of the species habitat or range. Habitat loss has not been the primary factor causing the reduced abundance of this species. However, actions that have been proposed within the species' range have the potential to modify or curtail portions of the habitat or range. Offshore oil and gas development activities are intensifying in central and southern California waters. Oil spills could impact individual fur seals in their pelagic habitat or on haulout areas at San Miguel and San Nicolas Islands. As fur seals rely on their thick pelage for insulation from the cold marine environment, contact with oil either at sea or on a haulout could adversely affect individual fur seals. Although the habitat in the Channel Islands area has a history of low level, chronic occurrence of oil from natural seeps, larger scale, or catastrophic oil spill events are not a typical component of the habitat.

The U.S. Air Force's Space Shuttle Program proposes to launch and return vehicles over the northern Channel Islands during the 1980's and 1990's. Over the ten year life of the program, a maximum of 7 launches are predicted to cause high intensity sonic booms over the northern Channel Islands, San Miguel Island in particular. The effects of these sonic booms are unknown at the present time. However, high intensity sonic booms are not a normal component of the habitat. Sonic booms of lower intensity may impact the islands from approximately 73 other launches and all returns. Any of these sonic booms could cause short-term disturbance to any individuals present.

(2) Overutilization for commercial, scientific, and educational purposes. The original population size probably included at least 30,000 individuals. Commercial hunting for the fur of this species resulted in overutilization and its nearly complete eradication in the mid to late 19th century. Archeologic and historic evidence indicates that the species' former breeding range probably was from San Miguel Island, California, to Socorro Island, Baja California. Two specimens were collected for scientific and educational purposes in 1927 when it was unlikely that the population exceeded 60 individuals. Shortly after this time, all known remaining animals reportedly were harvested for furs sold in Panama. The current breeding distribution is likely restricted to the eastern shore of Guadalupe Island; this area is used by at least 1,597 animals. The long-term population growth rate most likely has been influenced by the repeated reductions in numbers, although reduced genetic variability, or other unknown factors may be involved.

(3) Disease or predation. There is no information concerning disease or predation for this species.

(4) Inadequacy of existing regulatory mechanisms. Current regulatory mechanisms appear to be providing adequate protection of the species within areas subject to Mexican and U.S. jurisdiction. The Guadalupe fur seal has been protected under the provisions of the Marine Mammal Protection Act (MMPA, 16 U.S.C. 1361) since December 21, 1972. It is also listed on Appendix I to the Convention on International Trade in Endangered Species of Fauna and Flora (CITES) which prohibits trade for commercial purposes of this species between signatory parties to the Convention. Although Mexico is not a party to the Convention, these prohibitions would apply to trade with a signatory nation. Listing of the Guadalupe fur seal pursuant to the ESA would provide the species with additional protection through the Section 7 consultation process.

(5) Other natural or manmade factors affecting its continued existence. The potential for adverse impacts to individuals in the California Channel Islands due to OCS oil and gas and U.S. Space Shuttle activities were discussed previously according to criterion (1). Interaction with fisheries could result in the incidental take of A. townsendi and competition for fishery-food resources. While neither condition is known to occur at the current time, the expansion of several fisheries (in particular the shark drift gill net fishery) into waters adjacent to breeding areas on Guadalupe Island or the (as yet unknown) feeding grounds could adversely affect the Guadalupe fur seal population. At the current time, information concerning the number and types of fishing vessels operating near Guadalupe Island is not available.

CONCLUSIONS AND RECOMMENDATIONS

Listing.

The ESA requires that a determination to list a species as endangered or threatened be made solely on the basis of the best available scientific and commercial information concerning that species relative to the criteria reviewed above. A decision to list A. townsendi is best supported by evidence presented according to criterion (2): "overutilization for commercial . . . purposes." The record is incomplete concerning pre-exploitation or current population levels and life history parameters which could influence decisions affecting management of this species. Given the apparent persistence of the species over the past 40 years and relatively slow, but continued population growth, it does not appear that the species "is in danger of extinction throughout all or a significant portion of its range," the definition established by the ESA for an "Endangered" listing. However, despite the shortcomings of the scientific data base, it is apparent that these data indicate that the population was reduced to and, unless action is taken, will remain at a level where "the species is likely to become an endangered species within the forseeable future throughout all or a significant portion of its range." Thus it seems most appropriate to recommend that this species be listed as "Threatened" under the provisions of the ESA.

Critical habitat.

The 1982 amendments to the ESA require that the Secretary designate critical habitat, to the maximum extent prudent and determinable, concurrent with listing a species as endangered or threatened (Section 4(a)(3)). The regulations which implement Section 4 of the ESA (49 FR 38900; October 1, 1984) state that "Critical Habitat shall not be designated within foreign countries or other areas outside of U.S. jurisdiction" (50 CFR Part

424.12(h)). The only known breeding area is in Mexico and, therefore, cannot be designated as critical habitat. No specific information is available concerning the food habits or foraging areas throughout the range of the Guadalupe fur seal. Therefore, the designation of critical foraging habitat or establishment of forage reserves for particular prey species is not determinable at this time due to insufficient information (§424.19 [a][2][ii]). The National Park Service and the U.S. Navy restrict access at the few areas on the California Channel Islands where Guadalupe fur seals haulout. Thus, these areas are already protected, are not used for activities essential to the conservation of the species (such as breeding), and are occupied only by a very small number of individuals. As the designation of these sites as critical habitat would not provide any additional benefit or protection to the species, such designation would not seem to be prudent at this time (§424.12[a][1][ii]).

The need to establish critical habitat in the U.S. should be re-evaluated if it becomes apparent that breeding habitat in Mexico may be degraded by environmental change or by an increase in human activities on or adjacent to Guadalupe Island. The need to establish critical habitat also should be re-evaluated by the NMFS if A. townsendi begins to breed or pup at any California Channel Island site or if it appears that use of these sites is essential to the conservation of the species and the existing protective measures on these islands are not providing adequately for the reoccupation of historic breeding habitat. The need to establish critical habitat should be re-evaluated when the foraging habitat of the Guadalupe fur seal is determined and if it appears likely that special management considerations may be necessary to protect forage requirements essential to the continued existence of the species.

Research.

Section 108 of the MMPA established an international program which directs the Secretary of Commerce through the Secretary of State to initiate the development of bilateral or multilateral agreements with other nations for the protection and conservation of marine mammals. Under this authority, the NMFS has informally cooperated with the Government of Mexico in marine mammal scientific research programs that can be continued or expanded.

A cooperative research and management effort should be established with Mexico. The goal of this agreement would be to facilitate research into various aspects of population dynamics and life history through cooperation in funding, personnel, and shared expertise. These projects should include: a complete review of historical sealing records (logbooks); appropriately scheduled, periodic surveys to assess the population status throughout the range of the species on a consistently repeatable basis; description of natality and mortality rates; identification of food habits and distribution of feeding grounds; development of models used to assess population trends, status, and the evaluation and refinement of delisting parameters; and monitoring potential actions which could adversely affect the population, such as disturbance or fishery interactions.

ACKNOWLEDGEMENTS

This review was developed with the assistance of Dr. R.L. DeLong, Dr. D. DeMaster, D. Gittings, Dr. B. LeBoeuf, J. Lecky, P. Montanio, R. Tinney, and J.G. Smith. DeLong, DeMaster, Lecky and the Publication Review Board, Southwest Region, reviewed and provided editorial advice on the manuscript.

REFERENCES

Allen, J.A. 1870. The earred seals (Otariadae), with detailed descriptions of the North Pacific species. Bull. Mus. Comp. Zool. 2(1):1-108.

Allen, J.A. 1880. History of the North American pinnipeds. A monograph of the walruses, sea lions, sea bears, and seals of North America. Misc. Pub., U.S. Geol. and Geogr. Surv. 12(16):785 pp.

Allen, J.A. 1884. Seals and walruses. In: the Fisheries and Fishery Industries of the United States. Section I, pt.1:33-72, pls. 34-72, 2 maps.

Anon. 1902. Oils from seals, walrus, etc. In: Report of the Commissioner for the year ending June 30, 1902. U.S. Comm. Fish. and Fisheries. Part XXVIII. USGPO; 1904. pp 209-215.

Anon. 1930. A trip to Guadalupe. Zoonooz, S.D. Zool. Soc. 5(5):5-7.

Balcomb, K.C. 1979. Marine mammal survey along the west coast of Baja California, Mexico. Ocean Res. Exped. Rept. 14:19 p.

Bartholomew, G.A. 1967. Seal and sea lion populations of the California Channel Islands. In: Philbrick, R.N. (ed.) Proc. Symp. Biol. Calif. Channel Islands. Santa Barbara Botanic Garden: Santa Barbara, CA. pp 229-244.

Bartholomew, G.A. 1950. A male Guadalupe fur seal on San Nicolas Island, California. J. Mammal. 31(2):175-180.

Bartholomew, G.A. 1951. Spring, summer, and fall censuses of the pinnipeds on San Nicolas Island, CA. J. Mammal. 32(1):15-21.

Bartholomew, G.A. and R.A. Boolootian. 1960. Numbers and population structure of the pinnipeds on the California Channel Islands. J. Mammal. 41(3):366-375.

Bartholomew, G.A. and C.L. Hubbs. 1952. Winter population of pinnipeds about Guadalupe, San Benito and Cedros Islands, Baja California. J. Mammal. 33(2):460-471.

Bester, M.N. and G.I.H. Kerley. 1983. Rearing of twin pups to weaning by sub-Anatarctic fur seal Artocephalus tropicalus female. S. Afr. J. Wildl. Res. 13(3):86-87.

Bonnell, M.L. and M.O. Pierson. 1970. Report of Scripps Institution of Oceanography expedition MV70-IV to NW Baja California Islands, April 11-22, 1970. Unpubl. trip report, Univ. Calif., Santa Cruz. 19 p. On file SWR.

Bonnell, M.L., B.J. LeBoeuf, M.O. Pierson, D.H. Dettman, G.D. Farrens, and C.B. Heath. 1980. Pinnipeds of the Southern California Bight. Vol. III, Part I. Summary of marine mammal and seabird surveys of the Southern California Bight area, 1975-1978. Univ. Calif., Santa Cruz and BLM. 534 p.

Bonner, W.N. 1981. Southern fur seals - Arctocephalus. In: Ridgway, S.H. and R.J. Harrison (eds.). Handbook of marine mammals, Vol. 1. The walrus, sea lions, and sea otter. Academic Press: London. pp 161-208.

Bonner, W.N. and T.S. McCann. 1982. Neck collars on fur seals, Arctocephalus gazella, at South Georgia. Brit. Antarct. Surv. Bull. 57:73-77.

Bonnot, P. 1951. The sea lions, seals, and sea otter of the California coast. Calif. Fish and Game 37(4):371-384.

Bonnot, P., G.H. Clark, and S.R. Hatton. 1938. California sea lion censes for 1938. Calif. Fish and Game 24:415-419.

Bower, W.T. 1929. Guadalupe fur seals. In: Alaska fishery and fur seal industries in 1928. Appendix to Rept. US Commissioner of Fisheries for fiscal year 1929. US Bur. Fish. Doc. 1064:324-325.

Brownell, R.L. Jr., and R.L. DeLong. 1968. Marine mammals of the eastern grid area. Unpubl. rept. Pacific Ocean Biological Survey Prog., Smiths. Inst. 10 p.

Brownell, R.L. Jr., R.L. DeLong, and R.W. Schreiber. 1974. Pinniped populations at Islas de Guadalupe, San Benito, Cedros, and Natividad, Baja California in 1968. J. Mammal. 55:469-472.

Carnio, J. 1982. Observations on the mother and young interactions in captive cape fur seals (Arctocephalus pusillus pusillus). Aquatic Mamm. 9(2):50-56.

Collyer, R.D. and J.L. Baxter. 1951. Observations on pinnipeds of San Miguel Island. Calif. Fish and Game 37(4):511.

Doidge, D.W., J.P. Croxall, and J.R. Baker. 1984. Density-dependant pup mortality in the Antarctic fur seal Arctocephalus gazella at South Georgia. J. Zool. Lond. 202(3):449-460.

Fleischer, L.A. 1978a. Guadalupe fur seal. In: Haley, D. (ed.) Marine mammals of eastern north Pacific and Arctic waters. Seattle, WA: Pacific Search Press. pp. 160-165.

Fleischer, L.A. 1978b. The distribution, abundance, and population characteristics of the Guadalupe fur seal, Arctocephalus townsendi (Merriam, 1897). Seattle, WA: Univ. Washington. Thesis. 93p.

Goodwin, H.A. and C.W. Holloway. 1982. Guadalupe fur seal. IUCN. Mammal Red Data Book. Part I. pp 407-409.

Gustafson, C.E. 1968. Prehistoric use of fur seals: evidence from the Olympic coast of Washington. Science 161:49-51.

Hamilton, A. 1951. Is the Guadalupe fur seal returning? Nat. Hist. 60:90-96.

Hubbs, C.L. 1956a. Back from oblivion. Guadalupe fur seal: still a living species. Pacific Disc. 9:14-21.

Hubbs, C.L. 1956b. The Guadalupe fur seal still lives! Zoonooz, S.D. Zool. Soc. 29(12):6-9.

Hubbs, C.L. 1979. Guadalupe fur seal. FAO. Advisory Committee on Mar. Res. Research. Working Party on Marine Mammals. FAO Fish. Ser. 5(2):24-27.

Hubbs, C.L. and K.S. Norris. 1971. Original teaming abundance, supposed extinction, and survival of the Juan Fernandez fur seal. In: Burt, W.N. (ed.) Antarctic Pinnipeds, Antarctic Res. Serv. 18:35-52. Baltimore, MD: Horn Shafer Co.

Huey, L.M. 1930. Past and present status of the northern elephant seal with a note on the Guadalupe fur seal. J. Mammal. 11(2):188-194.

Johnson, S.W. 1979. An annotated catalog of published and unpublished sources of data on populations, life history, and ecology of coastal marine mammals of California. NMFS, SWFC, Admin. Rept. LJ-79-1, 193 pp.

Kenyon, K.W. 1973. Guadalupe (Arctocephalus townsendi). Proc. Working Meeting Seal Spec. Threatened and Depleted Seals of the World Held Under Auspices Survival Serv. Comm. IUC., 18-19 Aug. 1972. Univ. Guelph, Ont., Canada. IUCN, Morges, Switzerland.

Kerley, G.I.H. 1983. Comparison of seasonal haul-out patterns of fur seals Arctocephalus tropicalus and A. gazella on Subantartic Marion Island. S. Afr. J. Wildl. Res. 13(3):71-77.

King, J.E. 1983. Guadalupe fur seal. Pp. 37-39. Seals of the World. Ithaca, New York: Cornell Univ. Press. 240 p.

Kooyman, G.L. and R.W. Davis. 1980. Feeding behavior of female Antarctic fur seals, Arctocephalus gazella. Antarctic J. 15(5):159-160.

Kooyman, G.L., R.L. Gentry, and W.B. McAlister. 1976. Physiological impact of oil on pinnipeds. NMFS, Northwest and Alaska Fisheries Center Processed Rept. 23p.

LeBoeuf, B.J. 1977a. Back from extation. Pacific Disc. 30:1-9.

LeBoeuf, B.J. 1977b. Report of Scripps Institution of Oceanography Expedition to Baja California Islands, February 9-20, 1977. Unpub. trip rept., Univ. Calif., Santa Cruz. 53p. On file SWR.

LeBoeuf, B.J. and R.S. Condit. 1982. Report of an expedition to Isla de Guadalupe, Mexico, 3-8 March 1982, aboard Scripps Institution of Oceanography Research Vessel, Ellen B. Scripps. Unpub. trip rept., Univ. Calif., Santa Cruz. 8p. On file SWR.

LeBoeuf, B.J., R.S. Peterson, and C.L. Hubbs. Report of an expedition to Isla de Guadalupe, 14-20 February 1969. Unpub. trip rept., Univ. Calif., Santa Cruz. On file SWR.

LeBoeuf, B.J., D. Aurioles, R. Condit, C. Fox, R. Gisiner, R. Romero, and F. Sinsel. 1983. Size and distribution of the California sea lion population in Mexico. Proc. Calif. Acad. Sci. 43(7):77-85.

Levy, R. 1978. Coastanoans. In: Handbook of North American Indians. Vol. 8, California. Series Ed. Sturtevant, W.C. Vol. Ed. Heizer, R.F. Smithsonian Institution. pp. 485-495.

Lyon, G.M. 1937. Pinnipeds and a sea otter from the Point Mugu shell mound of California. Univ. Calif. Pubs. Biol. Sci. 1(8):133-168.

Mariner, W. 1827. An account of the natives of Tonga Islands, in the south Pacific Ocean.

Mate, B.R. 1977. Aerial censusing of pinnipeds in the eastern Pacific for assessment of population numbers, migratory distributions, rookery stability, breeding effort, and recruitment. Final Rept. U.S. Mar. Mamm. Comm., Contr. No. MM5AC001, Washington, D.C. 67 p.

Merriam, C.H. 1897. A new fur seal or sea bear (Arctocephalus townsendi) from Guadalupe Island, off Lower California. Proc. Biol. Soc., Washington 11:175-178.

Morrell, B. 1832. A narrative of four voyages to the South Seas, North and South Pacific Ocean, Indian, and Antarctic Ocean, from the year 1822 to 1831. J.J. Harper, New York. 492pp.

Odell, D.K. 1971. Censuses of pinnipeds breeding on the California Channel Islands. J. Mammal. 51(1):187-190.

Ogden, A. 1933. Russian sea otter and seal hunting on the California coast. Calif. Hist. Soc., Q. 12:217-239.

Palou, F. 1924. [Description of the Indians in the vicinity of Mission San Francisco, 1776.] In: Englehardt, Z. 1924. San Francisco or Mission Dolores. Chicago, IL: Franciscan Herald Press. pp. 59-64.

Peterson, R.S. and B.J. LeBoeuf. 1969. Fur seals in California. Pacific Disc. 22:12-15.

Peterson, R.S. and D.H. Ramsey. 1969. Reproductive behavior of the Guadalupe fur seal. Proc. 6th Ann. Conf. Biol. Sonar Diving Mammals. Menlo Park, CA: Stanford Univ. Press. pp. 35-42.

Peterson, R.S. and S.M. Cooper. 1968. A history of the fur seals of California. Ano Nuevo Repts. 2:47-54.

Peterson, R.S., C.L. Hubbs, R.L. Gentry and R.L. DeLong. 1968. The Guadalupe fur seal: habitat, behavior, population size, and field identification. J. Mammal. 49(4):665-675.

Pierson, M.O. 1978. A study of the population dynamics and breeding behavior of the Guadalupe fur seal, Arctocephalus townsendi. Santa Cruz, CA: Univ. Calif. Santa Cruz. Dissertation 110p.

Repenning, C.A., R.S. Peterson, and C.L. Hubbs. 1971. Contributions to the systematics of the southern fur seals, with particular reference to the Juan Fernandez and Guadalupe species. In: Burt, W.H. (ed.) Antarctic Pinnipeds, Antarctic Res. Ser. 18:1-34. Baltimore, MD: Horn Shafer Co.

Rice, D.W. 1963. The whale marking cruise of the Sioux City off California and Baja California. Norsk. Hval-Tid. 52(6):153-160.

Rice, D.W., K.W. Kenyon, D. Lluch. 1965. Pinniped populations at Islas Guadalupe, San Benito, and Cedros, Baja California, in 1965. Trans. San Diego Soc. Nat. Hist. 14:73-84.

Riddell, F.A. 1955. Archeological excavations on the Farallon Islands, California. Univ. Calif. Archealogical Survey. Papers in Calif. Arch. 34:20p.

Scammon, C.M. 1874. The marine mammals of the northwestern coast of North America, described and illustrated: together with an account of the American whale-fishery. San Francisco, CA: J.H. Camany and Co. 319 p.

Scheffer, V.B. 1958. Seals, sea lions, and walruses. A review of the pinnipedia. Menlo Park, CA: Stanford Univ. Press. 178 pp.

Starks, E.C. 1922. Records of the capture of fur seals on land in California. Calif. Fish and Game 8(3):155-160.

Stevenson, C.H. 1902. Utilization of the skins of aquatic animals. In: Report of the Commissioner for the year ending June 30, 1902. U.S. Comm. Fish and Fisheries. Part XXVIII USGPO; 1904. Appendix. pp. 281-352.

Stewart, B.S. 1981. The Guadalupe fur seal (Artocephalus townsendi) on San Nicolas Island, California. Bull. So. Calif. Acad. Sci. 80(3):134-136.

Thoburn, W.W. 1899. Report of an expedition in search of the fur seal of Guadalupe Island, lower California, June, 1897. In: D.S. Jordon et al. The fur seals and fur seal islands of the North Pacific Ocean. USGPO 3:275-280.

Townsend, C.H. 1899. Notes on the fur seals of Guadalupe, the Galapagos, and Lobos Islands. In: D.S. Jordon et al. The fur seals and fur seal islands of the North Pacific Ocean. U.S.GPO 3:265-270.

Townsend, C.H. 1912. Mammals collected by the 'Albatross' expedition in lower California in 1911, with descriptions of new species. Bull. Am. Mus. Nat. Hist. 31:117-130.

Townsend, C.H. 1916. Voyage of the Albatross to the Gulf of California in 1911. Bull. Am. Mus. Nat. Hist. 35:399-475.

Townsend, C.H. 1924. The northern elephant seal and the Guadalupe fur seal. Nat. History 24:566-578.

Townsend, C.H. 1928. Reappearence of the Lower California fur seal. Bull. N.Y. Zool. Soc. 31:173-174.

Townsend, C.H. 1930. Guadalupe fur seal in 1929. Bull. N.Y. Zool. Soc. 33:32.

Townsend, C.H. 1931. The fur seal of the California Islands with new descriptive and historical matter. Zoologica (N.Y.) 9:443-458.

Trillmich, F. 1981. Mutual mother-pup recognition in Galapagos fur seals and sea lions: cues used and functional significance. Behavior 78(1-2):21-42.

Vandervere, J.E. 1968. Report of an expedition to Isla de Guadalupe, November 1968. Unpub. trip rept., Univ. Calif., Santa Cruz, 14p.

Walker, P.L. and S. Craig. 1979. Archeological evidence concerning the prehistoric occurrence of sea mammals at Point Bennett, San Miguel Island. Calif. Fish and Game 65(1):50-54.

Wedgeforth, H.M. 1928. The Guadalupe fur seal (Arctocephalus townsendi). Zoonooz, S.D. Zool. Soc. 3(3):4-9.

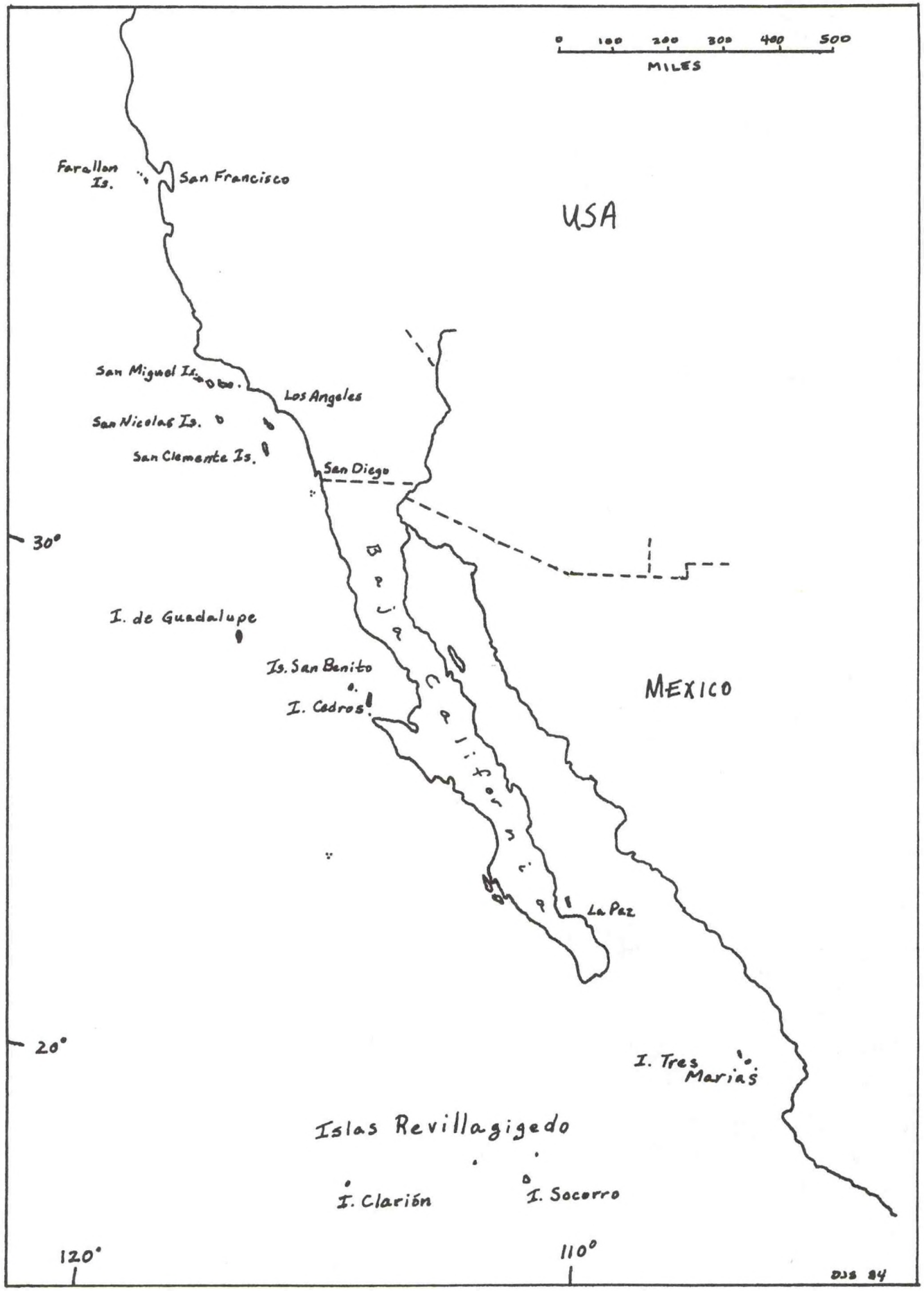


FIGURE 1. Range of the Guadalupe fur seal.

Table 1. Chronology of Events in Guadalupe fur seal abundance.

Aug - Sept 1806	Mariner (1827 in Townsend 1924) on board "Port-au-Prince" reportedly took 8338 fur seal skins at Cedros, San Benito and Guadalupe islands.
1807	Boston ship "Dromio" took 3000 fur seals (perhaps Guadalupe) from either Guadalupe (Belcher 1837, in Townsend 1924) or Socorro Island (Hamilton 1951).
1825	Morrell (1932, in Townsend 1899) took 400 Guadalupe fur seals from San Martin.
1831 - 1881	Hubbs (1956a) reported that American sealers from New England ports visited Guadalupe Island during this period and slaughtered fur seals on a massive scale.
1876 - 1894	Townsend (1924) reports that 5575 Guadalupe fur seals were taken during this period from Guadalupe and San Benitos Islands. Report based on records from sealing participants.
1892	Townsend (1899) finds only 7 fur seals offshore Guadalupe Island, shoots one, collects skulls of 4 previously dead animals.
1894	Commercial sealing vessel finds only 15 fur seals to be taken from Guadalupe Island (Townsend 1899).
1897	Thoburn (1899) found no fur seals at Guadalupe, heard about "a few left" from an island resident. Merriam (1897) describes the species from skulls collected by Townsend.
1897 - 1927	Species considered extinct.
1926	Small herd of between 35-60 found by a fisherman at Guadalupe Island (Wedgeforth 1928, Huey 1930, Townsend 1931).
1928	Two animals delivered to San Diego Zoo (Wedgeforth, 1928). In a dispute over payment, the collector returns to Guadalupe Island and reportedly kills all remaining seals.
1928 - 1949	No authenticated published observations of fur seals despite numerous trips to search at Guadalupe Island (Bartholomew 1950).
May - July 1949	Bartholomew (1950) repeatedly observes one male *A. townsendi* along the western shore of San Nicolas Island.
1954	Hubbs (1954b) counts 14 fur seals near Discovery Point, Guadalupe Island. This begins "modern era" of censuses as summarized in Table 2.

Table 2. Censuses for Arctocephalus townsendi on Guadalupe Island (modified from CEE/SRF, 1983).

Total No. Counted	Date	Area Searched/Comments	Population Estimate	Source
0	February 1950	Entire eastern shore by boat, except where fur seals later rediscovered	--	Bartholomew & Hubbs 1952
14	November 1954	"Rediscovery" of species, small boat survey	200	Hubbs 1956b
252	November 1964		--	Hubbs in Rice et al. 1965
285	28-31 Jan. 1965	Entire island; combination of vessel and foot surveys	600	Rice et al. 1965
211	March 1965		--	Hubbs in Rice et al. 1965
372	2-3 April 1966	Young animals and adult females	--	Peterson et al. 1968
198	2-4 May 1967	Subadults or territorial bulls in the majority	at least 500	Peterson et al. 1968
148	18-26 April 1968	Beach walks and small vessel surveys; mostly juveniles and females present	--	Brownell et al. 1974
314	21-29 June 1968	Bulls, females, pups, some non-breeders	--	Brownell et al. 1974
260	10-11 Nov. 1968	Dike Pt. to Double Point	--	Vandervere 1968
298	17-18 Feb. 1969	Discovery Pt. to Double Point only	--	Le Boeuf, Peterson and Hubbs 1969
374	12-17 April 1970	Discovery Pt. to Sealers Station	--	Bonnell and Pierson 1970
355	June-July 1976	N of Nursery to weather station	--	Fleischer 1978b
470	13 Feb. 1977	Entire eastern side	--	Le Boeuf 1977b
1073	June-July 1977	Entire island	1100	Fleischer 1978b
351	18 Feb. 1978	Eastern side	--	Pierson 1978
851	4-6 March 1982	Entire island	--	LeBoeuf and Condit 1982
1597	10-16 Aug. 1984	Entire eastern side	1600	Mexican government and National Marine Mammal Lab

Table 3. Highest counts of Guadalupe fur seal on San Miguel Island, California, during the summer survey season from 1969 through 1979. Source: DeLong, R.L., G.A. Antonelis, and E. Jameyson. In prep. Pinniped surveys at San Miguel Island 1968 - 1984. NWAFC Processed Report.

Date	Method	Males	Females	Pups	Total
May-Sep 1969	Land census	1 adult 1 subadult	0	0	2
Aug 1970	Land census	1 adult	0	0	1
31 Aug 1971	Land census	1 adult 1 subadult	1 small	0	3
Aug 1972	Land census	2 adult	0	0	2
Aug 1973	Land census	2 adult 1 subadult	0	0	3
1974	No census information				
20 Aug 1975	Land census	1 adult 1 subadult	0	0	2
29 July 1976	Land census	1 adult 2 subadults	0	0	3
30 July 1977	Land census	1 adult 2 subadults	0	0	3
19 July 1978	Land census	1 adult 4 subadults	0	0	5
2 Sep 1979	Land census	1 subadult	0	0	1
1980	Information unavailable at this time				
1981	Information unavailable at this time				
5 Aug 1982	Land census	1 subadult	0	0	1
28 July 1983	Land census	1 adult 2 subadult	0	0	3
2 Aug 1984	Land census	1 subadult	0	0	1

☆ U.S. GOVERNMENT PRINTING OFFICE: 1985-584-502/20029

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
National Marine Fisheries Service
Southwest Region
Terminal Island, CA 90731