

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME
WILDLIFE MANAGEMENT DIVISION
NONGAME BIRD AND MAMMAL SECTION

**REPRODUCTIVE SUCCESS OF BROWN PELICANS
IN THE SOUTHERN CALIFORNIA BIGHT, 1987**

by

Franklin Gress and David B. Lewis

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ABSTRACT

In the Southern California Bight, California Brown Pelicans (*Pelecanus occidentalis californicus*) nested on West Anacapa Island and Santa Barbara Island, both part of the Channel Islands National Park, California, and on Islas los Coronados, Baja California Norte, Mexico, during 1987. The total estimated breeding effort in the Southern California Bight was about 7300 nesting attempts, from which approximately 4900 young fledged; productivity was 0.67 young fledged per nesting attempt. On Anacapa Island 6326 nesting attempts produced 4257 chicks. This was the largest breeding effort ever recorded for Anacapa and marked the third consecutive year in which over 5000 nesting attempts occurred there. Productivity at Anacapa was 0.67 per nest, the same as it was in 1986; the 1987 breeding effort was characterized by high chick mortality (34%) and high nest abandonment (51%) rates. Egg-laying on Anacapa began in late January and continued over a four-month period to late May. For the third consecutive year Santa Barbara Island also had a relatively large breeding colony; 841 pairs produced 641 fledged young (productivity = 0.76). Breeding on Santa Barbara Island was much earlier and more synchronous than on Anacapa; egg-laying occurred between mid-December 1986 and mid-February 1987. Continuing a downward trend since 1979, nesting on Islas los Coronados in 1987 was greatly diminished and produced very few young; from about 150 nests on "Middle Island", no more than 25 young fledged for an estimated productivity of 0.17. Because of persistent human disturbance, in 1986 and 1987 pelicans did not nest on Coronado Norte, which has long been a primary breeding site, and instead nested on the smaller Middle Island. The prolonged detrimental effects of disturbance on nesting success at Coronado Norte clearly pose a threat to that island's breeding population.

INTRODUCTION

This report summarizes reproduction of the California Brown Pelican (*Pelecanus occidentalis californicus*) in the Southern California Bight (SCB) for the 1987 breeding season. This work was a continuation of ongoing studies examining pelican breeding biology and factors influencing reproductive success (see, for example, Anderson and Gress 1983, 1984; Anderson et al. 1980, 1982). Results of breeding surveys since 1970 are given in previous annual reports (cited in Gress and Anderson 1985). Known historical information and breeding records of the SCB pelican population, a summary of past research, and an analysis of the effects of human-related activities on pelican breeding success are given in the California Brown Pelican Recovery Plan (Gress and Anderson 1983), approved and published by the U. S. Fish and Wildlife Service in 1983. Since 1985, studies of Brown Pelicans nesting in southern California on the Channel Islands have been an integral part of a seabird monitoring program initiated and carried out by the Channel Islands National Park (described in Lewis et al. 1988).

In 1987 Brown Pelicans nested on West Anacapa and Santa Barbara islands in Channel Islands National Park, California, and on the middle island of Islas los Coronados off the northwestern coast of Baja California Norte, Mexico (Figure 1). Anacapa Island and Islas los Coronados historically were the largest and most consistent Brown Pelican colonies in the SCB (Gress and Anderson 1983). Nesting on Santa Barbara Island (SBI) has been ephemeral historically, but more consistent nesting has occurred since 1980; pelicans nested on SBI in 1980, 1983, and 1985-1987 (Gress and Anderson 1983, 1984; Lewis and Gress MS). Until 1986, pelicans breeding on Los Coronados have nested only on Coronado Norte each year since 1971 (Jehl 1973; Gress and Anderson 1983; Anderson 1988). Largely because of human disturbance from a more or less permanent fishing camp on the shore below the preferred pelican breeding area, pelicans deserted Coronado Norte and instead nested in a limited area on the much smaller "Middle Island" in 1986 and 1987 (Anderson 1988).

METHODS

Surveys of the Anacapa colony were from land observation points and by boat. The colony could not be viewed in its entirety from either land or water; the majority of the census work, however, was from land. Methods used for censusing this colony are described in Anderson and Gress (1983), Anderson et al. (1982) and Gress and Anderson (1983). Detailed methodology for monitoring pelicans nesting on the Channel Islands is given in a handbook developed for seabird monitoring in the Channel Islands National Park (Lewis et al. 1988). Censusing dates on Anacapa were as follows: 21 December 1986, 27 January, 18 February, 26-29 March, 28 April-5 May, 22 May-4 June, 7-13 July and 18-25 August 1987.

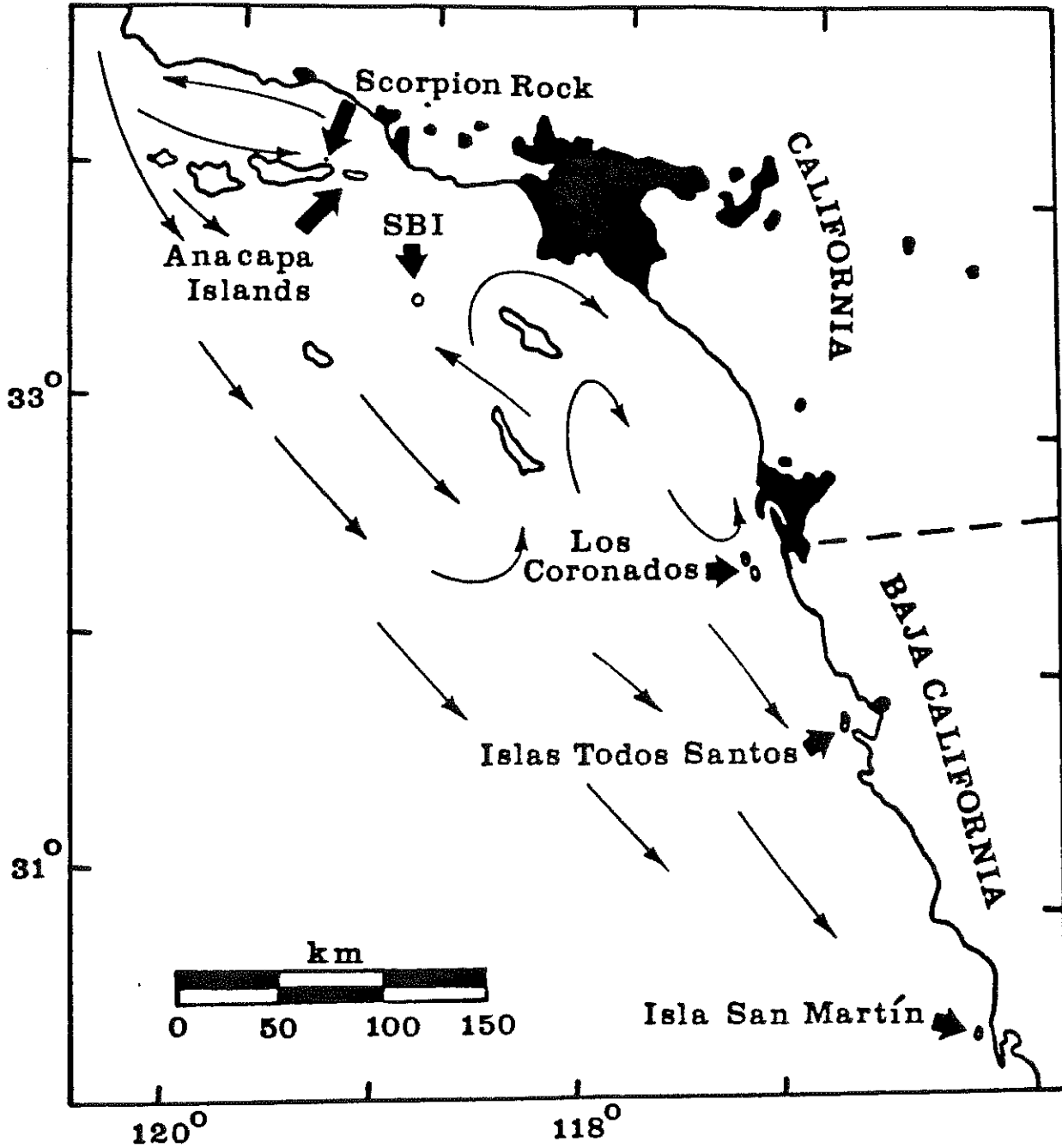


Figure 1. Map of the Southern California Bight area showing the locations of present and past Brown Pelican nesting colonies; Santa Barbara Island is abbreviated as "SBI". Of these, only Anacapa Island, Santa Barbara Island, and Islas Los Coronados were active in 1987. Scorpion Rock was active in 1972 and 1974-75; Islas Todos Santos has not been active since the 1920s; and Isla San Martin has been inactive since 1974. Narrow arrows indicate major water circulation patterns in the Southern California Bight. Taken from Anderson and Gress (1983).

The Santa Barbara Island colony was surveyed on 10 February, 6-8 March, 25-26 April, 15 May, 3-6 June and 19 July. Nearly all of the colony could be seen from land-based observation points; no boat surveys were required. Censusing methods are given in Lewis et al. 1988.

In 1987, Los Coronados was surveyed only once (on 7 June); thus, precise estimates of nest success were not possible. The entire island complex was censused from a boat; no land-based observations were made. Because Islas los Coronados lie in Mexican waters and therefore pose problems with logistics and gaining permits for access, monitoring the pelican population there has always been difficult. As a result, trips to Los Coronados are usually opportunistic and few in number. These problems prevented us from personally censusing the Coronados pelicans in both 1986 and 1987. Instead, colleagues conducting other research there gathered minimal monitoring data for us. The timing of their trips, however, prevented the obtaining of consistent breeding data in both years. Because of limited data on breeding success and because of the obviously deteriorating nesting effort in areas near the fishing camp, the emphasis of monitoring in recent years has become the effects of human disturbance.

On West Anacapa and Santa Barbara islands, reproductive data were compiled from total counts of nesting attempts and young hatched in sub-colonies which could be seen in their entirety from observation points; samples were used in other areas. Where possible, mortality and nest abandonment rates were estimated from sample counts. An abandoned nest is defined here as one in which a complete or nearly complete structure was built and abandoned before eggs were laid, one in which eggs were laid and then abandoned before hatching, or one in which eggs were hatched but less than one week old young have died. Conversely, successful nests were those from which young were fledged. At the end of the breeding season, we censused the entire nesting area on both Anacapa and SBI for a total nest and carcass count (including age at death).

RESULTS

Islas los Coronados

In 1987 (as in 1986), Brown Pelicans did not nest on Isla Coronado Norte. From an estimated 150 nests on the middle island, there were only 25 large young present on 7 June (W. Everett, San Diego Nat. Hist. Mus., pers. comm.). Assuming that all chicks fledged, we estimate maximum productivity of this colony to be 0.17 young fledged per nest attempt. Mortality and nest abandonment data were not available.

Anacapa Island

Brown Pelican nesting on Anacapa Island began in the Amphitheater area (Figure 2) in mid-January; by season's end this area contained 45 percent of the total nests built. As the breeding season progressed, the nesting effort spread westward to the Interior Bluffs area, where 31 percent of the nests were located, and to Lower Camel Ridge Bluff, with 7 percent. A late-season nesting effort (beginning in mid-April) occurring on West Interior Bluff and Summit Canyon Bluff comprised 17 percent of the total nests.

Nesting activity began in mid-January 1987. The first eggs were laid about 25 January, and egg-laying continued for about 4 months (until about 30 May); peak of egg-laying was in mid-March, with a secondary peak in mid-April. Hatching occurred between late February and late June. As usual on Anacapa, nesting was highly asynchronous (for yearly comparisons of egg-laying dates for 1970-1980, see Gress and Anderson 1983); new nests were being built for at least one month after the first chicks fledged in late April. The latest-hatched chicks fledged by mid-September. There was no evidence of reneating by birds with failed nests.

A summary of reproductive performance of the 1987 Anacapa Island pelican colony is given in Table 1. About 4200 chicks fledged from over 6300 nesting attempts, resulting in 0.67 young fledged per nest attempt (this is our measure of productivity; see discussion in Anderson and Gress 1983). Chick mortality was estimated at 33 percent; the nest abandonment rate was 51 percent. Mortality and abandonment rates were higher (53 percent and 58 percent respectively) in the earlier nesting effort of the Amphitheater and lower (9 percent and 42 percent respectively) in the more successful late-season effort on the western bluffs. The number of young fledged per successful nest in 1987 (1.36) was nearly equal to the 1979-1986 mean of 1.38 (SE = 0.19; range = 1.07 - 1.64), but was lower than in the past three years. The contrast between the 1987 early- and late-season figures (Table 1) is striking and reflects the high chick mortality rate earlier in the season. Mortality appeared to influence productivity more than did nest abandonment.

Santa Barbara Island

Pelican nesting on Santa Barbara Island began in early December 1986, about six weeks earlier than on Anacapa. The entire nesting effort was located in Graveyard Canyon on the eastern part of SBI (Figure 3), where the previous year's colony was also located. Breeding was relatively synchronous compared to Anacapa, with the last eggs laid by mid-February. The peak of egg-laying was in early January. Hatching began in mid-January, and the first-hatched chicks fledged in late March. The last hatches were in mid-March; these fledged by 10 June, three months before the last chicks fledged from Anacapa.

Figure 2. Location of California Brown Pelican nesting areas on West Anacapa Island, CA in 1987.

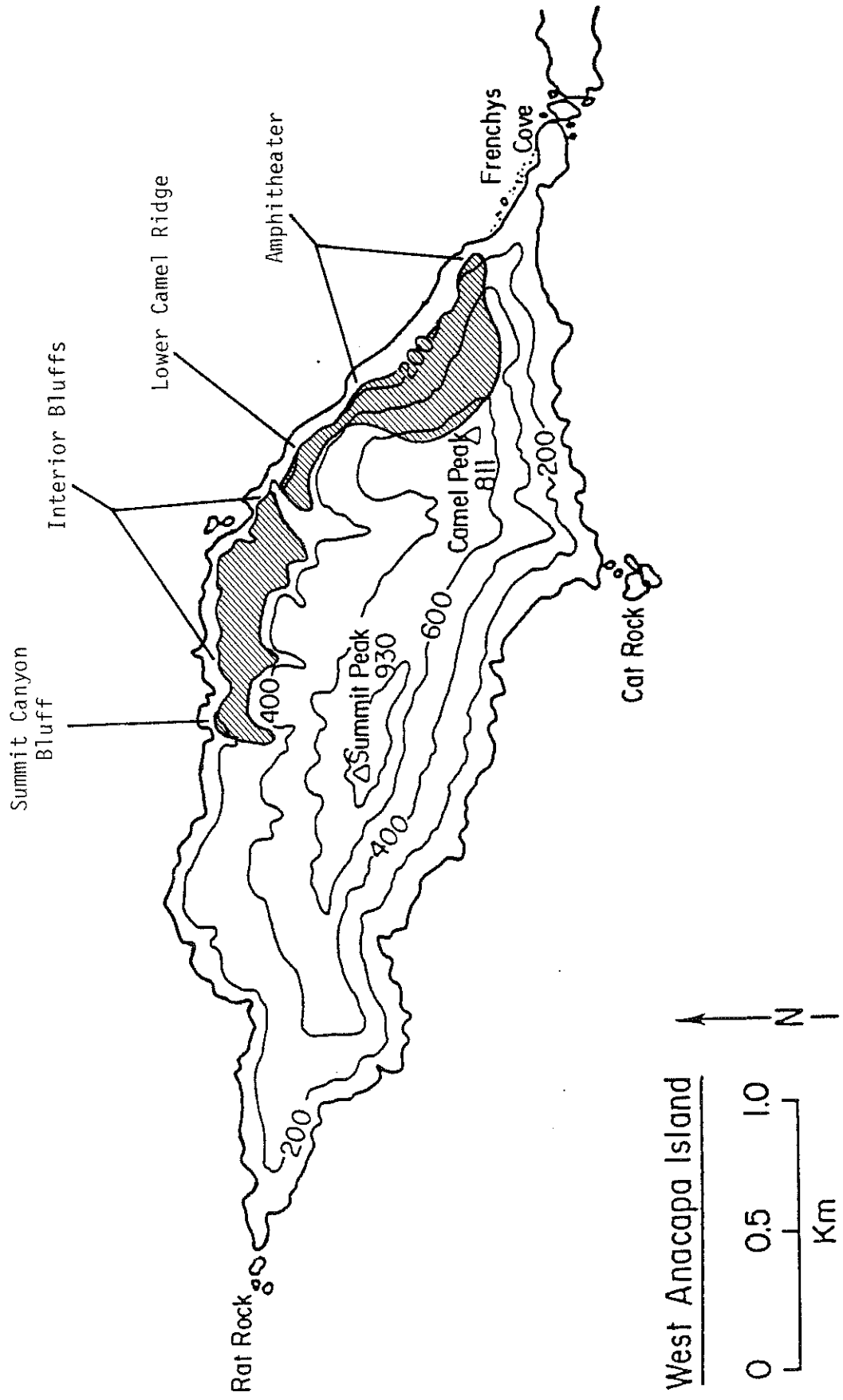


Table 1. Summary of Brown Pelican reproduction in 1987 in the Southern California Bight (SCB) colonies located on West Anacapa Island (WAI) and Santa Barbara Island (SBI) of the Channel Islands National Park (CHIS), California, and Islas Los Coronados (ILC), Baja California Norte, Mexico.

	Nest Attempts	Young Fledged	Productivity	Succ. Nests	% Succ. Nests	Young Fledged/ Succ. nests	Young Dead	% Mortality
WAI								
Early	3283	1630	0.50	1373	42	1.19	1864	53
Late	3043	2627	0.86	1757	58	1.50	269	9
Total	6326	4257	0.67	3130	49	1.36	2133	33
SBI	841	641	0.76	ND	ND	ND	457	42
CHIS Total	7167	4898	0.68	--	--	--	2590	35
ILC	150	25	0.17	ND	ND	ND	ND	ND
SCB Total	7317	4923	0.67	--	--	--	--	--

ND = No data available.

Productivity = Defined here as young fledged per nest attempt.

Successful nests = Nests from which young fledge.

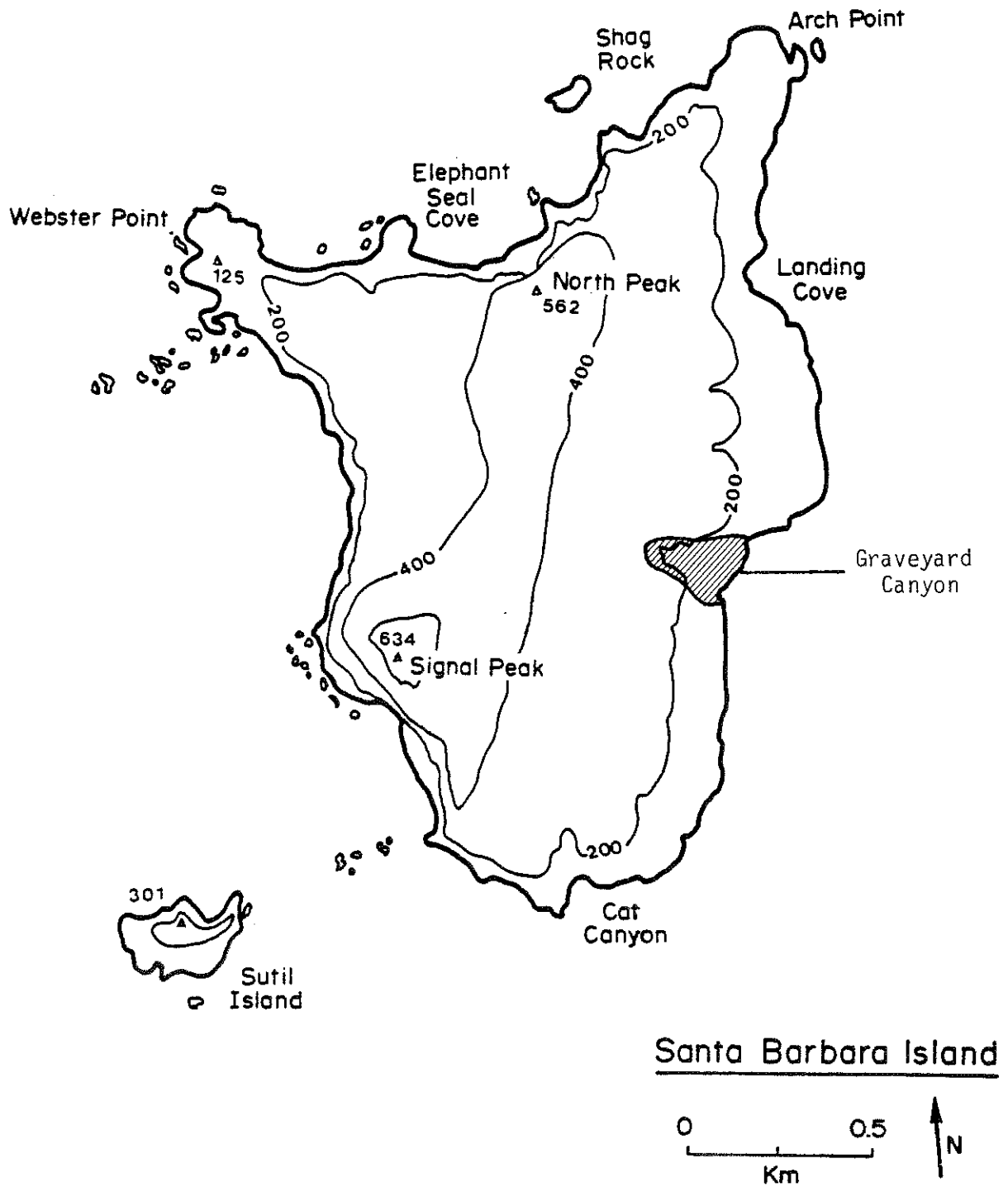


Figure 3. Location of California Brown Pelican nesting area on Santa Barbara Island, CA in 1987.

The nesting effort and fledging rate of pelicans on SBI for 1987 are shown in Table 1. An estimated 641 young fledged from 841 nesting attempts giving a productivity figure of 0.76. The size of the breeding effort on SBI was about 12 percent of the SCB total. Chick mortality was estimated at 42 percent, about 20 percent lower than the earlier Anacapa nesting attempts occurring at about the same time. The nest abandonment rate for SBI was not quantified.

DISCUSSION

Mean reproductive data for the three SCB Brown Pelican colonies in 1987 are combined and summarized in Table 1. Whereas the rapidly declining Coronados colony had one of its smallest and least productive breeding efforts since the early 1970s, Anacapa had its largest nesting effort on record (Tables 2 and 3). For the third consecutive year (1985-87), Anacapa had over 5000 nesting attempts; Anacapa and SBI combined averaged about 6900 nests per year. These are the largest Brown Pelican nesting efforts on record for the SCB (for historical reviews of Los Coronados, see Jehl 1973, and of the Channel Islands, see Gress and Anderson 1983).

The poor breeding success at Islas los Coronados in 1987 continued the downward trend noted there in recent years (summarized in Anderson 1988). Since 1979, there has been a shift of nesting effort and better productivity from Los Coronados to Anacapa/SBI. Shifts in the breeding population between Los Coronados and Anacapa may occur periodically in response to a changing food supply distribution (Anderson and Gress 1983). These long-term oscillations may partly explain the present reduction of the breeding population at Los Coronados. Not only have numbers of breeders on Los Coronados declined since 1979 (Table 3), but productivity there from 1980 to 1987 was less than half that of 1970-1979 (see Anderson 1988).

The Coronados pelican colony was much more productive than Anacapa from 1969 to 1979 (mean productivity = 0.74 versus 0.40). Even though Anacapa averaged 12 percent more nests during this period, Los Coronados produced nearly 40 percent more young. Beginning with 1980, however, most of the breeding effort (80 percent) shifted to Anacapa, with the remainder about evenly split between SBI and Coronados. Thus, in 1980-1987 only about 10 percent of the breeding effort and 5 percent of the chicks fledged in the SCB were from Los Coronados. Productivity on Anacapa/SBI in 1980-1987 was nearly twice as high as that on Los Coronados (0.78 versus 0.40), which was the antithesis of the 1969-1979 situation when productivity on Los Coronados was about twice that of Anacapa's.

The greatly expanded commercial fishery for northern anchovy (*Engraulis mordax*) along the Baja California coast in the late 1970s and early 1980s (PFMC 1983) may have contributed to the

Table 2: Yearly mean population data for California Brown Pelicans nesting in the Anacapa Island area (West Anacapa Island and Scorpion Rock) and the Santa Barbara Island area (Santa Barbara Island and Sutil Island), 1969-1987 (see Table 1 for definitions of terms used).

<u>Year</u>	<u>Nest Attempts(1)</u>	<u>Young Fledged</u>	<u>Productivity</u>
1969	750	4	0.005
1970	552	1	0.002
1971	540	7	0.013
1972 (2)	261	57	0.22
1973	247	34	0.14
1974 (2)	416	305	0.73
1975 (2)	292	256	0.88
1976	417	279	0.67
1977	76	39	0.51
1978 (3)	210	37	0.18
1979	1258	980	0.78
1980 (4)	2244	1515	0.68
1981	2946	1805	0.61
1982	1862	1175	0.63
1983 (4)	1877	1159	0.62
1984	628	530	0.84
1985 (4)	6194	7902	1.28
1986 (4)	7349	4601	0.63
1987 (4)	7167	4898	0.68

Data for years 1969-1974 from Anderson et al. (1975); for 1975-1980 from Anderson and Gress (1983); for 1981-1984 from Gress and Anderson (1983; 1985); for 1985-1986 from Lewis and Gress MS.

- (1) Estimates of numbers of pairs nesting represent a compromise between maximum numbers present, numbers of nests constructed, reproductive behavior, and appearance of secondary sexual characteristics.
- (2) Nesting occurred on Scorpion Rock in 1972 (112 nests; 31 fledged), 1974 (105 nests; 75 fledged), and 1975 (80 nests; 74 fledged).
- (3) Probable renesting on Anacapa in 1978; 210 pairs built 340 nests.
- (4) Nesting occurred on Santa Barbara Island in 1980 (97 nests; 77 fledged), 1983 (21 nests; 10 fledged). 1985 (1046 nests; 1515 fledged), 1986 (1441 nests; 615 fledged), and 1987 (841 nests; 641 fledged).

Table 3: Yearly mean population data for Brown Pelicans nesting on Islas los Coronados, Mexico (1), 1969-1987 (see Table 1 for definition of terms).

<u>Year</u>	<u>Nest Attempts</u>	<u>Young Fledged</u>	<u>Productivity</u>
1969	375	0	0
1970	175	4	0.02
1971	110	35	0.32
1972	250	150	0.60
1973	350	100	0.29
1974	870	880	1.01
1975	339	407	1.20
1976	473	487	1.01
1977	263	216	0.82
1978	265	62	0.23
1979	960	920	0.96
1980	758	350	0.46
1981	564	310	0.55
1982	374	189	0.51
1983	410	215	0.52 (2)
1984	220	54	0.25
1985	440	110	0.25
1986	< 250	ND	ND (3)
1987	< 150	< 25	< 0.17 (3)

Data for 1969-1974 are from Anderson et al. (1975), for 1975-1980 from Anderson and Gress (1983), for 1981-1984 from Gress and Anderson (1983; 1985), and for 1985-1987 from Anderson (1988).

- (1) Pelicans nested on Coronado Sur in 1969 and 1970, on Coronado Norte 1971-1985, and on "Middle Island" in 1986 and 1987.
- (2) A follow-up trip to determine the fate of 156 nests containing 4-6 week old young was not possible; productivity given here is a rough estimate based largely on chick mortality and nest abandonment patterns on Anacapa Island in 1983 (Gress and Anderson 1984). Anderson (1988) revised estimates and reported higher productivity (based on the maximum number of young that could have fledged) than we report here.
- (3) Precise estimates of nest success were not available; however, it was believed that no young were fledged in 1986 and not more than 25 fledged in 1987 (Anderson 1988). For calculating five-year averages, productivity of 0 for 1986 and 0.17 for 1987 are used.

Coronados pelican decline by decreasing the amount of available prey biomass (see discussion in Gress and Anderson 1983, 1985); northern anchovy is the primary forage species for SCB pelicans (see Anderson et al 1980; Gress et al 1980). The anchovy resource in the Coronados area apparently remains reduced, partially due, perhaps, to the overexploitation of the fishery resource, but also because of the effects of El Nino events in 1982-1983 (see Barber and Chavez 1983). Although we have not yet completed the analysis of the 1986-1987 SCB fishery data, based on previous analyses of pelican breeding success versus food availability (see, for example, Anderson and Gress 1984; reviewed in Gress and Anderson 1983), we suspect that anchovy abundance remains low in the Coronados area.

Previously, Gress and Anderson (1984) believed the impact of human activities was not a substantial contributing factor to reduced breeding success on Isla Coronado Norte. In recent years, however, the effects of disturbance from the fishing camp located on Coronado Norte seems to have increased and has been more clearly associated with the decline of the Coronados pelican population (Anderson 1988). Pelicans abandoned their nesting grounds on Coronado Norte in both 1986 and 1987 and nested in more limited numbers on the middle island, which is smaller and has less suitable nesting habitat than the north island (Anderson 1988). The pelican breeding population on Los Coronados appears to be in a critical state at this time.

Despite impressive increases in numbers of pairs nesting and young fledged since 1979 in the SCB (mostly on Anacapa Island), productivity remains relatively low (with the notable exception of 1985), or at least below the 0.90 criteria established by the California Brown Pelican Recovery Plan (Gress and Anderson 1983) as an indicator of full recovery. Anacapa productivity in both 1986 and 1987 was 0.67 (Table 2); excluding the high value from 1985, the Anacapa average from 1980 to 1987 was also 0.67 (SE = 0.08). Using all data (including 1985), mean productivity on Anacapa from 1974 (following major pollution-related declines) to 1979 was 0.63 (SE = 0.25) and from 1974 to 1987 was 0.69 (SE = 0.24). The addition of data from SBI has no effect on these averages. It appears, therefore, that the long-term productivity figure for the Anacapa colony (based on productivities since 1974) may be expected to average between 0.63 and 0.69.

Mean productivity for all SCB colonies, including Los Coronados, (Table 4) was 0.63 (SE = 0.04) for 1980-1987 (excluding 1985, for comparison above) and 0.72 (SE = 0.21) for 1974-1987 (using all data), reflecting the higher productivity on Los Coronados prior to 1980. Over a long period of time, a productivity figure of 0.63 - 0.72 may be all we can expect from the SCB pelican breeding population (see discussion of productivity and peripheral populations in Gress and Anderson 1983). Possibly it is the truly exceptional year, such as 1985, in which pelican productivity in the SCB reaches or exceeds 0.90 young fledged per nest attempt.

Table 4: Yearly mean population data for Brown Pelicans nesting in the Southern California Bight (Channel Islands, California, and Islas Los Coronados, Mexico), 1969-1987, combining data from Tables 2 and 3 (see Table 1 for definitions of terms).

<u>Year</u>	<u>Nest Attempts</u>	<u>Young Fledged</u>	<u>Productivity</u>
1969	1125	4	0.004
1970	727	5	0.007
1971	650	42	0.06
1972	511	207	0.41
1973	597	134	0.22
1974	1286	1185	0.92
1975	631	663	1.05
1976	890	766	0.86
1977	339	255	0.75
1978	475	99	0.21
1979	2218	1900	0.86
1980	3002	1865	0.62
1981	3510	2115	0.60
1982	2236	1364	0.61
1983	2287	1374	0.60 (1)
1984	848	584	0.69
1985	6634	6497	0.98
1986	7599	4601	0.61 (2)
1987	7317	4923	0.67 (2)

(1) See Footnote 2, Table 3.

(2) See Footnote 3, Table 3.

STATUS

The California Brown Pelican is classified as an endangered species by the U. S. Fish and Wildlife Service and by the California Fish and Game Commission. The objective of the California Brown Pelican Recovery Plan (Gress and Anderson 1983) is to restore and maintain stable, self-sustaining populations throughout the subspecies' range. The plan states that the accomplishment of this goal will require achievement of the following : 1. Maintaining existing populations in Mexico (those pelican breeding areas outside the SCB); 2. Assuring long-term protection of adequate food supplies and essential nesting, roosting, and offshore habitat throughout the range; 3. Restoring population size and productivity to self-sustaining levels in the SCB (both Anacapa/SBI and Coronados).

With reference to the SCB, the plan establishes specific criteria regarding breeding performance indicative of a recovered population. For consideration of federal reclassification or delisting, the criteria to be met by the SCB population are as follows:

1. When any five-year mean productivity for the SCB population reaches at least 0.7 young fledged per nesting attempt from a breeding population of at least 3000 pairs, the California Brown Pelican should be considered for reclassification to threatened status.
2. When any five-year mean productivity for the SCB population reaches at least 0.9 young fledged per nesting attempt from a breeding population of at least 3000 pairs, the California Brown Pelican should be considered for delisting.

Consideration for reclassification to threatened status would therefore require total production within the SCB to average 2100 fledglings per year over any five-year period. Consideration for delisting would require an average of at least 2700 fledglings per year over any five-year period. Attaining these goals would presumably be indicative of a stable, self-sustaining population in the SCB.

Running five-year averages (1969-1987) for both nesting effort and productivity for Anacapa/SBI only are shown in Figure 4 and for all SCB colonies (including the recovery plan thresholds) in Figure 5. Because precise data for nesting success were not available, Coronados productivity given for 1983, 1986 and 1987 are best-guess estimates based on certain assumptions (see footnotes of Table 3). The five-year means for pelican nesting effort for both Anacapa/SBI (Figure 4A) and all SCB colonies (Figure 5A) show a more or less steady increase since recovery from pollutant-related population declines began (see Anderson et al 1975). The three most recent five-year periods (1981-1985, 1982-1986 and 1983-1987) each averaged above

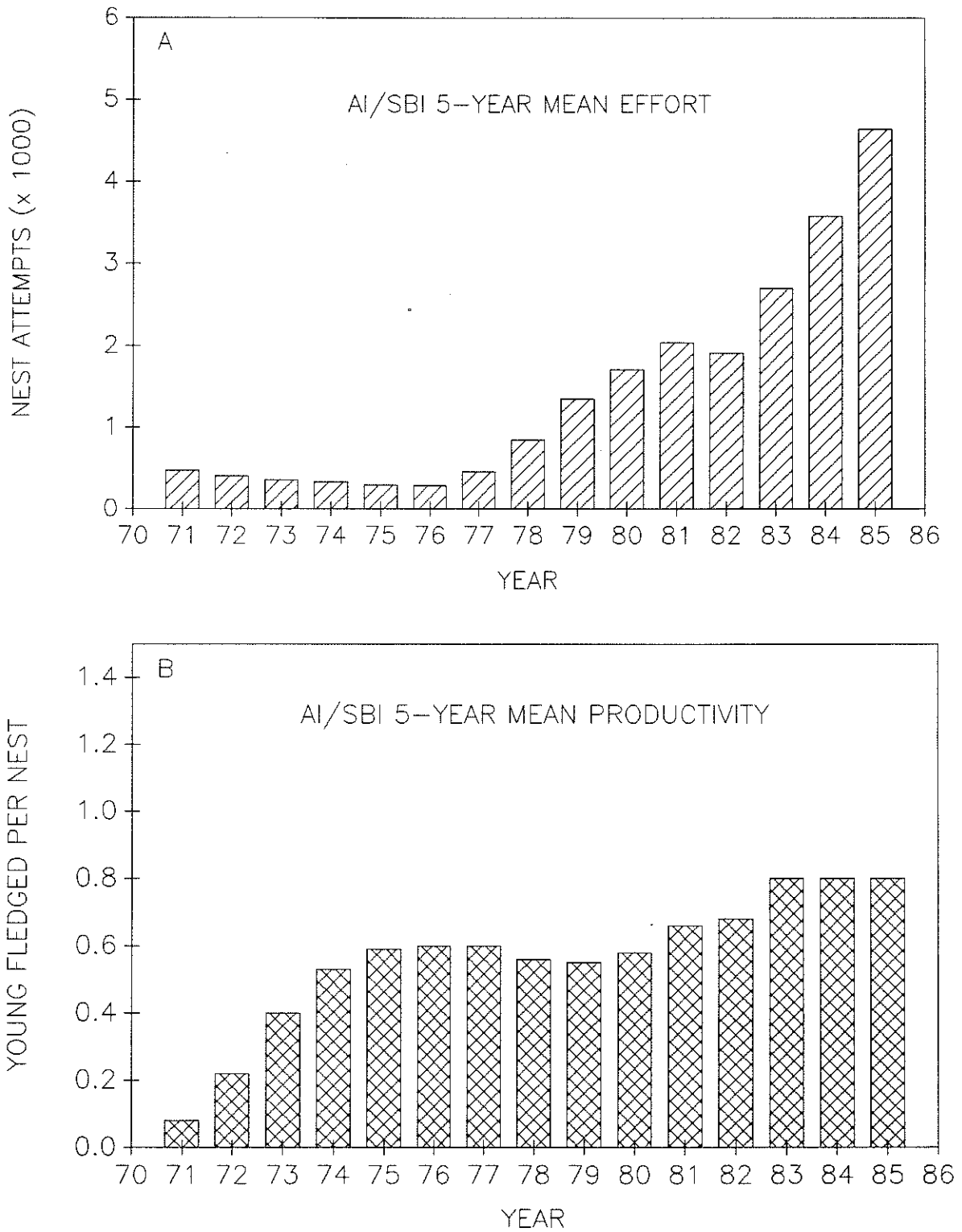
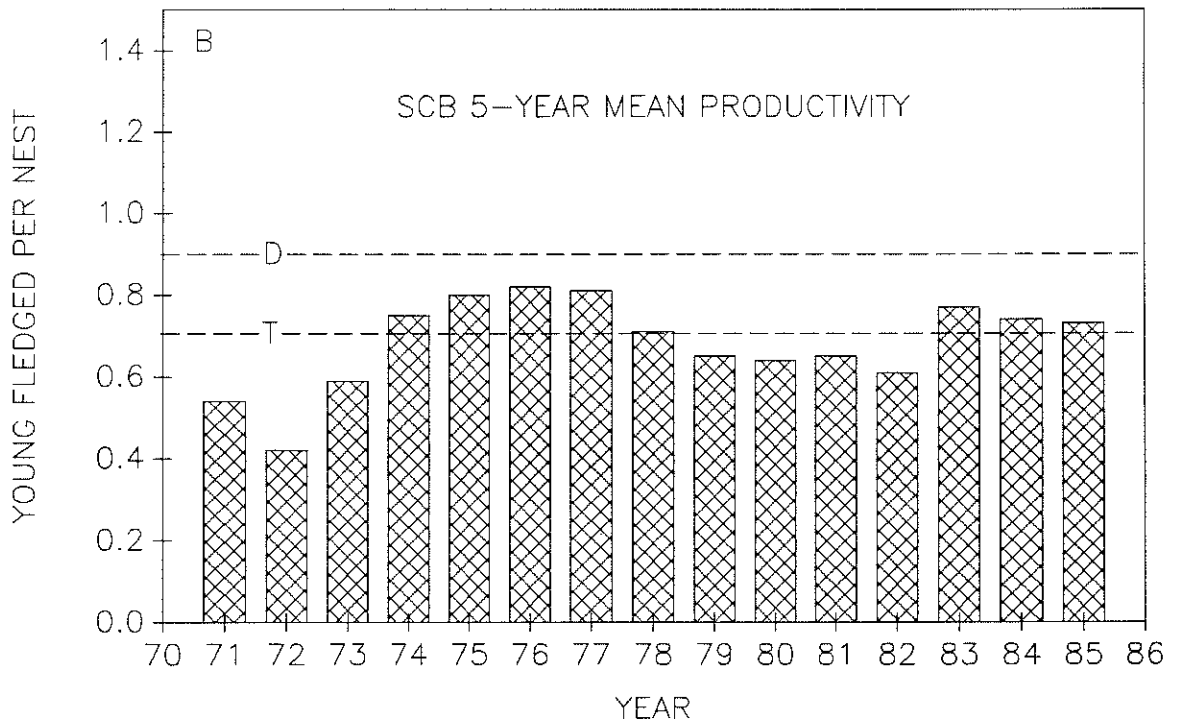
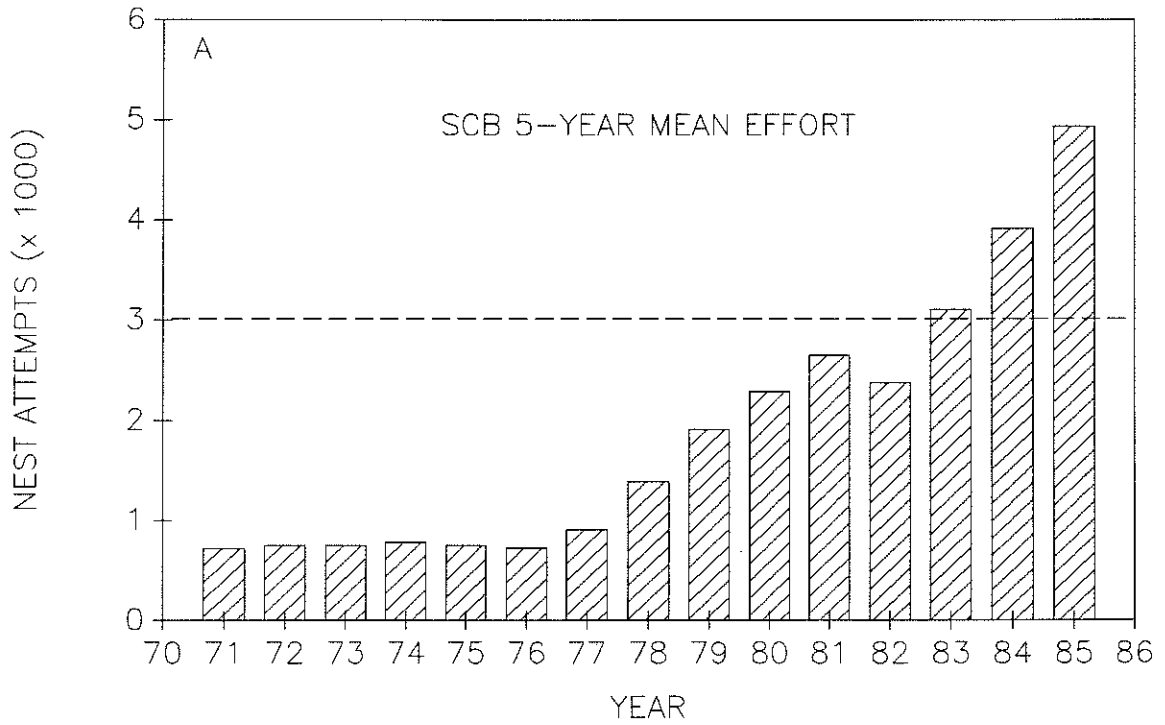


Figure 4. Five-year means of annual reproductive effort (A) and productivity (B) for California Brown Pelicans nesting on Anacapa Island (AI) and Santa Barbara Island (SBI), CA in 1969-1987. Each bar is centered on the middle year of a five-year period.

Figure 5. Five-year means of annual reproductive effort (A) and productivity (B) for California Brown Pelicans nesting in the Southern California Bight (SCB), including Anacapa Island and Santa Barbara Island, CA, and Islas los Coronados, Mexico, in 1969-1987. Each bar is centered on the middle year of a five-year period. The horizontal dashed line in "A" indicates the level which the SCB population should reach (3000 nest attempts) for consideration of reclassification. The dashed lines on "B" indicate productivity levels to be reached for consideration of reclassification to "threatened" status (T at 0.70) or delisting entirely (D at 0.90). See text for explanation.



the recovery plan threshold of 3000 nesting attempts.

The five-year averages of productivity of Anacapa/SBI (Figure 4B) and for the SCB (Figure 5B) show somewhat different profiles. At Anacapa/SBI, mean productivity increased sharply with time until about 1975 and then more or less leveled off until the latter three five-year periods. SCB mean productivity reflects the higher nest success at Coronados prior to 1980, which was followed by a decline that paralleled the increases at Anacapa beginning in 1980 (see also Tables 2 and 4). The three most recent five-year periods shown in Figure 5B are all above the 0.70 productivity mark, the level established by the recovery plan for consideration of reclassification to threatened status.

The last three five-year periods have each reached the threshold levels determined by the recovery plan for both nesting effort and productivity (as indicated on Figures 5A and 5B); by these criteria, therefore, the California Brown Pelican should be considered for reclassification. It must be emphasized, however, that the goals set in the recovery plan as a measure of achievement for reclassification or delisting are somewhat arbitrary. The goals were conservatively based on the best information available at that time (i.e., through 1982). The recovery criteria and the question of reclassification should also be viewed in the context of changes that have occurred since the recovery plan was published in 1983. At that time, based on historical information, Gress and Anderson (1983) believed the Anacapa colony would probably peak at about 3000 pairs. Moreover, because of the known breeding history of pelicans on SBI, they assumed that the small nesting efforts there in 1980 and 1983 were anomalous events, much like the Scorpion Rock colonies of 1972 and 1974-75 (see footnote 2, Table 2). While a downward trend at Los Coronados because of natural long-term oscillations was somewhat predictable (Anderson and Gress 1983), the precipitous population decline that has occurred there was not expected.

Clearly, the size of the Anacapa colony in the last three years has far exceeded all expectations. Also, the SBI colony has not only sustained itself, but has greatly increased in size; for now we have to consider SBI as a regular rather than an ephemeral breeding site. At present the Coronados breeding population could well be considered endangered; recovery in the near future does not appear promising. Additionally, none of the other historical colony sites in the southern portion of the SCB along the Baja California coast are active any longer. Although a nearly complete shift in the SCB breeding distribution to Anacapa and Santa Barbara islands has greatly increased breeding numbers and number of young produced there, productivity has remained relatively constant since 1979 (with the exception of 1985) and for the most part below the recovery plan thresholds for reclassifying or delisting. This population shift together with the exceptional breeding success of 1985 have greatly influenced the data used as the basis for the recovery criteria

in the most recent five-year periods. The exceptional nature of these events must be considered when examining these data for making a decision concerning reclassification.

Reclassifying the California Brown Pelican would be a major step in the kind of protection afforded it and would also affect how this species and its habitat will be perceived by the public, by government agencies, and by the military and industry; this step must therefore be taken judiciously and with caution. Trends determined from long-term data, as well as yearly breeding performance, must be carefully analyzed before management decisions are made. Even with long-term data, we cannot predict reproductive success from year to year. For example, after three years of the largest nesting efforts ever recorded, the number of pairs breeding on Anacapa/SBI in 1988 declined by an average of 60 percent (D. Lewis and F. Gress, unpublished data). This decrease may partly be attributable to poor winter food availability exacerbated by a bacterial disease that caused high mortality of adult pelicans along the California coast during the winter of 1987-1988; almost all carcasses found with bands were from the SCB (D. W. Anderson, pers. comm). Furthermore, recent data on pollutant residues in tissues of SCB Brown Pelicans indicate that relatively high levels are still found in the population, and some reproductive effects might be expected (F. Gress, unpublished data). The serious decline of the once large breeding population on Islas los Coronados is further evidence of the vulnerability of SCB Brown Pelicans.

RECOMMENDATIONS

1. Reconvene a meeting of federal and state agencies involved (U. S. Fish and Wildlife Service, National Park Service, and California Department of Fish and Game) and pelican biologists to review status and consider reclassification.
2. Establish and implement a plan to restore or improve breeding success of the Los Coronados pelican population, to include the following actions:
 - a. U.S. Fish and Wildlife Service should develop an international cooperative program with Mexican agencies and resource managers for monitoring and protection and provide assistance in carrying out these activities.
 - b. Remove fishing camps from the north and middle islands, if possible, and restrict human activities by placing signs and barriers in critical areas.
 - c. Protect Coronado Norte as a seabird sanctuary; develop an informational program to educate fishermen about the necessity of protecting the island and its resources.
 - d. Provide funding for adequate, consistent monitoring of breeding success, pollutant residues, and food supplies.
 - e. Continue studies on the effects of disturbance.
3. Continue monitoring breeding success on the Channel Islands; extend regular monitoring to include Islas los Coronados.
4. Maintain West Anacapa Island as a Research Natural Area with restricted access during the pelican breeding season; maintain the offshore closure area of West Anacapa Island (pelican protection zone within the Anacapa Island Ecological Reserve).
5. Develop a protection plan for Scorpion Rock, a former pelican breeding site off the northeast end of Santa Cruz Island (see the California Brown Pelican Recovery Plan for details).
6. Synthesize available fishery data annually for northern anchovy, Pacific mackerel, and Pacific sardine and correlate with pelican nesting effort and productivity in the SCB (both U.S. and Mexico).
7. Continue studies of daily activity patterns and feeding distribution at Anacapa Island.
8. Initiate studies relating the commercial anchovy fishery off Baja California to Brown Pelican populations in the SCB.
9. Continue pollutant monitoring.

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