LAYSAN ISLAND
(Leeward Island Survey No. 19)
June 7-12, 1967

Prepared by
Dennis L. Stadel

Itinerary

7 June	Landed on Laysan Island	0900
12 June	Left the Island	0900

Survey Party

R. DeLong (BIC)
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General Comments

This report is based on a visit by five Smithsonian personnel June 7-12, 1967. Primary emphasis was on collecting data and recapturing banded birds. Time was spent working with each species population, trying to more closely establish breeding phenology and population numbers. Gaps in available data was filled for some species, but efforts were limited on others. A longer stay would not have been of much benefit unless it was a matter of an additional week or so, permitting observation of changes over a period of time. Five days was sufficient time to complete the work planned.

A nest survey was undertaken on the afternoon of the 7th, with the observers scattered from the ocean to the lagoon. The numbers obtained were, at best, only indices to be used in making final population estimates. Blood samples were collected June 8. The cooler parts of each day were spent collecting biological data presented later in the report.

Weather during the survey was hot and sunny with no rain during the period. From observations of the vegetation it could be surmised that this island had received less rainfall than either Pearl and Hermes Reef or Lisianski Islands. The easiest method to determine relative rainfall is by observing the plant Ipomoea pes-capacae. Large areas of dried-up Ipomoea was present on Laysan, but not on the other two islands. Condition of other plants on the three islands supported this general observation.

The lagoon level was 6 to 12 inches lower than when the writer last visited the atoll in March of 1965. This would be due to the maximum high tidal level of the ocean, lower now than during the March visit, resulting in a fluctuation of the lagoon from seepage between the ocean and lagoon.

Lagoon water covered only two-thirds or three-fourths as much area during the month of June, compared to the month of March. This lower level results in a large open dry area on the west side of the lagoon. The Captain of one of the supporting vessels said he walked across the middle of the lagoon, indicating a depth of less than four feet. One wonders how many years will be required for the lagoon to become completely filled with detrital material.

During the survey, 24 species of birds were handled, 19 of which were in some stage of breeding.

House flies were numerous and pesky during the afternoon and early evening. Largest numbers were found around Sooty Tern nesting areas where egg mortality was heavy; large numbers were also found around heavy Albatross nesting concentrations.

SPECIES ACCOUNT

Laysan Albatross

Nesting occurs over the entire island with highest concentrations found in open spaces around the perimeter of the lagoon. The east beach, several open areas on the southwest section, and areas near the lagoon had large concentrated groups. During the hottest part of the day, immature birds seek protection from the sun under any available vegetation, usually *Eragrostis variabilis*. Immature birds with territories in large open areas cannot move out of the sun's heat, but are cooled by the wind, which is not found in more heavily vegetated area.

Two open nesting areas were checked for numbers and relative size of the nesting concentrations, as a basis for estimating maximum nesting densities. One area checked by the writer had 7500 square yards, 170 Laysan Albatross chicks and 120 Black-footed Albatross, with 50 and 20 dead chicks, respectively, in the area. This would be a density of one nest per 20.8 square yards, not counting mortality or desertion of eggs. A second area checked by the writer had 22,700 square yards with 2,700± albatrosses. Approximately five percent of the population were Blackfoots. Assuming 25 percent mortality in nesting from the beginning to the present, leads to an estimate of 3,600 nests originally. This amounts to one nest per 6.3 square yards, or at present one bird per 8.4 square yards. Other open areas did not have heavy concentrations and were not closely checked for density.

Immature birds wander around when their parents are not coming to the island. They move freely over territorial boundaries established by the parents during courtship and egg laying. These immatures sit around in clubs, showing very little defensive behavior as long as they cannot reach the nearest neighbor. When an adult lands, chicks have been seen to run up to the adult and start the characteristic begging response. If any young bird other than their own is present in the adults' territory they chase it out by aggressively pecking.

At the time of this visit, the Laysan chicks were not able to fly without further feeding from their parents. None had reached the stage where the parents desert the chick -- the final plumage development occurring before the immature flies. Many very weak birds were found near the ocean and lagoon beach; weak birds which ran up to any object that might possibly offer food. Extremely weak individuals were found all over the island, many of which will be fed in the near future and survive to roam the Pacific. Which weakened birds will survive and which will die could not be determined. Any one of them could be fed in the next week and go on to become a healthy individual. Mortality in this species is high compared to some other bird species, and it is much higher than in Black-footed Albatross.

Culmen measurements were obtained from 30 chicks, attempting to obtain a stratified random sample (Table 1).

Every afternoon after the island cools, large numbers of birds land on the island to spend the moonlight hours dancing and sitting around in conference; since none of these were handled it cannot be said for sure if they were adults or subadults, but most likely they are nonbreeding birds which are picking out future nesting sites and establishing pairs. Only a guess could be made of the number of adults on the island or using the island during one breeding season. Perhaps population data from Kure could be applied to the available data to give a more conclusive indication of numbers actually present.

A combinatinn count and estimate gave 16,500±, but probably all observers under-estimated when making the nesting survey. The writer could see no difference in population numbers between this visit and March of 1965, when the estimate was 25,000 chicks (based on an estimate that the 17,000 chicks banded represented almost 75 percent of the population. The estimate of 150,000 in June 1966 seems way out of line for the island, and I cannot see that much of a nesting fluctuation occurring from year to year.

Black-footed Albatross

Nesting occurs primarily in open, sandy areas on the east and northeast side of the island. Chicks were found all along the west side, coming from nests in open areas in the Scaevola association. Scattered chicks were in the Eragrostis association, all of which seemed out of place compared to the normal nesting habitat. Scattered birds were found around the lagoon, but no large concentrations.

Density figures for certain areas are included under Laysan Albatross. The open beach was not conducive to counting and measuring areas to determine nesting density.

The nesting cycle of the Black-foots is slightly ahead of that for the Laysan Albatross. Chicks averaged larger and were covered with less down. Several birds were checked which were free of down and appeared to be completing molting before leaving the island. All these birds had blood in the primaries and secondaries, although it felt like they were losing weight from not being fed by the parent. See Table 1 for culmen measurements.

Immatures move freely around their territory until the adult returns for feeding. Adults of this species are much more defensive of their territory than Laysan Albatross. Clubs of immature birds were present, but since the nesting densities of this species were less than for Laysans, the clubs were naturally of smaller size. Immatures (or locals) of this species were more defensive of territories than Laysans. Observers were often attacked and had to kick the immatures out of the way, or get bitten.

There were weakened birds, but I don't think the percentage was as high as for the Laysans. Chicks of this species are much more excitable, barf occasionally when approached, and more frequently barf when being banded. This barfing could easily cause the death of the bird if the adult did not return for an extra long period. Adults of this species are better parents than are the Laysans, once the egg is hatched. When the egg is being incubated, mortality is higher in the Black-foots, particularly due to moving sand on the open beach during a storm.

In the nest survey, 8,732 young birds were counted. The writer feels that as with the Laysan counts, the observers under-estimated large groups, so that the number present was probably more like 10,000.

Wedge-tailed Shearwater

This species had the widest distribution over the island and utilized the largest number of habitats for nesting. There were burrows on the sandy beaches where guano had formed a type of hard-pan, thus burrow roofs stand throughout the breeding season. Nesting occurs at the southwest end of the island under the large beach rocks. Scaevola is utilized for nesting throughout the association.

Most, if not all, of the burrows which will be used this year are dug and ready for nesting. When entering a burrow, the bird always sits at the entrance, cooing and scratching the ground. This scratching is a part of the ritual observed when adults change off incubating an egg, also a similar ritual occurs when the adults return to feed young. This ritual of scratching is described in detail in my notes made while working with this species on Kure.

Molt and brood patch condition seems to be the most important factor to check when Wedge-tails are preparing to breed. I checked molt on 40 birds and found all had new primaries and secondaries and also new tail feathers. Of these 40 birds, 30 had covered brood patches, 8 had uncovering patches, and two had bare patches which looked vasular as if incubating an egg. The two bare brood patches strongly indicated that Wedge-tails had eggs. The next night several eggs were found while working with the species more closely. All eggs found had been laid within the last five days or so, determined by egg flotation tests. Apparently this species only has a bare brood patch for a few days after incubation is complete or nesting is unsuccessful. The presence of refeathering patches would be an excellent sign that this species has chicks.

I know from my work on Kure that pairs formed early in the year remain paired throughout the nesting season. While we were bleeding birds,

on two occasions bled birds which were weak and laying on the ground resting were mounted by males in an attempt to copulate.

Large clubs were found in open areas around the island, but were not as prominent as later in the breeding cycle when large numbers of subadult and nonbreeding birds come to the island. Concentrations of birds were found in different areas on different nights during the survey. At different times of the same night large clubs would be found in different areas. I started to count burrows and birds, found in measured plots, but gave up after noticing the free movement of this species around the island and realizing the number of plots that would have to be examined to obtain any sort of index to be used for estimating population numbers. I don't feel that even a guess could be made on the population using the island. Even after working with the same small population on Kure almost every night for three months I had no real idea as to the population using the island. All kinds of figures have been presented in reports from this island, but all are at best a guess and uneducated at that. The area used by this species for nesting is several times that utilized by Sooty Terns (which can be fairly accurately calculated), yet Sooty Tern estimates are always considerably higher.

Christmas Island Shearwater

This species utilizes two habitats for nesting, Scaevola and beach rocks at the south end of the island. This species was apparently at the peak in its breeding cycle. Molting data were collected while banding; 57 birds had brood patch condition recorded, 44 had bare brood patches, 7 had no brood patch, and 6 had unfeathering brood patches. If this species is similar to Wedge-tails in that the brood patch starts to refeather within three days after eggs hatch, this would indicate a peak in breeding.

Egg flotation was run on eggs giving the following results: 4 eggs lightly incubated, 11 eggs medium incubated, 9 eggs heavily incubated, and 12 small downy chicks. Medium downy chicks would be unattended therefore no birds would be banded while attending this age class. There were medium-sized chicks on the island.

Population estimates are only a guess.

Bonin Island Petrel

Nesting was in two associations, the Eragrostis variabilis and the Ipomoea pes-caprae -- Eragrostis associatin. The heaviest nesting concentrations were in burrows under Ipomoea. Some adults returned to the island at night to feed chicks. There were dead chicks around the island; for example, in one 50-yard square plot I counted three dead chicks and in another I counted four dead chicks. Chicks are starting to fly; chicks which had attempted to fly and did not seem to be able were found in the lagoon and in the ocean with their feathers all water-logged. I had no real concept of population numbers after five days. On one, mile walk, at night I counted 43 live chicks. I do think estimates in the past have been low, and I think this because of the extent of the area where this species is present.

Bulwer Petrel

Nesting occurs where light intensity is low. The beach rocks at the southwest corner of the island were heavily infested with this species nesting or preparing to nest. Other rock piles around the island had large numbers of this species. Chris Thompson said large numbers of birds were sitting on eggs under the Scaevola where he banded Red-tailed Tropicbirds. We saw several birds nesting under Eragrostis. These nests were generally covered with Ipomoea. Nests under rocks contained Scaevola leaves -- I could not tell if this material had been collected or just happened to blow under the rock where nests were situated. Nests under rocks faced any direction and varied in depth from six inches to over three feet.

Breeding started at the south end of the island and moved north; eggs were of medium incubation at the south end, but along the west side there were only freshly incubated eggs. We could not tell if this indicated that these birds bred earlier or if part of the population just happened to come down and start nesting at the south end, while others coming in later nested along the edges of the earliest population.

We collected molt data on 100 birds, recording primary, secondary, tail, and brood patch condition. All 100 birds had new primaries and secondaries with no molt occurring. One of the 100 birds had uneven molt in the tail. The brood patch seemed to give the best indication of the breeding status. Of the 100 birds, two had completely covered, 13 had refeathering, and 85 had bare brood patches. At most, only 25 percent of the population was on eggs, most of the population was preparing to nest. It seemed that the population all returned to the island within a few days and once the breeding starts it commenced throughout the entire population. It also appears that the brood patch becomes bare only a week or less before egg laying occurs. Birds found with refeathering brood patches probably had had their breeding interrupted. Broken eggs were found, possibly the result of Laysan Finches, since most of the broken eggs were near vegetation.

During the day only incubating birds were present on the island, except for occasional other birds. At night over 1000 birds were sitting around on the southwest beach and about the same number on the south end of the island. There is a large area covered with Scaevola which is utilized for nesting. How do you make a population estimate for an island as big as Laysan? I could only guess there were over 5000 nests on the island that figure is probably low.

Sooty Storm Petrel

Three or four dead birds of this species were found at the northwest and west side of the lagoon where this species breeds earlier in the year. Dave Burckhalter and I found one bird of this species which I was sure was a small chick attempting to fly. It was found on 9 June along the east side of the lagoon, with feathers water-logged, sitting in water.

Red-tailed Tropicbird

This secretive species is breeding, but in what numbers is unknown. Data recorded while banding adults was as follows: 1 with large downy chick, 1 with medium downy chick, 16 with small downy chicks, 69 with eggs, and 11 with no status. These data should not be used as an indication of relative numbers, but should only be used to indicate that chicks of all age classes were present. Since large and medium and to some extent small chicks would be unattended, age class data obtained incidental to banding would be biased to an unknown degree.

Blue-faced Booby

This species was distributed in the same manner as on other visits. The largest concentrations were around the lagoon and next to the vegetation on the east beach. Scattered nests were found throughout the Eragrostis association. On our survey we counted 200 nests, but this figure is low since in some of the area I covered I later found more nests. The distance between surveyors was so great that nests were undoubtedly missed. I corrected the nesting data for a nesting population of 300. There were 100 nests with eggs, 50 with naked chicks, 100 with small downy chicks, and 50 with medium downy chicks.

I would estimate there were around 2,000 adults using the island during our visit, based on 300± nests, and assuming ratios between adults and chicks were the same on Laysan as on other islands, where accurate counts could be made. I am sure there was a large club or several clubs around the island which we did not see. We did not go on the east beach area at night. Dave Burckhalter and I found four or five clubs of up to 50 birds and other roosters around the lagoon when we banded and collected returns.

Brown Booby

Only five nests were found to my knowledge, one with one egg, three with two eggs, and one with medium downy chick. Occasional roosters were found along the ocean beach while working at night. We may have missed the nesting area referred to in the report of the June 1966 survey.

Red-footed Booby

Nesting was in Pluchea and Scaevola all around the island. Nests were easier to see than Blue-faced Booby nests, and we probably saw most of the Red-foot nests. We saw 172 nests, 89 with eggs, 19 with naked chicks, 51 with small downy chicks, 12 with medium downy chicks, and 1 with a large downy chick. There were probably somewhere between 200 and 250 nests. I would say there were 1,500 adults and subadults using the island at this time. Egg measurements were taken and are given in Table 4.

Great Frigatebird

Nesting was entirely in Scaevola with nesting material of primarily Tribulus and secondarily of Boerhavia. Nests were on the average two feet above the ground.

All stages of a breeding cycle were represented, from new nests through flying immatures of last year. Of 1,182 nests checked, 460 (39%) had eggs, 202 (17%) had naked chicks, 440 (37%) had small downy chicks, 67 (6%) had medium downy chicks, and 8 had large downy chicks. We probably saw 90% of the nests on the island. No correction was made for the number of nests checked.

I sat several afternoons and watched frigates chasing birds as they returned to the island. Boobies and tropicbirds were the two species most easily preyed upon by frigates. Sooty Terns were chased, but usually unsuccessfully. I did not see any frigate successfully gain food from wedge-tails or any other Procellerid.

I would estimate there were over 8,000 Great Frigatebirds on the island. Up to 2,000 birds were seen floating over the island during the day, most of which were subadult birds. At night birds were sitting on Scaevola around the island.

Egg measurements were taken and are given in Table 5.

Shorebirds

No actual survey was conducted on the four species included in this category. Golden Plovers, Ruddy Turnstones, Wandering Tattlers, and Bristle-thighed Curlews were all seen. I saw over 200 Golden Plovers next to the lagoon, most of which were in breeding plumage. No large flocks of Ruddy Turnstones were seen.

Sooty Tern

There were small, one- to three-day-old chicks in one area, indicating Sooty Terns have been here for over a month. All stages of nesting were present, including large numbers of birds only coming down at night to scratch out nesting sites. I would estimate that only 25 percent of the population had laid eggs, with others sitting down at night or flying around. Egg density was very slight in all areas.

Nesting colonies on Laysan and Lisianski did not fit the normal pattern which I have observed many times here in the Pacific. The normal pattern being: (1) birds swirling toward evening, (2) birds landing at night for copulation and nest site selection, (3) pair scratching out a nesting site and laying of the egg, (4) one group of birds, called a subpopulation, coming down within a few days of each other and other subpopulations forming later next to the original group of birds. By running an egg flotation test on eggs within a nesting colony a definite pattern of the formation of subpopulations usually can be established; however, not on Laysan. In most of the areas there was no discernible pattern, as all stages of eggs could be found next to each other. In the one area where chicks were present there were birds laying eggs within and all around the chicks. This was the case in all but one nesting area, which I will discuss later. There was such a large number of nesting birds that it seemed that birds were confused. There were small numbers of birds nesting off by themselves. It seemed like there were pairs or a few pairs starting to nest within established nesting colonies.

During the day there were birds flying around the island or sitting in areas where they would not be found at night. In colony areas where birds were scratching out nests or the nesting site had been selected and copulation was occurring at the nesting site, the birds remained on the island during the day. In areas where birds were not definitely established as to nesting site, they usually left the island during the hot part of the day. Toward evening the number of birds on the island increased considerably, although I am not sure when this increase in numbers stops.

On Laysan the Sooty Tern nesting occurs primarily in the Eragrostis association, with some nesting in open sandy areas. Nesting is around the large Eragrostis clumps, with a definite preference shown for shaded areas around the grass. The hot, open, sandy areas were the last nesting sites to be used; it seemed that mortality of eggs was highest in these hot areas.

I checked molt on over 100 birds and found all were the same. All birds had new primaries and secondaries with no interrupted molt. All birds had a bare brood patch. An occasional bird had a molting primary but not of the interrupted type of molt.

There were essentially four separate nesting areas around the island (see Diagram 1). I will write one or two paragraphs about each area. An estimate of Laysan Finch mortality on eggs will be included, but a discussion of this mortality will be included under Laysan Finch. These are not break-downs on subpopulations, but merely areas which can be discussed in a unit.

Area number one started at the southwest corner of the island and continued around to the southeast corner and connected on to area number 2. This area had about 100 one- to three-day-old chicks; most of the other nests contained fresh eggs or were being prepared for egg laying. At first I felt that birds in this area were primarily unsuccessful nesters, but I did not see broken eggs and finally at night observed copulation several times. This area was more or less 100 yards wide and 400 yards long. I used a belt transect method to determine that the eggs were 7.2 feet apart on the average, which would give a nesting population of 50,000 nests. With the other non-nesting birds I would estimate there will be 200,000 nests when nesting is completed. Laysan Finch mortality on the 50,000 nests is possibly as hight as 5 percent.

Area 2 was continuous with area 1, but varied in width and in certain characteristics. This colony was composed of many subpopulations, with all stages of incubated eggs present in a haphazard fashion. This area was one of the most unsuitable nesting sites which could be used by this species; Eragrostis density was high, leaving little area for nesting. Laysan Finch density was greatest in this area and egg mortality was also greatest, estimated as high as 25 percent. Some areas of up to 50 eggs were all destroyed by finches. Nesting was not continuous due to Ipomoea concentration in some portions, which acted as a barrier to nesting. This portion was approximately 30 yards wide and 3,000 yards long; it stretched from the southeast corner more than half the way up along the east side. Using a belt transet method I determined the eggs on the average were 10

feet apart for the entire area, although the densities varied throughout the area. There was a calculated 81,000 nests before the Finch mortality was subtracted. There were at present 60,775 eggs in the area. Nesting was over 75 percent completed in this area, although I could not tell for sure because of the tremendous mortality of eggs. Paired birds were standing around in the area; I could not tell what they were doing and I did not visit the area during the night.

Area 3 was at the northwest corner of the island, covering an area of 971,500 square feet. The northern end was 150 yards wide by 450 long, and the southern part was 100 yards wide by 400 yards long, giving a total length of 950 yards. Nesting was from open sandy areas to dense Eragrostis clumps, with no particular pattern to the nesting. There were medium incubated eggs and also nests being constructed. Egg density was determined (by the belt-transect method) to be 9.1 square feet per egg over the entire area. This area will have three or four times as many nests when nesting is completed. There are at present 106,329 calculated nests in the nesting colony.

Area number four was situated at the northeast corner of the island. When we made our nesting survey on the 7th, there were no birds in the area. There may have been birds coming in at night and we did not see them. The evening of the 9th was the first time this nesting colony was observed. This colony fit the normal pattern which I described earlier. There should be about 18,000 nests when nesting is completed. I visited the area each evening to watch the increase in eggs; there was also an increase in the number of birds sitting down at night. The population numbers are based on the assumption that no more birds come into the area.

All the Sooty Tern data were collected on the 8th and 9th, with population figures based on data obtained on the 9th. The following table indicates populations in each area.

Area	Nests on 9 June	Laysan Finch mortality	Eventual population mortality
1	50,000	2,500	200,000
2	60,775	20,000	81,033
3	106,329	10,000	400,000
4	0	-	-18,000
Scattered Colonies	40,000	-	40,000 +
	257,104	32,500	749,033
			32,500 - Finch mortality
			771,533 - Total nests calculated

This gives 1,543,066 total birds on Laysan during our stay.

+ Quite possibly more birds will come to the island to nest, but this figure is as close as can be calculated with the available data.

Gray-backed Tern

This species is probably the most underworked, under estimated, least understood, and one of the most beautiful birds in the Central Pacific. There were birds on nests and flocks sitting in every type of habitat on every part of the island. All stages of nesting were represented from nests being constructed to flying immatures. Nests were found in Scaevola, Eragrostis, Ipomoea, and rocky associations. I saw over 2,000 birds sitting around the lagoon during the daytime; there were more during the night. I would estimate there were 10,000 nests and 40,000 adults using the island during this survey.

Common Noddy

This species is easily underestimated as to nests and numbers of birds on the island, because of utilization of almost any type of habitat. When we made our initial nest survey we found eggs and two or three medium-sized chicks, but when out stomping around the island at night we found all sizes of chicks. We found immature birds which were completely feathered and attempting to fly. Most of the nests had eggs, but I saw over 1,000 chicks. I would estimate there were over 10,000 nests and 40,000 adult birds on the island.

I conducted an interesting study while on this trip, actually it was two separate studies but on Laysan both were run together. While walking half way around the island I recorded data on nests. When I came to a nest, I recorded what plants were within three feet, what plant the nest was constructed under, and recorded all the materials used in the nest. These data do not represent a random sample of the nesting population over the entire island, but do represent a statistical sample of 30 nests. These data point out for a particular part of the island, the plants most frequently used for nesting material and in what plant association nests are most frequently found.

This study shows that nesting is primarily in the Eragrostis or Scaevola associations, with nests constructed primarily under Scaevola or Eragrostis. The presence of Tribulus, Boerhavia, Portulacae, Ipomoea, Wild Cucumber, and Coconut appeared to be independent of nest site selection; their presence appeared to be just a matter of chance where the nest description was taken.

Eragrostis is the primary material used by Common Noddies for nesting material, with other materials depending primarily on the closeness of the material to the nest site. If Scaevola is within three feet, then leaves are used. In most other cases if a plant is within three feet, then this material is used for nesting material.

Data from this study are given in Table 2. Egg measurements for this species are given in Table 6.

White-capped Noddy

Nesting was primarily in the Casurina clump, but with nesting in

several other areas in Scaevola. I checked in the Casurina tree behind camp and found 38 nests. Of the 38 nests there were 19 with large downy chicks, 13 with medium downy chicks, 6 with small downy chicks, and none with eggs. At night large numbers of birds come to the island to roost, but show no sign of attempting to nest. These roosters sit around on Scaevola, coming to the island after dark and leaving at first light. Some sit on the island during daytime. There were flying immatures, from this year, on the island.

White Tern

There were breeding birds, with all stages from eggs to flying young, found nesting in Scaevola and on rocks. Population estimates would be only a guess.

Blue-gray Noddy (Procelsterna cerules)

On the night of 11 June I saw one small tern. I realized it was probably a subadult Blue-gray Noddy. Perhaps this was an island record.

Laysan Teal

This species was seen all over the island. Heaviest concentrations were found at the southeast corner of the lagoon. I checked the lagoon area on two separate nights looking for small ducklings, but did not find any. Very few birds were seen during the daylight hours. No actual survey of the population was made, so population estimates are merely drawn from past surveys.

Laysan Finch

Concentrations of finches varied over the island, quite often the heaviest concentrations were found near Sooty Tern nesting colonies. Finch predation on eggs was observed several times. An adult tern would leave its egg and within a minute a finch would have a hole in the egg. In tern nesting areas where Eragrostis clumps were near maximum density, finch predation was the heaviest. There were areas where finch mortality was 100 percent for the 40 or 50 eggs in the area. The heaviest finch mortality was along the east side.

All stages of nesting were present. I found nests with eggs and observed flying immatures being fed by parents.

Diagram # 1. Sooty Tern nesting areas. Areas are not drawn to scale, but represent approximate areas utilized for nesting. Dennis Stadel

TABLE [illegible]. Laysan and Black-footed Albatross culmen measurements - Laysan Island. (Taken by Dave Burckhalter and Dennis Stadel)

Laysan Albatross

97.5	104.5	104.0	99.0	105.6
95.3	109.7	111.5	103.4	106.0
105.3	101.1	104.1	109.3	98.4
104.5	92.0	102.8	102.0	100.7
103.2	98.9	99.9	105.3	109.9
108.7	103.1	112.0	102.1	90.4

Black-footed Albatross

102.1	104.1	104.0	101.4	107.4
101.0	108.8	95.2	104.6	97.3
94.7	99.7	108.7	100.7	105.1
102.9	105.7	106.0	106.4	95.4
103.5	98.1	100.7	104.5	103.0
99.9	97.4	97.9	100.1	106.7

TABLE 2. Plant association and nesting material studies for Common Noddy - Laysan Island. (Data collected by D. L. Slade.)

Nest is Under this Plant	Plants within 3 ft.								Nesting material				
	Scaevola	Eragrostis	Tribulus	Boerhavia	Portulacaa	Ipomoea	Cucumber	Coconut	Eragrostis	Scaevola	Bones	Tribulus	Ipomoea
Scaevola	x	x							x	x			
Eragrostis	x	x							x	x			
Scaevola	x	x							x	x			
Scaevola	x								x	x			
Scaevola	x								x	x			
Scaevola	x								x	x			
Scaevola	x								x	x			
Eragrostus		x			x				-	-	-	-	-
Eragrostis		x			x				x		x		
Eragrostus		x			x						x	x	
Eragrostis		x			x				x			x	
Eragrostus		x	x			x			x			x	
Eragrostis		x		x		x			x		x		
Eragrostis		x					x		x				
Eragrostis		x		x		x			x				x
Eragrostus		x	x						x				
Coconut			x					x				x	
Eragrostis		x							x		x	x	
Scaevola	x	x		x					x	x			
Eragrostus		x	x	x					x				
On top of Eragrostis	x	x				x			x	x			x
" " " "		x							x				
Eragrostus		x	x	x					x	x			
Eragrostus		x	x	x					x				
On top of Eragrostis	x	x							x				x
Eragrostis	x	x					x		x				x
Eragrostis	x	x						x	x				
On top of Eragrostis	x	x	x	x		x							x
" " " "		x	x						x				
Eragrostis		x		x					x		x		

TABLE 3. Population estimates for Laysan Island. Sooty Tern estimates for June 9; all other estimates for June 12. (Estimates by Dennis L. Stadel.)

Species	Nests	Adults and Subadults	Rel. Class
Laysan Albatross	25,000	200,000*	C
Black-footed Albatross	10,000	80,000*	C
Wedge-tailed Shearwater	10,000	1,000,000	E
Christmas Shearwater	2,000	6,000	F
Bonin Island Petrel	50,000	10,000	F
Bulwers Petrel	5,000	20,000	E
Sooty Storm Petrel	10±	0	E
Red-tailed Tropicbird	1,000	4,000*	E
Blue-faced Booby	300	2,000	C
Brown Booby	5	50	C
Red-footed Booby	200	1,500	C
Great Frigatebird	1,400	8,000	C
Golden Plover	0	300	D
Ruddy Turnstone	0	300	D
Bristle-thighed Curlew	0	20	D
Wandering Tattler	0	20	D
Sooty Tern	257,000	1,543,000	C
Gray-backed Tern	10,000	40,000	D
Common Noddy Tern	10,000	40,000	D
White-capped Tern	100	5,000	D
White Tern	200	1,000	D
Blue-grey Noddy Tern	0	1	A
Laysan Teal	??	300	D
Laysan Finch	??	10,000	F

* Represents estimate for the total population and not birds on the island during our visit.

TABLE 4. Red-footed Booby egg measurements - Laysan Island.
(Taken by F. Christian Thompson and Dennis Stadel)

Length	Width	Length	Width
56.9	41.4	66.3	41.9
58.2	41.7	59.9	37.1
65.4	42.4	64.6	40.2
64.7	41.1	58.8	41.3
62.1	49.8	66.5	41.6
61.0	41.1	61.8	43.0
67.9	40.3	61.7	40.1
58.1	39.4	66.1	43.2
61.3	41.4	63.0	40.0

TABLE 5. Great Frigatebird egg measurements - Laysan Island.
(Taken by F. Christian Thompson and Dennis Stadel)

Length	Width	Length	Width
69.6	47.3	70.7	46.5
69.2	48.5	78.4	43.1
68.0	47.7	73.9	47.6
59.3	49.9	68.2	47.0
72.7	50.9	68.9	47.4
69.3	48.5	66.9	45.6
71.4	47.6	70.7	48.6
72.3	48.1	70.9	49.5
74.1	49.2	65.9	44.9
79.0	45.8	71.5	47.4
56.2	46.9	67.7	47.5
54.1	48.3	72.3	47.1
68.2	47.3	70.1	48.5
67.8	47.9	69.8	50.9
68.3	48.4		

TABLE 6. Common Noddy egg measurements - Bryan Island.
(Taken by F. Christian Thompson and Dennis Stadel)

Length	Width	Length	Width
55.0	37.7	51.4	36.0
55.4	36.4	53.5	35.9
50.4	36.0	54.5	37.0
53.9	35.9	50.6	35.5
52.1	34.7	54.6	35.9
54.1	37.4	53.5	36.7
53.9	38.7	54.2	36.7
55.1	35.1	51.4	36.3
52.5	36.0	53.0	36.4
52.7	38.0	56.8	37.3
53.9	38.9	52.5	34.4
54.9	36.3	51.4	36.5
51.9	37.0	52.7	36.5
52.7	37.2	50.9	35.1
56.5	37.7	52.5	37.3
52.5	36.3		