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SIZE AND DISTRIBUTION OF THE CALIFORNIA  
SEA LION POPULATION IN MEXICO

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**ABSTRACT:** California sea lions were censused during the 1979 and 1981 breeding seasons on rookeries and hauling grounds in the Gulf of California and the Pacific coast of Mexico. Correcting for underestimate bias and uncensused islands yielded estimates of approximately 20,000 sea lions in the Gulf with an annual production of 7,000 pups, and 63,000 sea lions on the Pacific coast with an annual production of 29,000 pups. Counts on seven major rookeries in the Gulf in 1979 were 35% higher than in 1966. Sixteen percent of the California sea lion population in the United States and Mexico (estimated at 145,000 animals) resides in the Gulf and 46% inhabits the Pacific coast of Mexico.

INTRODUCTION

The California sea lion, *Zalophus californianus*, along with numerous species of birds and whales, is a top trophic-level predator in the productive waters of the Gulf of California. In the southern part of the Gulf, it feeds predominantly on a variety of fishes and occasionally on squid (Aurioles, Fox, and Sinsel 1981). The full impact of this pinniped on Gulf of California fisheries is unknown because few systematic censuses of these animals have been conducted.

Long before California sea lions in the Gulf of California were counted, they were exploited. Early inhabitants of Baja California, Sonora, and Sinaloa killed California sea lions for their meat.

Between 1860 and 1870, whalers killed thousands of sea lions for their oil and skins. Later, the animals were hunted for their "trimmings"—vibrissae and genitalia which were sold in the Orient as aphrodisiacs. Local slaughter for oil and meat continued until the early 1960's on some islands in the Gulf, e.g., Puerto Refugio on Ángel de la Guarda (Lluch 1969), and poaching is still going on today.

The first systematic census of the sea lions in the Gulf was conducted by Lluch (1969). He estimated 6,027 total animals on eight islands from counts made in 1963, 1964, and 1966 at the peak of the breeding season. Orr, Schonewald, and Kenyon (1970) censused several islands between 1960 and 1968, but with the exception of Los Islotes, no rookery was censused during the breeding season. Mate (1977) estimated 9,428 sea lions in the Gulf of California from aerial censuses taken in June 1975, but his data are difficult to compare with other censuses because

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FIGURE 1. The route of R/V *Ellen B Scripps* on expeditions in 1979 and 1981 from San Diego, California, to California sea lion rookeries along the Pacific coast of Baja California, Mexico, and in the Gulf of California. The itineraries were similar in both years except for deviations taken in 1979 which are noted by solid lines. The numbers refer to rookeries not censused (1–6) and islands supporting nonbreeding aggregations (7–12). The code is: 1 = Los Coronados, 2 = Isla San Gerónimo, 3 = Punta Rosarito, 4 = Isla Magdalena, 5 = Isla Lobos, 6 = Farallón at Mazatlán, 7 = Isla Salsipuedes, 8 = Cabo Haro, 9 = Roca Vela, 10 = Isla Patos, 11 = Cabo Lobos, 12 = Punta Lobos.

they are categorized by latitude rather than by island.

The main purpose of this report is to present recent data on the number and distribution of California sea lions in the Gulf of California during the breeding season and to compare these data to earlier counts and to counts obtained on islands on the west coast of Baja California, Mexico. In addition, we report weights and measurements of sea lion pups obtained from Gulf and Pacific rookeries.

#### METHODS

**CENSUSES.**—The data in this report were collected on two expeditions aboard the Scripps Institution of Oceanography research vessel *Ellen B Scripps*. Inclusive dates were 21 June to 21 July 1979 and 1 to 30 June 1981. The track records are shown in Figure 1.

Both expeditions were timed to coincide with the breeding season of California sea lions and to facilitate counting sea lions in the Gulf. At Los Islotes, the peak number of breeding females occurs at the end of June, and the maximum number of pups are observed on about 10 July (Aurioles, Romero, and Fox 1978). We were aided in locating all suspected rookeries in the Gulf by previous investigations and by information obtained from local fishermen. The only rookeries not censused in the Gulf were Isla Lobos and the farallón at Mazatlán. We did not census the following rookeries on the outer Pacific coast of the peninsula: Isla Natividad, Los Coronados, Isla San Gerónimo,<sup>4</sup> and Punta Rosarito. Estimates of the sea lion population on these Gulf and Pacific rookeries are available from other sources (e.g., Mate 1977).

Censuses were conducted from a dinghy or launch, from the ship, and on foot. Most counts were made from a 4-m Avon or Zodiac inflatable dinghy powered by a 15- or 25-hp outboard motor. One person operated the boat and one or two people censused. Small islands were circumnavigated; on large islands, a dinghy was launched after sea lion aggregations were sighted from the ship. In ideal conditions, the boat was run slowly within 10 m of the shoreline. This did not alarm the sea lions and accurate counts were obtained. When waves or wind were strong, or extensive kelp beds surrounded an island, the boat was operated 30 to 70 m offshore. In bad weather, binoculars were used from the research vessel from 0.5 to 1 km offshore. This was necessary at Isla Santa Margarita and three small nonbreeding aggregations on Isla Magdalena, Salsipuedes, and Cabo Haro in 1981.

We censused sea lions in six categories: adult males, subadult males, females, juveniles, pups, and miscellaneous. Adult males are the largest animals with large dorsal head crests and thick necks. Subadult males are smaller, have thinner necks, and little crest development. For most analyses, these two age categories are combined. Females and juveniles are distinguished from males by their smaller size, thinner neck, and light brown color compared to dark brown in males. Juveniles are the smallest class in this group and include one- to two-year-olds, and possibly some three-year-olds. The miscella-

<sup>4</sup> Also spelled Isla San Jerónimo

neous category encompasses any animal except pups that could not be readily categorized because of high animal density or poor censusing conditions. Pups are the unmistakable, but easily concealed, young of the year.

**VALIDITY AND RELIABILITY ESTIMATES** — Validity tests were performed using ground counts and boat counts of the same rookery. After a census was conducted from a dinghy, one person went ashore, counted adults from a hiding place, and then frightened the adults into the water and quickly counted the pups. This was done at six places in 1981. In addition, at two sites we compared counts from the ship with counts from a dinghy. Estimates of reliability were obtained by having two censusers make simultaneous counts at all rookeries in 1979 and at five rookeries in 1981. For these areas, the mean of the two censuses conducted is presented.

**WEIGHTS AND MEASUREMENTS**.—A crew of three to six people weighed and measured 111 pups on six rookeries, one in the Pacific and five in the Gulf. Landing near a rookery caused adults to flee into the water leaving their pups behind. The procedure consisted of capturing a one- to three-week-old pup by the hindflippers and restraining it on a flat rock. Curvilinear length (tip of nose to tip of tail) was measured along the contour of the dorsal midline. The pup was then placed in a light leather dog harness and weighed with a hand-held spring scale (25-kg capacity  $\pm$  0.5 kg). After extracting a blood sample, the pup was tagged with an "All-Flex" cattle ear tag in the trailing edge of a foreflipper, its sex was determined, and it was carried back to where it was captured. Mothers retrieved their pups shortly after pups were released or soon after the launch and crew departed from the rookery.

## RESULTS

**WEATHER**.—Weather conditions in 1979 were ideal for censusing in the Gulf, seas were calm, winds of 0–5 knots were variable in direction. Conditions were fair for censusing Pacific coast islands except at Isla Santa Margarita where high surf prevailed. Wind and choppy water made censusing in the Gulf difficult in 1981, especially on the windward sides of Islas San Esteban, San Pedro Mártir, Granito, and San Ignacio Farallón, on the Pacific side, heavy surf made landings or censusing by dinghy impossible at Islas Mag-

dalena and Santa Margarita and on the west side of Isla Cedros.

**GULF OF CALIFORNIA**.—More than 15,000 sea lions were counted in the Gulf in 1979 and more than 14,000 in 1981 (Table 1). Major rookeries in the Gulf were found on islands in the center or midriff area: San Esteban and Ángel de la Guarda (Los Machos, Granito, and Los Cantiles). In 1979 and 1981, 76 and 71% of the sea lions counted were observed in the area from the north end of Ángel de la Guarda (29°35'N) south to San Pedro Nolasco (27°58'N). Most of the sea lions in the north end of the Gulf were located on Isla San Jorge. Relatively few sea lions breed in the southern end of the Gulf, and these were concentrated on Los Islotes and San Ignacio Farallón.

No pups were observed in the small groups of sea lions present on Isla Salsipuedes, Cabo Haro, Roca Vela, Isla Patos, Cabo Lobos, and Punta Lobos. No sea lions were observed during careful surveys of Isla Coronado, Tortuga, Raza, Mejía, Cabo Tepopa, Los Frailes, Cabo San Lucas, and the eastern half of Islas San Lorenzo, Las Ánimas, and Espíritu Santo. A few males or juveniles were observed on Islas Carmen, San Lorenzo, and Partida.

Eleven Gulf rookeries produced a minimum of 3,422 pups in 1979, 2,277 in 1981 (Table 1). The largest category of the animals counted on rookeries were female (48% in 1979 and 60% in 1981). The mean operational sex ratio (adult males:adult females) for rookeries was 1:8.30 ( $N = 9$ ,  $SD = 5.61$ ) in 1979 and 1:9.41 ( $N = 10$ ,  $SD = 3.83$ ) in 1981. The overall operational sex ratio for rookeries in these years were 1:5.84 and 1:8.94, respectively.

Sea lions in the Gulf occupied cobblestone coves or the boulder-strewn shoreline. Few breeding groups were seen on sand or gravel beaches, which tended to be occupied by non-breeding males. Most territorial males were observed "patrolling" the water in front of the females. Females and pups occupied a narrow zone near the water's edge and rarely were observed 10 m or more inland. In some locations, rafts of females floated in the shallows and the females occasionally vocalized to their pups onshore. Even on islands supporting numerous sea lions, the population was broken up into small groups, and a small number of animals took up a large part of the shoreline.

TABLE 1. CENSUSES OF CALIFORNIA SEA LIONS IN THE GULF OF CALIFORNIA, 29 JUNE TO 8 JULY 1979 (top figures) AND 8-21 JUNE 1981 (bottom figures, in italics) “—” denotes that no census was taken. Abbreviations for census methods: G = ground, L = launch, S = ship

Islands	Census methods	Males	Females	Pups	Juv	Misc	Totals
Los Islotes	G, L	18	88	28	4		138
	<i>G</i>	<i>11</i>	<i>26</i>	<i>7</i>	<i>0</i>		<i>44</i>
San Ignacio Farallón	—	—	—	—	—	—	—
	<i>G, L</i>	<i>10</i>	<i>133</i>	<i>64</i>	<i>36</i>	<i>80</i>	<i>323</i>
Cabo Haro	L	1	32		16		49
	<i>S</i>	<i>25</i>					<i>25</i>
San Pedro Nolasco	L	76	382	232	133	23	846
	<i>L</i>	<i>82</i>	<i>696</i>	<i>125</i>	<i>201</i>	<i>22</i>	<i>1,126</i>
San Pedro Mártir	L	150	903	321	167	93	1,634
	<i>G, L</i>	<i>134</i>	<i>1,061</i>	<i>252</i>	<i>120</i>	<i>125</i>	<i>1,692</i>
San Esteban	G, L	504	2,044	820	325	268	3,961
	<i>G, L, S</i>	<i>295</i>	<i>2,252</i>	<i>705</i>	<i>239</i>	<i>102</i>	<i>3,593</i>
Salsipuedes	L	8	34		56		98
	<i>S</i>		<i>19</i>		<i>15</i>		<i>34</i>
Roca Blanca	L	8	121	40	38		207
	—	—	—	—	—	—	—
Patos	L	454			19		473
	—	—	—	—	—	—	—
Ángel de la Guarda							
Los Machos	L	35	709	168	404		1,316
	<i>L, S</i>	<i>84</i>	<i>762</i>	<i>226</i>	<i>247</i>	<i>70</i>	<i>1,389</i>
Granito	L	87	436	337	242		1,102
	<i>G, L</i>	<i>73</i>	<i>658</i>	<i>161</i>	<i>79</i>	<i>47</i>	<i>1,018</i>
Los Cantiles	L	163	969	446	219	13	1,810
	<i>L</i>	<i>91</i>	<i>688</i>	<i>270</i>	<i>102</i>	<i>229</i>	<i>1,380</i>
Roca Vela	L	3	50		30		83
	—	—	—	—	—	—	—
Cabo Lobos	L	50	48		72		170
	—	—	—	—	—	—	—
San Jorge	L	167	1,398	1,030	632	26	3,253
	<i>L</i>	<i>165</i>	<i>2,034</i>	<i>457</i>	<i>667</i>	<i>21</i>	<i>3,344</i>
Rocas Consag	—	—	—	—	—	—	—
	<i>L</i>	<i>18</i>	<i>295</i>	<i>10</i>	<i>98</i>		<i>421</i>
Totals 1979		1,724	7,214	3,422	2,357	423	15,140
Totals 1981		<i>988</i>	<i>8,639</i>	<i>2,277</i>	<i>1,789</i>	<i>696</i>	<i>14,389</i>

Approximately 10–20% of the females observed were still nursing yearlings, and some small groups were made up almost entirely of such pairs.

PACIFIC COAST.—Approximately 23,000 sea lions were counted on Pacific coast rookeries in 1979, a greater number than in 1981 (Table 2). However, some islands censused in 1979 were not censused in 1981, and vice versa. A better estimate of the total number of animals associated with the rookeries shown in Table 2 is 27,895—obtained by adding the 1981 census count for Islas Cedros (4,730) and Magdalena (47) to the 1979 total census.

At least 6,529 pups were produced on the

islands censused in 1979. If the number of pups counted on Isla Cedros in 1981 (2,138) is added to that, annual pup production was at least 8,667 pups.

As in the Gulf, females were in the majority (53% of animals counted in 1979 and 55% in 1981). The mean operational sex ratio of rookeries in 1979 was 1.687 ( $N = 6$ ,  $SD = 5.83$ ), the overall sex ratio was 1:3.58. Less than 2% of the females were observed nursing yearlings.

Large aggregations of sea lions were observed on each rookery visited with the exception of Isla de Guadalupe. The females were hauled out in clumps well above the surf line, usually on sandy beaches. Territorial males stationed themselves

TABLE 2 CENSUSES OF CALIFORNIA SEA LIONS ON THE PACIFIC COAST OF BAJA CALIFORNIA, 13–20 JULY 1979 (top figures) AND 3–5 JUNE 1981 (bottom figures, in italics) Numbers in parentheses are calculated from total number of animals censused, “—” denotes that no census was taken Abbreviations for census methods: G = ground, L = launch, S = ship

Islands	Census method	Males	Females	Pups	Juv	Misc	Totals
San Martín	G	25	9	—	40	—	74
	—	—	—	—	—	—	—
Guadalupe	L, S	5	85	2	8	—	100
	—	—	—	—	—	—	—
San Benito							
Oeste	G, L	355	502	283	13	—	1,153
	<i>G, L</i>	<i>21</i>	<i>115</i>	<i>1</i>	—	<i>150</i>	<i>287</i>
Centro	G, L	817	3,718	2,560	88	—	7,183
	<i>G</i>	<i>79</i>	<i>1,985</i>	<i>1,185</i>	<i>38</i>	—	<i>3,287</i>
Este	L	183	1,070	900	59	—	2,212
	<i>L</i>	<i>(97)</i>	<i>(441)</i>	<i>(304)</i>	<i>(10)</i>	—	<i>852</i>
Cedros	—	—	—	—	—	—	—
	<i>G, L</i>	<i>270</i>	<i>1,880</i>	<i>2,138</i>	<i>282</i>	<i>160</i>	<i>4,730</i>
Asunción	G, L	1,793	4,183	1,582	506	—	8,064
	<i>G</i>	<i>(105)</i>	<i>(2,780)</i>	<i>(406)</i>	<i>(608)</i>	—	<i>3,899</i>
Magdalena	—	—	—	—	—	—	—
	<i>S</i>	—	—	—	—	<i>47</i>	<i>47</i>
Santa Margarita	L, G	265	2,676	1,202	114	—	4,257
	<i>S</i>	<i>(108)</i>	<i>(1,086)</i>	<i>(652)</i>	<i>(46)</i>	—	<i>1,892</i>
Punta Lobos	L	6	35	—	14	—	55
	—	—	—	—	—	—	—
Totals 1979		3,449	12,278	6,529	842	—	23,098
Totals 1981		<i>680</i>	<i>8,287</i>	<i>4,686</i>	<i>984</i>	<i>357</i>	<i>14,994</i>

on land with the females. Nonbreeding males were observed considerable distances inland on nearby rocks or on unoccupied beaches. In smaller groups that were sometimes seen in coves or on rocky ledges, territorial males were either on land or in the water near the females.

Eighteen sea lions were observed at sea in the Pacific and in the Gulf in 1981. They were solitary and most were within a few kilometers of a rookery. Three exceptions were one sea lion seen near Cabo Pulmo, one east of Cabo San Lucas, and one near Isla Coronados.

CENSUS METHOD BIAS.—Comparison counts using different census methods are shown in Table 3. Ground counts of pups exceeded those taken from a launch, with the underestimate from a launch being greatest when the animals were distributed in rocky areas. Launch and ground counts of adults were similar, the slightly higher counts from a launch were partly because launch counts always preceded ground counts. The latter were conducted in the morning when the temperature was rising and some adults were entering the water to cool off. Ship counts of adults were lower

than those taken from the launch, and pups were most difficult to see from the large vessel.

Two measures of inter-observer agreement were obtained. In 1979, independent counts of two censuses on 13 rookeries were correlated. Correlation coefficients were high and positive for total animals (0.976), females (0.935), and pups (0.926). Correlation coefficients were lower for juveniles (0.777) and males (0.712), animals which are more difficult to categorize, i.e., sub-adult males or juveniles can be confused with adult females. In 1981, two independent censuses were conducted on parts of five rookeries in the Gulf. The results, shown in Table 4, are similar to those obtained in 1979 in that agreement is usually high for total animals and females and relatively low for juveniles. Independent counts of pups in 1981 were more discrepant than in 1979.

PUPS WEIGHTS AND MEASUREMENTS.—The mean weight and curvilinear length of newborn pups is shown in Table 5. On each rookery, the mean weight and mean length of males is greater than that of females. For all rookeries combined,

TABLE 3 A COMPARISON OF CENSUS METHODS ON SHORT SECTIONS OF ROOKERIES. Abbreviations for census methods G = ground, L = launch, S = ship

Island	Weather and terrain	Census method	Adults	Pups
Cedros	Calm sea, animals packed tightly on sandy beach with some in arroyo behind beach.	L	—	55
		G	—	80
San Pedro Mártir	Calm sea, overcast sky, animals on pebbly beach	L	—	25
		G	—	42
Granito (A G)	Calm sea on protected side, animals distributed on small cobblestones & large boulders backed by vertical cliffs	L	269	45
		G	231	117
San Ignacio Farallón	Calm sea, animals on rocky shoreline containing a large open cave, flat shelves & large boulders	L	65	4
		G	58	52
San Esteban	Slight chop, animals on long sandy spit, in rock stubble at base of vertical cliffs & in shallow sea caves	S	264	0
		L	388	2
Los Machos (A G)	Calm sea, animals on sandy beaches, rock tables & among boulders at base of cliffs	S	347	0
		L	488	179

males were significantly heavier ( $t = 5.42$ ,  $df = 109$ ,  $P = < 0.05$ ) and longer ( $t = 4.88$ ,  $df = 109$ ,  $P = < 0.05$ ) than females. The mean weights of pups of both sexes from Cedros Island, the only Pacific rookery represented, are lower than that of pups from any Gulf rookery, but these differences are not statistically significant.

#### DISCUSSION

We counted 15,140 California sea lions in the Gulf of California in 1979. This number is 61% higher than an aerial census in July 1975 by Mate (1977) and 151% higher than a launch and ground census in 1963–1966 by Lluch (1969). Is our higher count due to increased censusing effort, the census methods employed, or to a genuine increase in the population? Each explanation has some validity.

Our census was more complete than Lluch's. Fifty-four percent of the animals we counted in 1979 were on rookeries and resting places Lluch did not visit; Los Islotes, San Esteban, Roca Blanca, Ángel de la Guarda (Los Machos and Los Cantiles), Cabo Haro, Islas Salsipuedes and Patos, and Cabo Lobos. If sea lions were found on these islands in the mid-1960's in the same relative proportions as in 1979, the total number of animals would have approximated 13,000, 16% fewer than we counted in 1979.

Terrain and climatic conditions in the Gulf are such that an aerial census like that conducted by Mate (1977) from a small airplane underestimates the number of animals present more than counts from a launch or on foot. Mate explains

that his count of 9,428 was low because of the difficulty of counting and photographing animals from the air over the dark, rocky terrain, with many animals in the water by mid-morning. An indication of the different results of these two censusing methods is that Mate counted only 122 pups in the entire Gulf compared to our 3,422.

Because of discrepancies in method and location of censusing, entire censuses are not very useful for determining population change. However, comparisons of individual rookeries indicate that the population in Mexico has increased. For seven rookeries, our counts can be compared with Lluch's (1969). Both the dates and method of censusing were similar. He counted 5,977 animals and we counted 7,662 and 8,091 animals in our two censuses. These represent increases of 28 and 35% over a period of 13 to 16 years. Our counts were higher on San Jorge (77%), San Pedro Mártir (56%), and Rocas Consag (181%), and lower on Granito (40%), Roca Vela (81%), and San Ignacio Farallón (alias Topolobampo) (24%). Counts on San Pedro Nolasco were similar in 1966 and 1979 but increased by 32% in 1981. Finally, it is not clear if the population decreased from 1979 to 1981, because the two censuses were conducted at slightly different times during the breeding season. The 1981 census was made prior to peak season, accounting for the lower count.

There are numerous difficulties in simply counting large groups of sea lions, leading to underestimates of animals present. Counts vary with the census method used, weather condi-

TABLE 4. COMPARISON OF INDEPENDENT CENSUSES TAKEN AT SEA LION ROOKERIES IN THE GULF OF CALIFORNIA IN JUNE 1981  
Abbreviations G = ground, L = launch, RC = R Condit, FS = F Sinsel, CF = C Fox

Rookery	Census method	Weather, light, terrain	Censuser	Males	Females	Pups	Juv	Totals
Los Islotes	G	Clear sky, fading light, rough terrain, boulder & cobblestones.	RC	11	26	7	0	44
			FS	16	14	6	6	42
San Pedro Mártir	L	Windy, overcast, choppy to heavy seas, 2 sandy beaches, cobble coves, rock tables, large boulders backed by steep cliffs	RC	69	925	72	124	1,190
			FS	134	1,186	252	120	1,692
Los Machos (A G ) (partial)	L	Sunny, flat sea, most females & pups on sandy beaches, juveniles & subadult males on rock tables & in boulder fields	RC	84	832	226	247	1,389
			FS	67	1,069	293	109	1,535
Granito (A G )	L	S side calm, N side very choppy, poor censusing conditions, 1 sandy beach on each side bordered by irregular rocky coastline backed by steep cliffs.	RC	60	621	163	72	916
			FS/CF	87	789	159	87	1,122
San Esteban	L	Calm sea N & W sides, steep cliffs with caves & rocky shelves, long sandy or cobbly beaches	RC	234	1,865	369	500	2,968
			FS	212	1,824	545	160	2,741
Totals			C	458	4,269	837	943	6,507
			FS/CF	516	4,882	1,255	482	7,132

tions, terrain, the experience and reliability of censusers, and the size, age, and sex composition of groups being counted. Moreover, the number of sea lions on land varies with time of year and the time of day. A special difficulty for estimating breeding females is that some will always be at sea feeding during the breeding season. As a result, counts provide only minimum estimates of the number of animals present. Empirically based correction factors must be employed to estimate actual population numbers.

We reason that the actual number of sea lions counted in the Gulf of California underestimates the number of animals and that a more valid estimate is 20,144 animals. This estimate is derived by applying three correction factors to the 1979 total count of 15,140 animals (the 1979 census is selected over the 1981 census because it is closer to the peak of the breeding season). This count is augmented by: (a) 744 animals,

representing known rookeries not censused in 1979; San Ignacio Farallón (323) and Rocas Consag (421); (b) 3,496 pups, assuming that pups counted reflect only 50% of the pups present, (c) 764 females, assuming that 10% of the females are at sea feeding (see Bonnell et al. 1978). We believe that 20,144 total animals in the Gulf and an annual production of approximately 7,000 pups are reasonable, conservative estimates.

Using the same assumptions, we can estimate the number of sea lions on the Pacific coast of Mexico. Before doing this, it should be noted that previous censuses from launches or on foot are of limited use for estimating population size because they are only partial counts of the area or they were conducted outside the breeding season, e.g., Bartholomew and Hubbs (1952), Rice, Kenyon, and Lluch (1965), Orr, Schonewald, and Kenyon (1970), Brownell, DeLong, and Schreiber (1974). Aerial censuses of sea lions on the

TABLE 5. WEIGHTS AND MEASUREMENTS OF CALIFORNIA SEA LION PUPS OBTAINED 11–28 JUNE 1981. For each island listed, the mean weight (in kilograms) or mean length (in centimeters) is shown plus or minus one standard deviation. N is in parentheses.

Rookeries	Weight		Length	
	Males	Females	Males	Females
San Pedro Mártir	8.75 ± 1.89 (6)	7.50 ± 1.96 (4)	76.42 ± 4.58 (6)	71.43 ± 8.94 (4)
San Esteban	10.17 ± 1.54 (6)	8.00 ± 1.06 (9)	74.93 ± 3.00 (6)	74.08 ± 5.03 (9)
Granito (A-G)	9.19 ± 1.04 (16)	7.75 ± 0.97 (13)	75.17 ± 2.62 (16)	71.48 ± 3.14 (13)
San Jorge	8.86 ± 0.92 (9)	7.71 ± 1.14 (12)	75.01 ± 2.30 (9)	72.55 ± 3.16 (12)
San Ignacio Farallón	8.80 ± 1.10 (5)	8.20 ± 1.30 (5)	76.20 ± 0.92 (5)	70.34 ± 3.31 (5)
Cedros	8.54 ± 1.45 (12)	7.29 ± 1.93 (14)	76.79 ± 3.37 (12)	72.82 ± 3.91 (14)
Totals	9.01 ± 1.32 (54)	7.60 ± 1.45 (57)	75.71 ± 2.93 (54)	72.34 ± 4.18 (57)

Pacific coast of Mexico by Mate (1977) (see Bonnell et al. 1978) yielded a direct count of 45,872 animals. We estimate that the total number of sea lions on the Pacific coast of Mexico is approximately 63,020 animals, a number which includes the annual production of 29,000 pups. We start with the direct count of 23,098 animals obtained in 1979. We increase this number by: (a) 4,777 representing two rookeries we counted in 1981 but not in 1979 (Islas Cedros and Magdalena, see Table 2); (b) 12,682 representing the following rookeries we did not census but which were censused by Mate (1977) (see also Bonnell et al., 1978): Los Coronados (297), San Gerónimo (1,113), Punta Rosarito (2,722), Natividad (5,785), and Punta Tosca (2,765), (c) 8,667 pups, assuming that 50% of the pups counted from launches were missed; (d) 11,445 pups, to compensate for the failure to count pups from aerial censuses, and (e) 2,351 females, assuming that 10% of the females were at sea. Augmentations in categories b, d, and e are based on Mate's aerial census in 1975 (Mate 1977). Since he did not categorize animals by age or sex, we added pup and female counts to his numbers using ratios derived from our censuses.

From these estimates and censuses conducted in the United States, we can estimate the size of the population. Bonnell et al. (1978) estimated 50,000 animals in southern California waters from aerial censuses and 4,000 in the northern part of the nonbreeding range. Thus, the total

number of California sea lions in the United States and Mexico is approximately 145,000 animals. Of this total, 16% are in the Gulf of California, 46% are on the Pacific coast of Mexico, 35% are in southern California, and 3% range as far north as Vancouver Island, British Columbia (Hancock 1970; Bigg 1973). Our estimate of the United States and Mexico population of this species exceeds the figure of 125,000 estimated by Bonnell et al. (1978). Both estimates do not include the geographically separated subspecific populations on the Galápagos Islands and in Japan.

The distribution of breeding animals in the Gulf differs from that most commonly observed on Pacific coast rookeries. In the Gulf, male territories are predominantly aquatic, fronting on small groups of females and pups distributed in a narrow zone along the water's edge on cobblestone beaches, among boulders, or on rocky ledges. On Pacific coast rookeries in Mexico and California, females are most often hauled out in large groups well above the surf line on sandy beaches or on flat rock outcroppings sloping into the sea (Peterson and Bartholomew 1967, Odell 1975; Bonnell et al. 1978), male territories are semi-aquatic or usually terrestrial. Higher temperatures in the Gulf may account in part for these differences in behavior and distribution.

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