

THE BREEDING COLONY OF LAYSAN ALBATROSSES ON ISLA DE GUADALUPE, MEXICO

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Early accounts of the birds of Isla de Guadalupe and adjacent waters did not mention the Laysan Albatross, *Diomedea immutabilis* (Jehl and Everett 1985), though Pitman (1986) and Jennings (1987) observed the species around the island from 1974 to 1984. Dunlap (1988) first reported it breeding on Isla de Guadalupe in May 1986, the first known breeding colony for the species east of the Hawaiian Islands and a major range extension. Howell and Webb (1992) noted additional new colonies established on Isla San Benedicto (19° 19' N, 110° 49' W) and Isla Clarión (18° 22' N, 114° 44' W) in the Revillagigedo Archipelago. The colony at Isla de Guadalupe has been reported on subsequently by Oberbauer et al. (1989) and Howell and Webb (1992). Here we summarize the growth and current status of this colony on the basis of our observations in 1991 and 1992 and those of the island's military staff.

STUDY SITE AND METHODS

Isla de Guadalupe (29° 00' N, 118° 15' 30" W), a volcanic island, 240 km off Baja California, lies within the California Current, in which nutrient-rich cold upwelled water flows from north to south (Rodén 1971, Lynn and Simpson 1987).

We censused nesting albatrosses by ground counts, maintaining a distance of 10 m to avoid disturbing the birds. The colony was divided into three study areas, according to substrate, vegetation, and density. Nests were plotted on a map of the colony (Figure 1). The area occupied by the colony was estimated from marine charts of Isla de Guadalupe (H. O. 1688, U.S. Navy). We estimated the total population by adding the number of nesting pairs to the number of nonbreeding birds. We estimated breeding success by monitoring during the incubation period to assess hatching success (February 1991: two censuses of the colony; February 1992: three censuses), after fledging to assess chick mortality (June 1991: two censuses, July 1991: two censuses; June 1992: one census, July 1992: three censuses), and during arrival for nesting (November–December 1991: two censuses; November 1992: two censuses).

RESULTS

The Laysan Albatross colony is located at the southern end of the main island, on a man-made terrace known as the "weather station." This plateau is approximately 100 m above sea level and is exposed to the predominant

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northwesterly (fall, winter, spring) and southeasterly (summer) winds (Berdegú 1957). The terrace has been cleared of scattered lava rocks and gravel and is the site of a meteorological observatory and a seismographic station. Several pathways and a dirt road cross the terrace (Figure 1). Parts of this terrace are covered by dirt, sand, low vegetation, and lichens.

Most albatrosses (in 1992, 41 of 45 nests, or 91%) nested in areas with low brush and rocks (Figures 2 and 3). Only a few nested in areas with little or no vegetation (4 nests, or 9%). Area 1, the area most exposed to the wind, is located on the steep slope toward Punta Sur, covering about 1000 m² with a substrate composed of lava rocks, lava rubble, gravel, and abundant brush (*Fraseria camphorata* and *Atriplex palmeri*). This area supported the

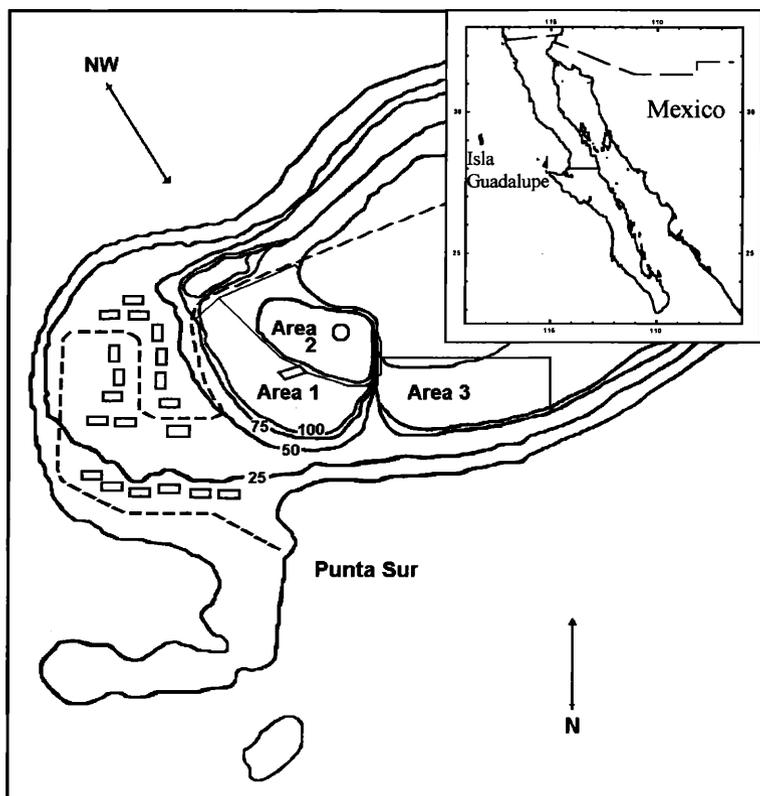


Figure 1. Location of the Laysan Albatross breeding area at Punta Sur, Isla de Guadalupe, just above the town. The arrow at upper left shows the direction of the predominant winds. The circle in Area 2 is the meteorological radar dome, and the rectangle in Area 1 is the seismological station.

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Figure 2. Area 1 of the Laysan Albatross colony, Isla de Gualaupe. Slope sheltered from the wind by rocks and brush (February 1992).

Photo by Juan-Pablo Gallo-R.



Figure 3. Area 1 of the Laysan Albatross colony, Isla de Guadalupe. Terrace with little cover from the wind (February 1992).

Photo by Juan-Pablo Gallo-R.

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highest density and number of birds with 79 individuals (60.8%) (Figures 2 and 3). Area 2, separated from Area 1 by a dirt road, is where the buildings of the weather and seismography stations are located. It covers about 2000 m², and is characterized by lava rocks, lava rubble, and sparse vegetation. Nineteen individuals (14.6%) were found here. Area 3 is separated from areas 1 and 2 by a dry creek bed, and is about 8 m lower than the terrace. It covers about 3000 m² and is also composed of lava rocks, rubble, and gravel with abundant low brush and few scattered areas of dirt. We counted 32 individuals (24.6%) here.

From 2 to 5 June 1983, Gallo visited Guadalupe for a pinniped survey. Several portions of the island were explored, including the terrace where the Laysan Albatrosses currently nest. We found no evidence of this species on the island (including nests, bones, feathers, or eggshells) even though the expedition was made before any albatross chicks would have fledged.

According to the island's military staff, in November 1983 the first two pairs of albatrosses landed in the terrace area, about 100 m above the naval base. They attempted to nest but were not successful (Cruz-Bautista pers. comm.). Later that winter, in January 1984, four pairs nested in the terrace area (Cruz-Bautista pers. comm.). Four hatchlings were observed in February 1984, but no information concerning their fledging success is available.

In January 1985, five pairs attempted nesting (Cruz-Bautista pers. comm.), and by May 1986, six molting chicks and five to six adults were observed (Jennings 1987, Dunlap 1988).

On 26 January 1988, Howell and Webb (1992) estimated 35–40 adults, 12 of which were incubating single eggs. That year, however, military personnel ate some eggs and some adults; as a result, the population was almost exterminated. Although eating albatrosses by humans was stopped, later in the same year, a dog from the naval base was observed killing and eating a young chick. The dog was killed by military personnel (Cruz-Bautista pers. comm.).

On 30 March 1989, Oberbauer et al. (1989) found only 10 adults, five young and one nest with an egg.

By February 1990 the population consisted of 18 pairs with 18 chicks (Cruz-Bautista pers. comm.). That year, R. Le Duc found a dead adult albatross near the colony that military personnel said a dog had killed (R. L. Pitman in. litt.).

On 18 and 19 February 1991 we counted 21 nesting pairs, 21 nestlings, and six unpaired individuals. We censused the population again on 16 June, and observed 12 young with their parents.

On 14 and 18 February 1992, we counted 45 nests and estimated a population of about 130 birds. Unusually heavy rain (rainfall for 5–6 February was 75.5 mm) associated with 1992 El Niño was the probable cause of death for three chicks killed by rock and mud slides. That summer, we arrived on 26 June, and found 13 fledglings. Upon arriving we observed a dead fledgling floating southeast of the island.

In fall 1992 the first albatross arrived on 2 November. When we left on 24 November the colony had 41 individuals, 32 of which were nesting birds.

Using the exponential model of growth, $k = (\ln t - \ln t_0)/t$ (where k = rate of increase), we obtained an average rate of annual population increase of

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29.9% over the last eight years (exponential regression: $r^2 = 0.78$, $n = 8$ years) (Figure 4). The finite rate of increase, the year-to-year increase of the population (λ), of 13.5% was calculated from the expression $\lambda = e^k$ (Poole 1974).

Laysan Albatrosses arrived on Isla de Guadalupe from early November to mid-December. The egg-laying period over the two years of our study was from 27 November to 12 February. Hatching extended from 23 December 1990 to at least 28 February 1991 (when we left the island, seven eggs had not hatched), peaking around 27 January. Rice and Kenyon (1962) found the species' nestling period in Hawaii to be 165 days. We found an average length of the nestling stage of 201.5 days for the two nesting seasons (21 nests in 1991 and 45 nests in 1992). The average nesting period started on 23 December and finished on 17 July.

In 1991, the chicks fledged between 12 June and July 17. Fledging success in 1991 was likely near 100%, as we found no evidence of dead young around the colony, or near caves which often shelter feral cats and where carcasses of Xantus' Murrelets (*Synthliboramphus hypoleucus*) were seen. Albatrosses started arriving again on 14 November, and immediately began pair formation and courtship.

In 1992 the last chick fledged on 10 July, seven days earlier than the previous year. In this year, 45 of the 41 chicks that hatched fledged, for a fledging success of 91%.

DISCUSSION

Approximately 2.5 million individual Laysan Albatrosses breed on the northwestern Hawaiian Islands. The density of the population is very high, and new nesting areas were established and grew in the mid to late 1980s (Harrison 1990). From the availability of nesting area at Isla de Guadalupe and apparent reproductive success, it is probable that this population will expand.

The Laysan Albatrosses nesting on the island today can not all be descendants of the first four pairs found on Isla de Guadalupe in 1984 (Figure 4). The rate of population growth has been greater than intrinsically possible, on the basis of an average age at first breeding of 5 to 7 years (Rice and Kenyon 1962, Fisher 1972) and annual reproductive potential. Thus we infer that recruitment to Isla de Guadalupe explains much of the population increase.

The factors prompting the Laysan Albatross to colonize the islands off Mexico can only be speculated on. Possibly significant are the continuing increase of the Hawaiian population, now recovering from earlier exploitation (Harrison 1990), and the massive development since 1980 of the drift-net fishery in the North Pacific. The latter, though catching huge quantities of the albatrosses' prey species, also releases a tremendous quantity of waste (squid offal) that the birds consume.

The conservation and growth of the Laysan Albatross colony on Isla de Guadalupe will be achieved if ongoing efforts are continued. The presence of biologists has had a significant impact on the authorities and fishermen by

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helping them understand the importance of this species as a newcomer to the Mexican avifauna. Efforts by Mexican authorities, especially the Mexican Navy, to preserve this species at Isla de Guadalupe have been undertaken and have been successful to date.

SUMMARY

The Laysan Albatrosses breeding on Isla de Guadalupe arrive from early November to mid December and lay from late November to early February. The chicks hatch from late December to late February and fledge from mid-June to mid-July. From two seasons of study, the mean length of the nestling stage is 201.5 days. From 4 pairs in 1984 the colony has grown to 131 individuals in 1992, an annual rate of increase of 13.5%. This colony was established after the species' population expansion in the Hawaiian Islands and coincident with the development of the drift-net fishery.

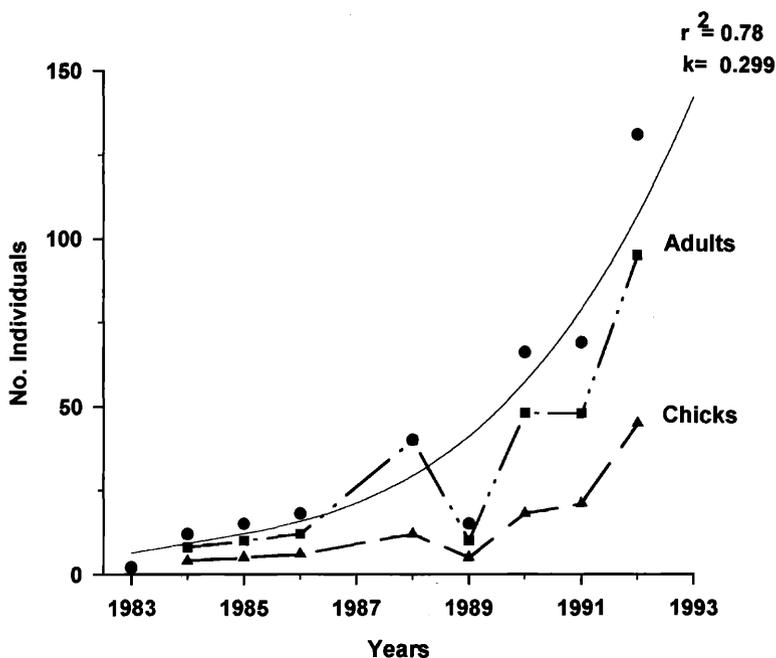


Figure 4. Growth of the Laysan Albatross population at Isla de Guadalupe. Nesting adults include nesting pairs. Circles, total population; squares, nesting adults; triangles, chicks; curve, derived rate of population increase ($k = 0.299$). No data available for 1987. The decrease observed in 1989 was due to exploitation of the eggs by military personnel.

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