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## Pinniped Populations at Islas ae Guadalupe, San Benito, Cedros, and Natividad, Baja California, in 1968

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the high mountains may be lower than the habitats of the foothill populations. It is interesting that the longest distance recorded for *E. minimus* (530 meters) was made by a lactating female.

These data suggest that in mountain valleys where the altitudinal gradient produces broad plant life-zones, *E. amoenus luteiventris* is unable to maintain a stable population in the subalpine and proximate continuous forest, and only utilizes these habitats seasonally. *Eutamias minimus oreocetes*, however, maintains a low population density with large individual ranges exclusively in the alpine, not utilizing the subalpine even in the absence of *E. a. luteiventris*. The two species come together only along the steep valley slopes, where the subalpine zone is narrow and only a few meters from each species' high-use habitat.

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## PINNIPED POPULATIONS AT ISLAS DE GUADALUPE, SAN BENITO, CEDROS, AND NATIVIDAD, BAJA CALIFORNIA, IN 1968

In April and June 1968, the Pacific Ocean Biological Survey Program (POBSP) of the Smithsonian Institution conducted surveys on breeding marine birds and pinnipeds on various Mexican islands. Between 18 to 26 April and 21 to 29 June, pinniped populations were surveyed at Islas de Guadalupe, San Benito, Cedros, and Natividad off Baja California. Species observed were the California sea lion, *Zalophus californianus*, Guadalupe fur seal, *Arctocephalus townsendii*, harbor seal, *Phoca vitulina*, and northern elephant seal, *Mirounga angustirostris*.

Pinniped counts made at exactly the same time of year but 15 years apart (end of January and early February 1950 and 1965, on Islas de Guadalupe, San Benito, and Cedros) were reported by Bartholomew and Hubbs (1952) and Rice *et al.* (1965). These censuses were made at the end of the *Mirounga* breeding season, whereas our 1968 surveys took place before and during the *Zalophus* and *Arctocephalus* breeding season. Berdegúe (1957)

TABLE 1.—Summary of April and June 1968 pinniped censuses on *Islas de Guadalupe, San Benito, Cedros, and Natividad*.

Island	<i>Zalophus</i>	<i>Arctocephalus</i>	<i>Phoca</i>	<i>Mirounga</i>
18 to 26 April 1968				
Isla de Guadalupe (Zapato)	636 (186)	148		9341
Islas San Benito				
San Benito del Centro	1533			1201
Isla Cedros	1854		62	39
Isla Natividad	366		263	
Totals	4389	148	325	10,581
21 to 29 June 1968				
Isla de Guadalupe (Zapato)	(119)	314		1100
Islas San Benito				
San Benito del Oeste				41
San Benito del Centro	6590			153
San Benito del Este				358
Isla Cedros	5110			25
Isla Natividad	3648		110	
Totals	15,467	314	110	1677

and Bartholomew and Hubbs (1960) have further discussed pinniped population trends on Isla de Guadalupe.

Large concentrations of pinnipeds are difficult to count, particularly when available time is brief. The method employed by Rice *et al.* (1965) for estimating total numbers was followed. They "counted sample sectors containing 10 to 100 animals, and estimated the total number by visually dividing the total occupied area into sectors equivalent to the counted sample areas."

We censused in the following ways: by walking beaches and beach cliffs; by following the coast in rubber rafts or "Boston Whaler" (both powered by outboard motors); by cruising as close to the coast as possible with the M/V *Sioux City* and M/V *Stella Polaris* (these vessels are 41 meters and 33 meters long, respectively, and both draw about 3 meters).

Our April and June 1968 censuses are summarized in Table 1. Detailed tables with counts for the various sections of each island and figures of each island are on file at the Marine Mammal Study Center of the National Museum of Natural History, Smithsonian Institution.

Large breeding aggregations of sea lions were observed in June on all islands except Gaudalupe. Sea lions are easily overlooked along the islands' rugged coastlines, especially on Islas San Benito. We found it impossible to obtain accurate counts of the animals present unless censused from shore. Small size, black natal pelage, and large aggregations of pups made it difficult to determine their numbers.

At Islote Zapato, off southern Isla de Guadalupe, 186 sea lions were counted in April and 119 in June. On 21 June seven territorial bulls with cows, five adult males not holding territory, 99 others, and only eight pups were counted. No bulls or pups were present in April. At Pilot Rock Beach, Isla de Guadalupe, 450 subadult and adult male sea lions were counted in April 1968, but none was present in June.

Our counts of sea lions on Islas San Benito (only San Benito del Centro) were 1533 in

April and 3783 with an additional 2807 pups in June. Complete censuses were not made on Islas San Benito del Oeste and Este.

Along the east shore of Isla Cedros, 1854 sea lions were counted in April and 4034 plus over 1000 pups in June. In June, from the *Stella Polaris*, breeding aggregations of hundreds of sea lions on the north end of the island were sighted.

We counted 366 in April and 2856 with 792 pups in June at Isla Natividad. Kenyon (personal communication, 7 July 1968) observed that *Zalophus* was present on Isla Natividad in April 1946.

Guadalupe fur seals, like California sea lions, breed during the summer (Peterson *et al.*, 1968; Peterson and Ramsey, 1970; Rice *et al.*, 1965). In April 148, mostly juveniles and females, were counted on Isla de Guadalupe. In June the count comprised 314, including numerous bulls with females and pups, individual subadult males, a single yearling, and one group of at least 45 nonbreeding animals. All pups then were in the black natal pelage. Two fresh placentas were seen in a harem area containing a bull, three females, and three pups. Peterson and Ramsey (1970) reported that two births were observed during their study of the species between 21 and 29 June 1968. Individual males were seen both north and south of the breeding concentrations.

Peterson *et al.* (1968) reported a complete land census of fur seals for 2 to 4 May 1967 of 196 animals and estimated the population on Isla de Guadalupe to be about 500. Our higher count probably reflects the return of more seals during the breeding season.

In April 263 harbor seals were counted on Isla Natividad and 62 at Isla Cedros; 110 were counted at Isla Natividad in June, but the area in which we found *Phoca* at Isla Cedros was not rechecked in June. Bartholomew and Hubbs (1952) stated that no harbor seals were observed on Islas de Guadalupe, San Benito, and Cedros. Dale W. Rice (personal communication, May 1968) stated that during their survey of 1965 no harbor seals were recorded, but they did not cover the area where we found the species on Isla Cedros. Kenyon (personal communication, 7 July 1968) observed approximately 100 harbor seals on Isla Natividad in April 1946.

By June the population of *M. angustirostris* had decreased about 65 per cent from April counts. In April females and immature males were present, but no adult males were seen. In June, numerous males (approximately 3.6 to 4.2 meters in length) were hauled out on Islas de Guadalupe and San Benito.

At Isla de Guadalupe 9341 elephant seals were counted in April and 1100 in June. On 22 June none was found at the West Anchorage, where Rice *et al.* (1965) found 169 on 31 January 1965. On neither visit was it feasible to check Elephant Seal Beach, on the west side of the island.

At Isla San Benito del Centro 1201 were counted in April and 153 in June. On Islas San Benito del Oeste and Este 41 and 358, respectively, were recorded in June. Several hundred idle bull sea lions were found associated with the largest *Mirounga* aggregation on Isla San Benito del Centro.

In April 39 elephant seals were counted along the northeast side of Isla Cedros. In June none was found here, but approximately 25 were noted on the north end of the island.

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#### RESUMEN

Hicimos un censo de los lobos marinos de California, *Zalophus californianus*, de las focas finas de Guadalupe, *Arctocephalus townsendi*, de las focas comunes, *Phoca vitulina*,

y de los elefantes marinos del norte, *Mirounga angustirostris* en las Islas de Guadalupe, San Benito, Cedros y Natividad, Baja California, Mexico, entre los días 18–26 de abril y 21–29 de junio de 1968. Los calculos de abril y luego de junio para estas especies se encuentran abajo. Los numeros de los lobos marinos entre parentesis incluyen los cachorros. Los calculos del numero de lobos marinos fueron 636 y 111 (119) en Guadalupe; 1533 y 3783 (6590) en San Benito del Centro y una poblacion aproximada de 9000 (15,600) en las Islas San Benito; 1854 y 4078 (5110) por el lado oriental de Cedros; y 366 y 2856 (3648) en Natividad. Contamos 148 y 314 focas finas en Guadalupe pero ningunas en otra parte. En abril contamos 263 y 110 focas comunes en Natividad y 62 en Cedros. En junio contamos 9341 y 1100 elefantes marinos en Guadalupe; 1201 y 153 en Benito del Centro y 41 y 358 en San Benito del Oeste y del Este respectivamente; y 39 y 25 en Cedros en distintas areas.

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GROWTH AND SEXUAL MATURATION OF LABORATORY-REARED, WILD  
*RATTUS NORVEGICUS*, *R. RATTUS*, AND *R. EXULANS* IN HAWAII

To provide a better understanding of wild rat populations in Hawaii, weight curves for 1 through 20 weeks of age were plotted for laboratory-reared litters of wild-trapped Norway rats (*Rattus norvegicus*), black rats (*R. rattus*), and Polynesian rats (*R. exulans*). Although we realize the bias inherent in comparisons of this sort, such weight categories provide a rough indication for age of wild-trapped rats, especially up to the age of sexual maturity.

Pregnant appearing, wild-trapped rats from gulch edges adjacent to sugarcane fields near Hilo, Hawaii were isolated in cages that contained litter boxes and nest material. Six Norway rats, eight black rats, and seven Polynesian rats had litters that were used