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Breeding Biology of the Black Storm-Petrel at Islas Los Coronados, Baja California, Mexico

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San Diego

Breeding Biology of the Black Storm-Petrel at Islas Los Coronados, Baja California, Mexico

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Marine Science

by

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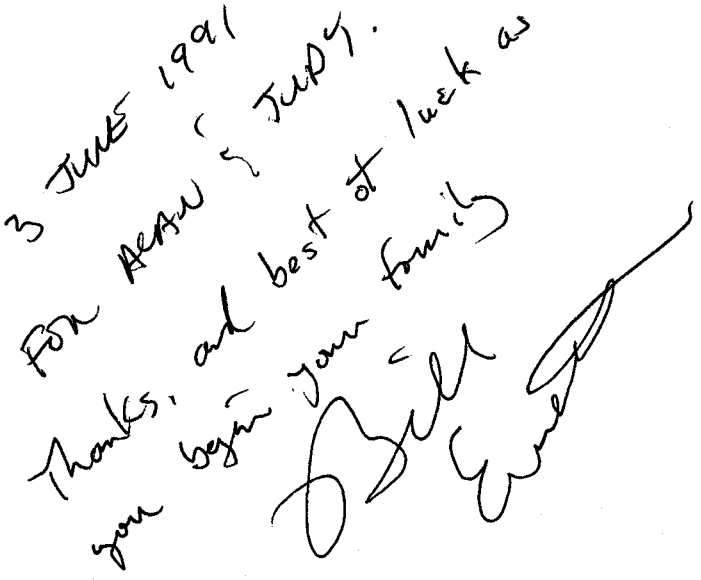
3 June 1991
For Aegis & Judy.
Thanks, and best of luck as
you begin your family

DEDICATION

This thesis is dedicated to my mother, Dorothy Everett, for giving me a lifetime of encouragement and inspiration, and to my mentor and coach Dr. Richard Casey, for his steadfast support and for helping make this dream become a reality.

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INTRODUCTION

The Black Storm-Petrel, *Oceanodroma melania* (Bonaparte) is a highly pelagic species of the avian seabird order Procellariiformes. It is one of the largest of the 20 Storm-Petrel species of the family Oceanitidae. The Black Storm-Petrel is endemic to the Eastern Pacific Ocean, occurring at sea from Central California south to coastal waters off Ecuador and Peru, rarely wandering more than several hundred miles offshore (Murphy 1936, AOU 1983, Pitman 1986).

Black Storm-Petrels breed exclusively on islands. They are abundant breeders at many locations within the Gulf of California, and are known to breed off the Pacific coast of Baja California, Mexico, at two locations: Islas San Benito and Islas Los Coronados (Grinnell 1928, Everett and Anderson 1991). Outside of the boundaries of Mexico, the only known breeding locale is a small colony at Sutil Island, a tiny islet adjacent to Santa Barbara Island in the Southern California Bight (Pitman and Speich 1976).

Of the 20 extant species of Storm-Petrels, fairly detailed life-history information is available for Wilson's Storm-Petrel *Oceanites oceanicus* (Roberts

1940, Mougin 1968, Beck and Brown 1971, Lacan 1971), Leach's Storm-Petrel *Oceanodroma leucorhoa* (Gross 1935, Wilbur 1969, Abe et al. 1972, Ainley et al. 1974, Harris 1974, Morse and Buchheister 1979, Watanuki 1985, Vermeer et al. 1988, Ainley et al. 1990), British Storm-Petrel *Hydrobates pelagicus* (Lockley 1932, Ainslie and Atkinson 1937, Davis 1957), Fork-tailed Storm-Petrel *Oceanodroma furcata* (Harris 1974, Boersma et al. 1980, Simons 1981, Vermeer et al. 1988), Ashy Storm-Petrel *O. homochroa* (Ainley et al. 1974; 1990), Band-rumped Storm Petrel *O. castro* (Allan 1962, Harris 1969), Wedge-rumped Storm-Petrel *O. tethys* (Harris 1969), White-faced Storm-Petrel *Pelagodroma marina* (Richdale 1965, Gillham 1963, Brothers 1981), Black-bellied Storm-Petrel *Fregetta tropica* (Beck and Brown 1971), and the Grey-backed Storm-Petrel *Garrodia nereis* (Plant 1989).

OBJECTIVES

This study was undertaken to provide new information on several aspects of the breeding biology and natural history of the Black Storm-Petrel. Primary objectives included elucidation of breeding phenology: timing of colony attendance by adults, egg-laying, hatching, and fledging of chicks. Data was also sought

on nest site tenacity and retention of pair bonds. In addition, details were recorded on nest site selection, interspecific competition, breeding success, chick growth and plumage development, adult morphometrics and molt, food items, vocalizations, and ectoparasites.

HISTORICAL INFORMATION

The scant available information on the breeding habits of the Black Storm-Petrel is found primarily in literature from the 1890's and the first two decades of this century. These mostly anecdotal accounts are based on infrequent collecting visits to breeding colonies and focus on descriptions of nest sites, eggs, and chicks. These reports are summarized as follows:

The breeding grounds of the Black Storm-Petrel were first confirmed in July 1896, when pioneer Baja California ornithologist A. W. Anthony, after several unsuccessful attempts, found two adults on fresh eggs in a rock crevice at Islas Los Coronados (Anthony 1898). Two weeks later he discovered another colony at Islas San Benito, about 400 miles south of the Coronados (Anthony 1896, 1900). He described the eggs and provided sparse details on the nesting colonies and nests. He revisited the Benito Islands in early

September of the same year and noted that many chicks had not yet fledged, and that some adults were still incubating eggs.

On 6 August 1902 Joseph Grinnell (Grinnell and Daggett 1903) spent two days on Islas Los Coronados, collected 4 adults with eggs, and reported breeding on both Middle Rock and North Island. Like Anthony, they described the eggs and provided egg measurements. The Revillagigedo Islands Expedition of the California Academy of Sciences stopped at Islas San Benito on 6 May 1903 and found many Black Storm-Petrels on nests (Loomis 1918). The Academy's Galapagos Expedition also visited the Benitos in 1905, but then found only adults without eggs or chicks (Loomis 1918). During the next 15 years, numerous egg collectors visited Islas Los Coronados (L. Kiff, pers. comm.), but only a few developed an interest in Storm-Petrels and published information from their observations. Pingree Osburn (1911) was the first to realize Black Storm-Petrels laid their eggs earlier in the year than the Leach's Storm-Petrels also nesting on the islands. A. J. van Rossem and A. B. Howell made periodic trips to the Coronados between 1907 and 1915. Nest sites and downy plumages of chicks were subsequently described by van Rossem (1915), and Howell (1917), who in addition gave

a rough outline of nesting phenology. Howell (in Bent 1922) also correctly ascertained that Black Storm-Petrels rarely occupy their burrows during the daytime before the egg is laid.

During the 1920's it was learned that Black Storm-Petrels bred at many locations within the Gulf of California (Grinnell 1928, and references cited therein), but few details other than incidental observations were reported.

It was not until the 1970's that another account of Black Storm-Petrel breeding biology appeared in the literature. In 1968 personnel from the Smithsonian Institution's Pacific Ocean Biological Survey Program (POBSP) paid two brief visits each to Islas San Benitos and Islas Los Coronados (Crossin 1974). They commented on nightly arrival and departure patterns of birds at the breeding colonies, noted brood patch condition of birds caught in mist nets, described two vocalizations, and estimated the San Benito population at 10,000+ birds.

In light of the meager information available on this species, a concerted effort to conduct a study over an extended period seemed warranted. With this in

mind, I began in Fall 1987 seeking permission from various Mexican governmental agencies to land on Islas Los Coronados and undertake a research project. All the necessary approvals were obtained in time to initiate the study in early 1989.

THE ISLANDS

Islas Los Coronados consist of three islands and an islet located approximately 35 kilometers (km) south of San Diego, California, and 13 km west of the coast of Baja California, Mexico (Figures 1 and 2). They lie five kilometers south of the United States/Mexico border, and belong to the Mexican Government.

The largest member of the group is South Island, which is 3.6 km long and 0.6 km wide at the widest point. It reaches a maximum elevation of 205 meters. The terrain is characterized by steep, unstable slopes. A sheltered cove on the northeast corner of the island provides a landing for a lighthouse keeper, his family and a small (usually less than 8) garrison of Mexican Marines. Up to 15 transient fishermen often inhabit a few shacks built into the cliffs of the cove. The residents have introduced and maintain burros, goats, pigs, chickens, cats and dogs. These introductions have

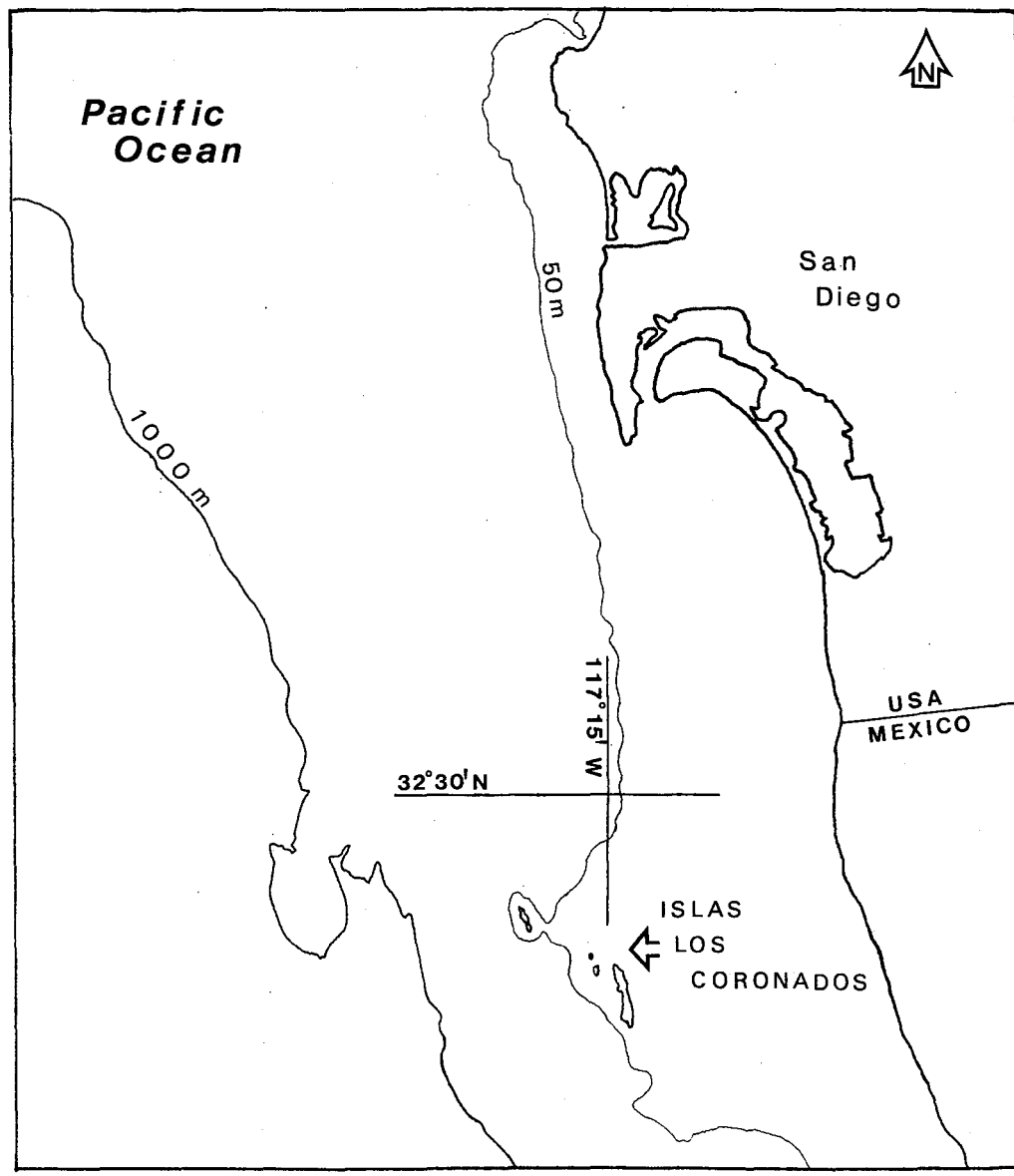


Figure 1. Position of Islas Los Coronados relative to nearby mainland.

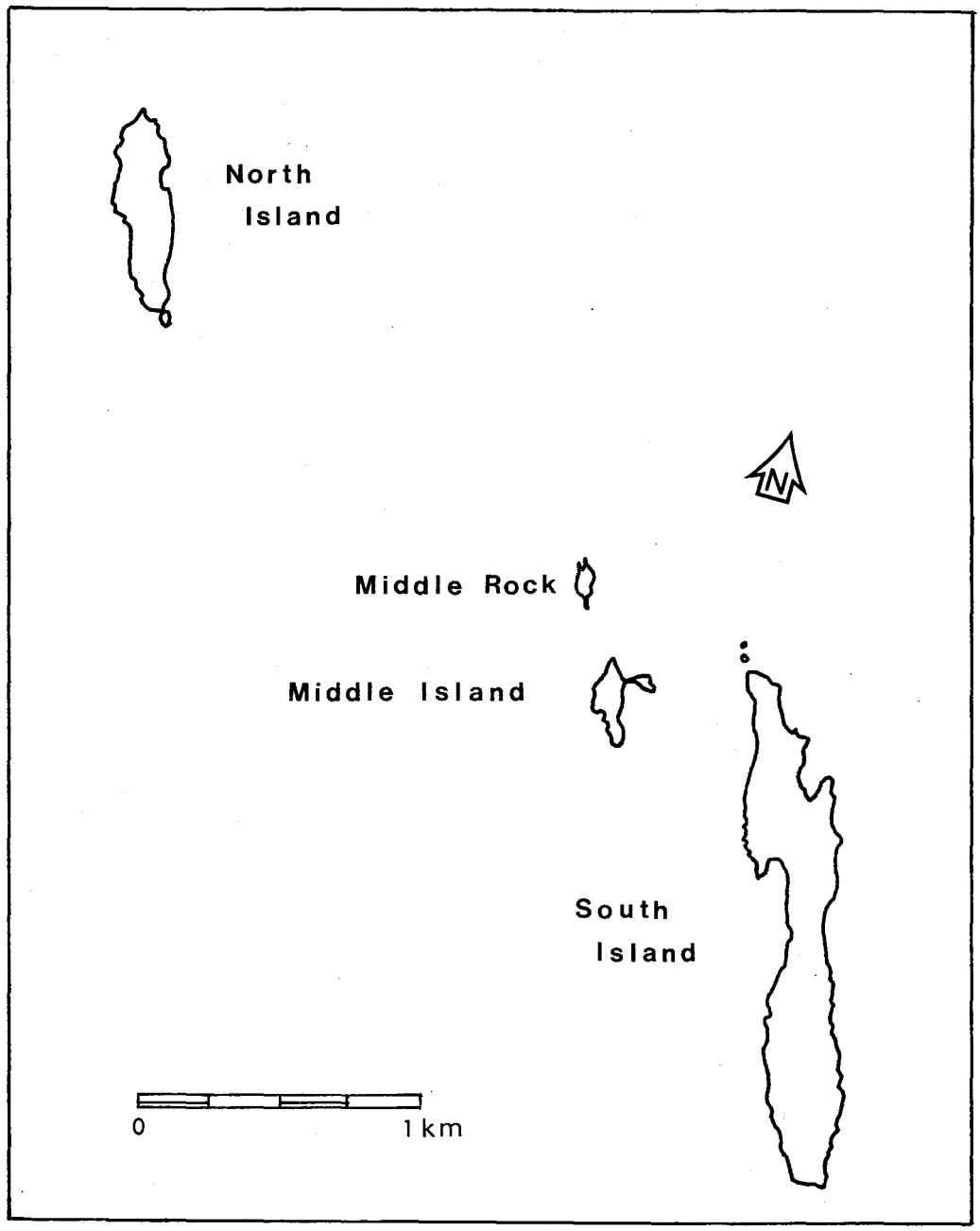


Figure 2. Islas Los Coronados.

resulted in a predictable degradation of the native fauna and flora on the island.

North Island is the second largest of the group, 1.3 km long and slightly more than 0.3 km wide at the widest point. The maximum elevation is 145 meters. Although the ridge of the island is broader than that of South Island, the slopes of North Island are equally sheer. There has in recent history never been a permanent habitation on North Island, but a small cove near the northeast corner the island was the site of a small fisherman's camp until the mid-1980's. Sometime during the last 10-20 years cats were released on the island, and have subsequently established a feral population. The carcasses of hundreds of nesting seabirds, particularly Storm-Petrels and Xantus' Murrelets, were observed during the course of this study. Freshly killed birds were noted on virtually every visit to North island during the breeding season.

Between the north and south islands lies L-shaped Middle Island, rising abruptly to a maximum elevation of 76 meters. The island protects a small cove from the prevailing northwest swell. Due to its extremely rugged terrain, it is rarely landed upon, even by transient fishermen. Middle Rock, the smallest island in Islas

Los Coronados and the site of this study, is described in detail later in this paper.

Climate

Islas Los Coronados lie in an arid Mediterranean maritime climatic provence. Rainfall averages about 35 centimeters a year. Cycles of wet and dry years are common. The surrounding ocean tends to moderate temperatures, and much of the year is characterized by early morning low clouds or fog, clearing in the afternoons as offshore winds develop.

Vegetation

Vegetation of the islands is typical Maritime Sage Scrub (Thorne 1976). Each individual island, however, has different vegetation characteristics resulting from slightly varying soils, topography, and levels of disturbance. Numerous microhabitats occur on the islands. The flora of the islands includes 109 vascular plant species (T. Oberbauer, pers. comm.), 2 of which are endemic. Introduced grasses and salt tolerant plants such as *Gasoul crystallinum* are common. Dominant plant species include *Haplopappus berberidus, Atriplex canescens, A. californica, Encelia californica, Opuntia*

prolifera, O. littoralis, Stephanomeria diegensis, Chenopodium murale, Eriogonum fasciculatum, and *Dudleya candida*.

Additional information on the geography and biogeography of the islands can be found in Nelson (1921), Ellsberg (1970), Bostic (1975), and Kuper and Hart (1978).

Marine Environment

The climate, flora, and fauna of Islas Los Coronados are greatly influenced by the surrounding marine environment. The dominating feature of the region is the California Current, which transports cold water from the Gulf of Alaska south along the west coast of North America (Sverdrup et al. 1942, Hickey 1979). As the current passes Point Conception (35° N) a gyre is often generated over the continental shelf, resulting in near-shore eddies and a northern counter-current bringing warmer water from Mexico into the Southern California Bight. The strength of this effect is enhanced in winter by the rise of the north-flowing Davidson Current. Surface water temperatures off southern California generally range between 14-20° C, salinity from 33.3-33.6 ppt, and dissolved oxygen from

about 4.5 to 7.0 ml/l (Bakus 1989).

The complex interaction of this series of currents, in concert with strong seasonal offshore winds, results in periodic upwellings of nutrient-rich waters typical of western boundary currents (Sverdrup et al. 1942, Emery 1960, Bakun and Nelson 1977). The pattern of Spring (and to a lesser extent Fall) upwellings fuels often substantial phytoplankton blooms in the region (Owen 1974). These, in turn, spawn a particularly diverse and abundant zooplankton fauna. Dominant taxa include numerous copepods, amphipods, and euphausiids. Peak abundance of zooplankton in surface waters occurs in Spring and Summer (Bakus 1989).

The net result of these productive systems is an environment well-suited for marine birds, and typical of areas heavily exploited by Storm-Petrels (Brown 1988). Details of both migratory and resident seabird occupation and exploitation of California waters are summarized by Ainley (1976), Briggs et al. (1987), Ainley and Boekelheide (1990), and Ainley and Hunt (1991). A summary of the status and distribution of the breeding seabirds of Baja California can be found in Everett and Anderson (1991).

STUDY SITE

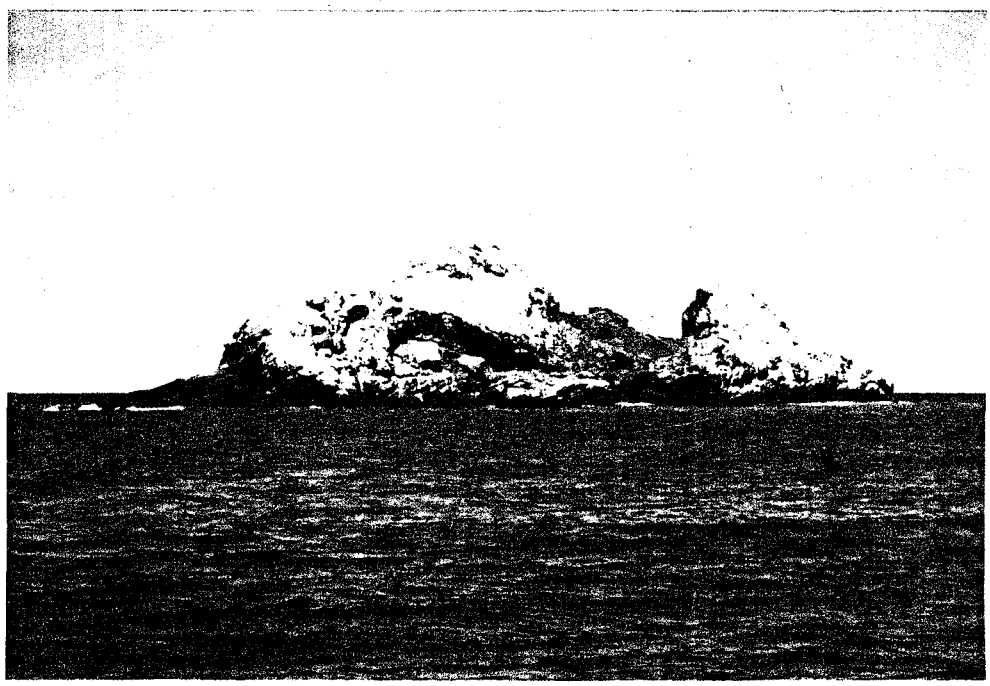
Middle Rock of Los Islas Coronados was selected as the best site for this study for several reasons: Both North and South Islands have populations of feral cats that prey on Storm-Petrels. Colony dynamics and breeding biology at these locations would thus not reflect normal conditions. Middle Island is too precipitous, and the soil too unstable, to allow safe regular visitation. Also, because of the treacherous terrain, many of the Storm-Petrel breeding sites on the island could be unreachable. In addition, Middle Island hosts a large breeding population of Brown Pelicans, which are easily disturbed by the presence of humans and would likely desert their nests in the event of regular intrusions.

Middle Rock met the criteria of being free of introduced predators, most of the island and nest sites were accessible, landings could be made with relative ease, a site suitable for overnight camping and studies was available, and sufficient numbers of breeding Black Storm-Petrels were present.

Middle Rock (Figure 3) is approximately 150 meters long and 32 meters high at the maximum elevation.

Figure 3. Middle Rock looking from east to west.

Figure 4. Entrance to nest site and identifying marker.




8545

Parallel northwest-southeast running steep ridges shelter a collapsed central area about 40 meters across. The west-facing slope of this central area, exposed to the prevailing wind, consists of large boulders. The east-facing segment of the formation is an amphitheater-like basin made up of loose, powdery soil. Adjacent to this is a bouldery grotto that resulted from erosion and undermining of the east rim of the central basin. An arch over the east edge of the grotto remains in place. The island consists entirely of reddish brown sandstone and conglomerate formations (Lamb 1978). The sandstone contains grains of quartz, feldspar, and rock fragments. Most clasts within the conglomerate are in the range of 3-10 centimeters in diameter, and are typically comprised of rhyolite, dacite, andesite, and basalt. The conglomerates appear to have been formed in the Middle Miocene (Lamb 1978). The relentless excavations of many thousands of generations of subterranean nesting seabirds have undoubtedly contributed substantially to the high state of decay and erosion of much of the island.

Most of Middle Rock is covered with guano and is devoid of vegetation. Sufficient soil has accumulated on the upper south-facing slope of the south ridge to provide substrate for a small patch of vegetation

including *Coreopsis, Dudleya, Stephanomeria diegensis, Lycium californicum, Opuntia prolifera*, and *O. littoralis*. The soft soils of the amphitheater contain *Malva parviflora, Hordeum leporinum, Gasoul crystallinum*, and a few examples of *Salsola kali*. The introduced plant *Chenopodium murale* is one of the commonest species on the island, but nowhere forms continuous cover.

Several other species of seabirds use Middle Rock as a roosting or nesting site. Brown Pelicans, Brandt's Cormorants *Phalacrocorax penicillatus*, Double-crested Cormorants *P. auritus*, Pelagic Cormorants *P. pelagicus*, Western Gulls *Larus occidentalis*, and Heermann's Gulls *L. heermanni* all roost on the guano-covered slopes. Of these surface nesting species, only Brown Pelicans, Pelagic Cormorants, and Western Gulls were recorded breeding on Middle Rock during the course of the study. Eleven pairs of Brown Pelicans nested in the amphitheater area during the 1989 season, fledging an estimated 12 offspring. Although it is a common breeder on other islands of Islas Los Coronados, this is the first instance the species has been reported breeding on Middle Rock (Gress et al. 1990). Two pairs of Pelagic Cormorants nested on sheer south-facing cliffs during the 1990 season. Their breeding success is

unknown. Western Gulls are regular breeders, with 30-50 pairs breeding during the 1989 season, and approximately 25 nests recorded during 1990. Gull reproductive success for both years was low, with an estimated 8-10 chicks fledged each year.

Xantus' Murrelets *Synthliboramphus hypoleucus*, Cassin's Auklets *Ptychoramphus aleuticus*, and Leach's Storm-Petrels all nest on Middle Rock in habitat overlapping, and in some cases identical, to that of Black Storm-Petrels. I estimate that fewer than 10 pairs of Cassin's Auklets, and from 20-30 pairs of Xantus' Murrelets, breed annually on the island. Leach's Storm-Petrels are more difficult to estimate due to their deep-burrowing habits, but 50-100 pairs probably constitutes the average annual breeding population. The interactions of these species with the Black Storm-Petrels, insofar as their known and probable effects on the latter's breeding biology, are briefly addressed later in this paper.

METHODS

Nest Sites

I made a total of 29 visits to Middle Rock between

March 1989 and September 1990, 10 of which involved staying overnight on the island (Table 1). The first 4 visits were primarily exploratory, seeking and investigating potential Black Storm-Petrel nesting sites. Guided by information given in the literature, I inspected likely sites with the aid of a flashlight. During these early visits only the north and east-facing sides of the island were checked. The areas checked were limited in order to minimize disturbance to a small nesting colony of Brown Pelicans (*Pelecanus occidentalis*) located in the center of the island. By 3 June 1989 the pelican chicks were large enough to allow more extensive investigation on the island without the risk of predation by gulls.

As occupied Black Storm-Petrel nest sites were discovered, I marked the entrances for future reference with livestock eartags. The 45 x 15 millimeter tags (Figure 4) were white with embossed black lettering, and were affixed to the rocks with a permanent toluene-based adhesive (Household Goop). Each tag had a four-digit number. The first number issued was 8501, and successive consecutive numbers were assigned as new sites were discovered. The location of each site was then plotted on a map of the island (Figure 5). Numbers were assigned to a site only when an adult bird or a

TABLE 1. SCHEDULE OF RESEARCH VISITS TO ISLAS LOS CORONADOS.

Asterisks indicate overnight visits to the islands where mist nets were deployed.

1.	11 MAR 89	16.	22 APR 90
2.	8 APR 89	17.	6 MAY 90
3.	15 APR 89	18.	12-13 MAY 90 *
4.	8 MAY 89	19.	19-20 MAY 90 *
5.	13 MAY 89	20.	29-30 MAY 90
6.	3-4 JUN 89 *	21.	14 JUN 90
7.	10 JUN 89	22.	23 JUN 90
8.	24-25 JUN 89 *	23.	14-15 JUL 90 *
9.	2 JUL 89	24.	23 JUL 90
10.	22 JUL 89	25.	28-29 JUL 90 *
11.	14 AUG 89	26.	7 AUG 90
12.	27-28 AUG 89 *	27.	26 AUG 90
13.	1 OCT 89	28.	13 SEP 90
14.	10-11 FEB 90 *	29.	22-23 SEP 90 *
15.	24-25 MAR 90 *		

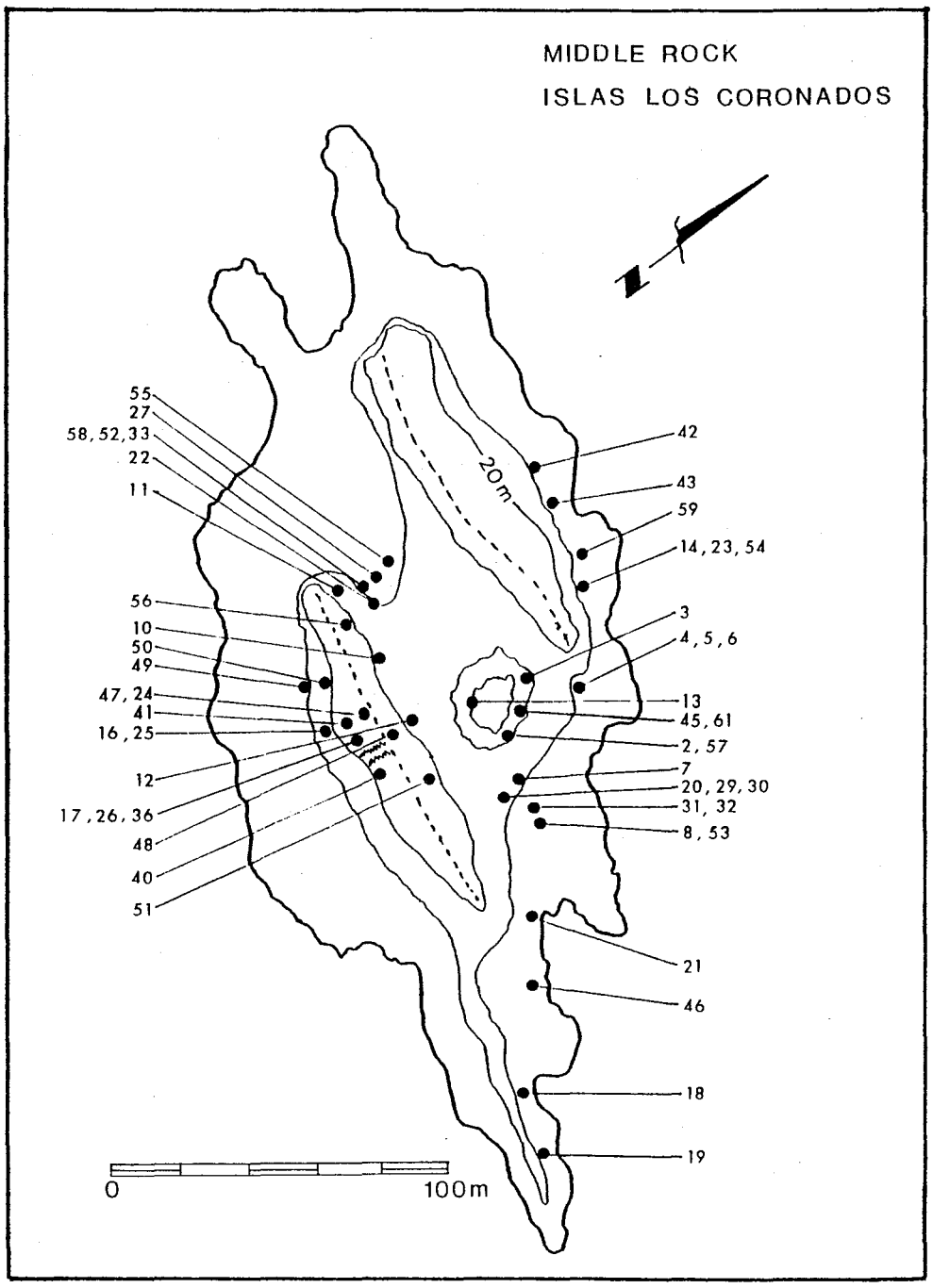


Figure 5. Locations of study nest sites.

chick was present and could be captured. During the course of the 1989 breeding season 39 Black Storm-Petrel sites were identified and marked. In addition, several numbers from the series were assigned to nests of Leach's Storm-Petrels. Data pertaining to this species will be presented elsewhere.

Most birds were accessible within arm's length, but some could be captured only with the aid of a device fashioned from an extendable automobile antenna with a bent fork attached to the end. This was not always effective, however, and for the 1990 season a new implement was fashioned which allowed birds to be grabbed by means of a retractable hook. This device proved to be highly effective, and by carefully attaching the hook around the tarsometatarsus, birds could be gently extracted for examination. With this newer technology, an additional 9 sites were studied during the 1990 season, and more data were acquired from previously studied sites. Similar devices have proven useful in other studies of burrow-nesting species (Lockley and Russell 1953).

As birds were found in nest sites, individually numbered bands (U.S. Fish and Wildlife Service aluminum butt-end, Size 1-A) were placed on the right

tarsometatarsus of each bird. Various data on adult birds (e.g. weight, molt, condition of brood patch) were recorded. Eggs were occasionally weighed and measured. All numbered nest sites were examined during each visit to the island, and the status and activities of occupants (or the lack thereof) were noted. On most overnight visits the nests were checked and data recorded on both days. During the 1989 season 268 nest checks were recorded. In 1990 824 records were made, the total for both seasons being 1,092. As chicks hatched and developed, their weights and plumage condition were recorded, along with measurements of the length of the tarsometatarsus, flattened wing, and exposed culmen. Measurements were taken in accordance with procedures given by Baldwin et al. (1931). All weights were taken with Pesola spring scales and recorded to the nearest 0.5 gram. All chicks were banded after the third week of development.

Additional procedures for studies of nests were employed for the 1990 season. In order to determine the rate and timing of nest visitation, a toothpick was placed upright in the entrance of most unoccupied nests at each visit to the island. The toothpick would usually be knocked down as birds entered or left the nest. This technique has been successfully used in

several other studies of storm-petrel breeding biology (Lockley 1932, Wilbur 1969, Abe et al. 1972). Although feasible at most nests, the lack of soft substrate precluded use of this method in a few nests. The primary purpose of the toothpick placement was to provide an indication of whether or not nests previously known to be occupied were being visited throughout the breeding season by presumably non-breeding birds. Only nests that did not contain eggs or chicks were marked in this manner.

Since excessive handling of adults during the incubation stage may have resulted in high nest desertion rates in 1989, this practice was reduced during 1990. Adults were removed from nests only for banding or to record existing band numbers. During 1990 no nest data on adult weight, molt, or brood patch condition were recorded.

As is the case with many Procellariiformes, Black Storm-Petrels occasionally regurgitate stomach oil when disturbed. This fluid sometimes ends up on the bird's feathers. In order to investigate the effects of this phenomenon, the extent of oiling for each adult bird handled during 1990 was recorded on an index scale of 1 to ten, with one signifying no oil on the plumage, and

10 indicating heavily soaked plumage. Subsequent recovery rates for oiled and non-oiled birds will be compared to shed light on this potential problem.

During handling, some adults and chicks regurgitate identifiable food items. Portions of six such regurgitations were collected in 1990, preserved in 70% alcohol, and returned to the laboratory for identification. Weight and volume data on stomach contents were not collected, but some prey items could be identified.

Mist Nets

During all overnight visits to the island, attempts were made to capture Storm-Petrels in mist nets (Black, 7′ x 42′, 50 denier, 2 ply nylon, 4 shelf nets with 1.25 inch mesh). These were deployed in the central amphitheater of the island. Netting effort usually extended from sunset to midnight, with one or two nets deployed. All Storm-Petrels captured were banded, and various data were recorded including band number, weight, molt, condition of brood patch, abnormalities, time of capture, and an index of level of oiling.

Vocalizations

Recordings of Storm-Petrel vocalizations were made during several nights on the island. These include the calls of birds in flight and birds on the ground.

RESULTS AND DISCUSSION

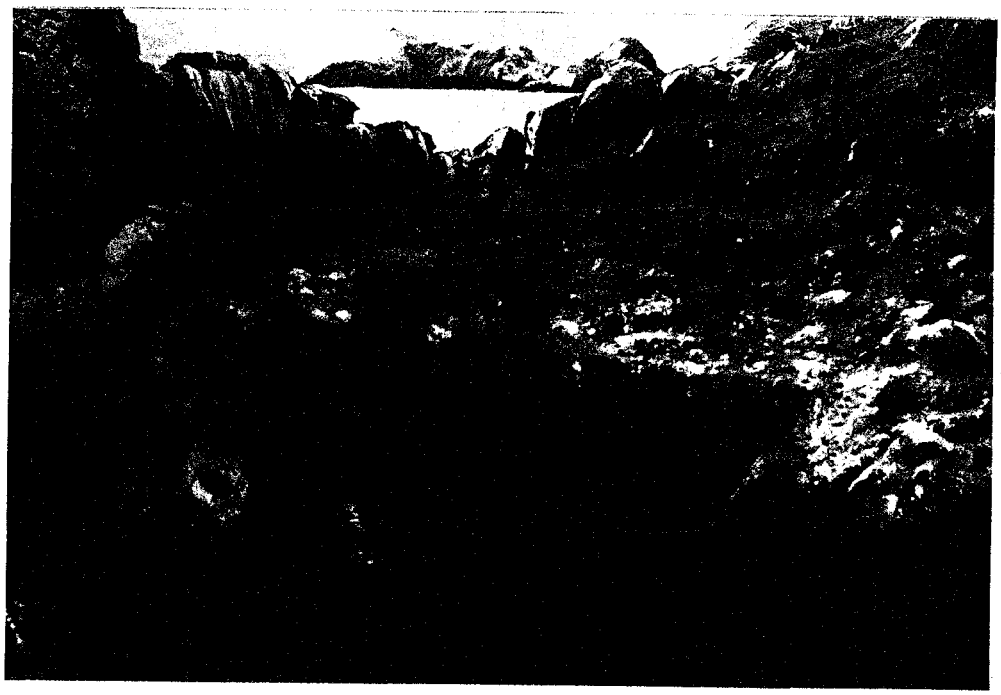
Description of Nesting Sites

On Middle Rock, Black Storm-Petrels are not concentrated in a discrete nesting colony. Nesting sites occur wherever suitable shelter is available, from approximately 3 meters above the high tide line to the top of the island. Since most apparently favorable sites were occupied, there appear to be no preferences for orientation or location of nests based on prevailing wind or other similar environmental factors.

The most typical nest sites are in a crevice, under a large boulder, or in a fissure or crack between slabs of rock (Figures 6 and 7). Of the 48 sites studied, 38 (80%) generally fit this description. Another 10 (20%) sites were located in burrows in the conglomerate or guano. Early visitors to Black-Storm Petrel colonies on Islas Los Coronados and Islas San Benito have suggested

Figure 6. Terrain on Middle Rock inhabited by Black Storm-Petrels.

Figure 7. Terrain on Middle Rock inhabited by Black Storm-Petrels.



that this latter type of site was originally excavated by larger species more capable of such excavation, most likely Cassin's Auklets (Anthony 1896, van Rossem 1915, Howell 1917, Loomis 1918). Considering the densely compacted nature of the conglomerate in which several of these sites are located, and the difficulty for a small bird in excavating such a burrow, this hypothesis seems quite reasonable. In only one case was an adult Black Storm-Petrel, and a chick, found in an entirely soft-soil burrow such as those commonly occupied by Leach's Storm-Petrels in the amphitheater area of the island (Grinnell and Daggett 1903). Although I have no evidence suggesting Black Storm-Petrels dig new sites, the annual deposition of fine soil at the entrances to most nest sites suggests the birds regularly refurbish their nests, removing dirt and debris accumulated before and during the breeding season. Several nest sites were located in clefts in sheer rock walls up to 10 meters above level ground. At these sites, birds would have to alight exactly at the entrance to enter their nests. Individual nests can be isolated, or where habitat is available, located as close together as 50 centimeters. Grouping of several nests in these "condominiums" is not uncommon. The characteristic pungent odor of Storm-Petrels is strong in the vicinity of these nest groupings, even at times of the year when

the birds are absent.

Considering the continuous removal of soil from underneath boulders, it seems inevitable that some sites eventually collapse. The efforts of the birds, combined with other erosive forces such as rain and wind, may cause this to happen fairly regularly. Between the 1989 and 1990 seasons, 3 nest sites were rendered unusable. Two were entirely filled in with soil (#s 8510 and 8512), and one (# 8513) disappeared because a large block of boulders and soil, perhaps 2 cubic meters, collapsed and slid down a slope.

The nest itself (the exact location where the egg is deposited) is often positioned such that it receives only a small amount of indirect light. The nest is also often located out of direct view from the entrance to the crevice or hole. In these cases nest occupation can only be confirmed by use of a small mirror or by feel. Eggs are sometimes deposited as close as 20 centimeters to the entrance, but placement at arm's length or beyond is more typical. No nesting material was used by birds in this study, the egg being deposited on bare ground.

Population Estimate

Precisely determining the number of breeding pairs of Black Storm-Petrels on Middle Rock is problematic. Plot and transect extrapolation methods for estimating nest density (Savard and Smith 1985) are effective only in larger areas with more uniform habitat. Mark-recapture analysis of birds caught in mist nets are biased by the presence of large numbers of non-breeding birds, and further complicated by the likelihood of the nets not randomly sampling the island's population as a whole (Furness and Baillie 1981, Copestake et al. 1988). A direct count of burrows is also imprecise, because nests may or may not be occupied, or could in some cases be occupied by other species. Forty-eight known Black Storm-Petrel nesting sites were identified and their status monitored during the course of this study. Approximately 15 additional inhabited sites were located, but were not included in the study because the occupants were not accessible or even entirely visible. During the course of the study, especially during periods when incubating adults or chicks would be present, careful searches were made throughout the island by teams of up to four persons. As late in the study as the 21st visit new sites were being found, but it is unlikely that numerous additional sites remain

undiscovered. From counts of fresh storm-petrel tracks and strong odors at additional likely nest-site entrances, the breeding population on Middle Rock appears to be about 100 pairs.

Pre-egg Stage

Black Storm-Petrels are generally absent from southern California waters during the winter (Briggs et al. 1987). During an overnight stay on Middle Rock on 10 February 1990, I heard no Storm-Petrels calling and caught none in a mist net. Burrows occupied the previous season showed no signs of recent occupation. Spider webs were spun across the entrances to many nest sites. Limited preliminary searches of Middle Rock in mid-March 1989 also failed to produce evidence of nest occupation. In late March 1990, however, a single Black Storm-Petrel, the only one seen or heard, was captured in a mist net. During the February 1990 visit, I placed toothpicks in the entrances to about 10 nest sites. Most of these were knocked down when examined on the next visit, but there is no evidence that they were displaced exclusively by Black Storm-Petrels. The only nests occupied during the late March 1990 visit contained other seabird species. Two Leach's Storm Petrels were found together in a crevice, four were

captured in a mist net, and up to 60 were heard calling throughout the night. In addition, six nests inhabited by Black Storm-Petrels during the previous season were occupied by Xantus' Murrelets incubating eggs, and five Cassin's Auklets were captured in the mist net the same night.

In mid-April 1989 no Black Storm-Petrels were found on Middle Rock, but a fresh carcass was found on nearby North Island. In late April 1990, I found one Black Storm-Petrel, without an egg, on a nest on Middle Rock. During the same visit, a Cassin's Auklet and a Leach's Storm-Petrel with a de-feathering brood patch were found in nest sites occupied during the previous season by Black Storm-Petrels. However, by this date most Xantus' Murrelets had left the island, more of the 1989 Black Storm-Petrel nest sites showed signs of recent renovation, and more toothpicks at nest entrances had been knocked down. Although the toothpick technique is not conclusive, the absence of nest-site prospecting Xantus' Murrelets and Cassin's Auklets from mid-April on suggests that the displacements later in the season were attributable to Black Storm-Petrels. Toothpicks were placed deep in the soil at nest entrances such that it was highly unlikely they would fall over without being dislodged by a bird, and there are no

small mammals on Middle Rock. Figure 8 gives the percentage of dislodged toothpicks of the total placed at Black Storm-Petrel nest sites occupied in 1989 but vacant during the daytime nest checks made throughout the 1990 season. From this, and other evidence presented above, it is apparent that some Black Storm-Petrels begin to make nocturnal visits to the breeding grounds by mid-April.

Prior to egg-laying, the presence of Black Storm-Petrels within nest sites during the daytime was unusual. This corresponds with findings reported in the literature, except the statement of Loomis (1918), who noted that an expedition to Islas San Benitos in early May 1903 found 50 occupied burrows but no eggs, and that "two petrels usually occupied a burrow..." It is not stated specifically that the burrows were dug up by the collectors during the daytime. In addition, there exists the possibility that the writer misidentified the birds, mistaking them for the dark-rumped morph of Leach's Storm-Petrels which are abundant breeders on the islands. Only twice did I record two birds in a nest site (6 May 1990, nest site # 8552; 13 May 1990, nest site # 8514). Throughout the two years of this study, 32 instances (in 19 different nest sites) were recorded of adults without an egg or chick. In 68% of

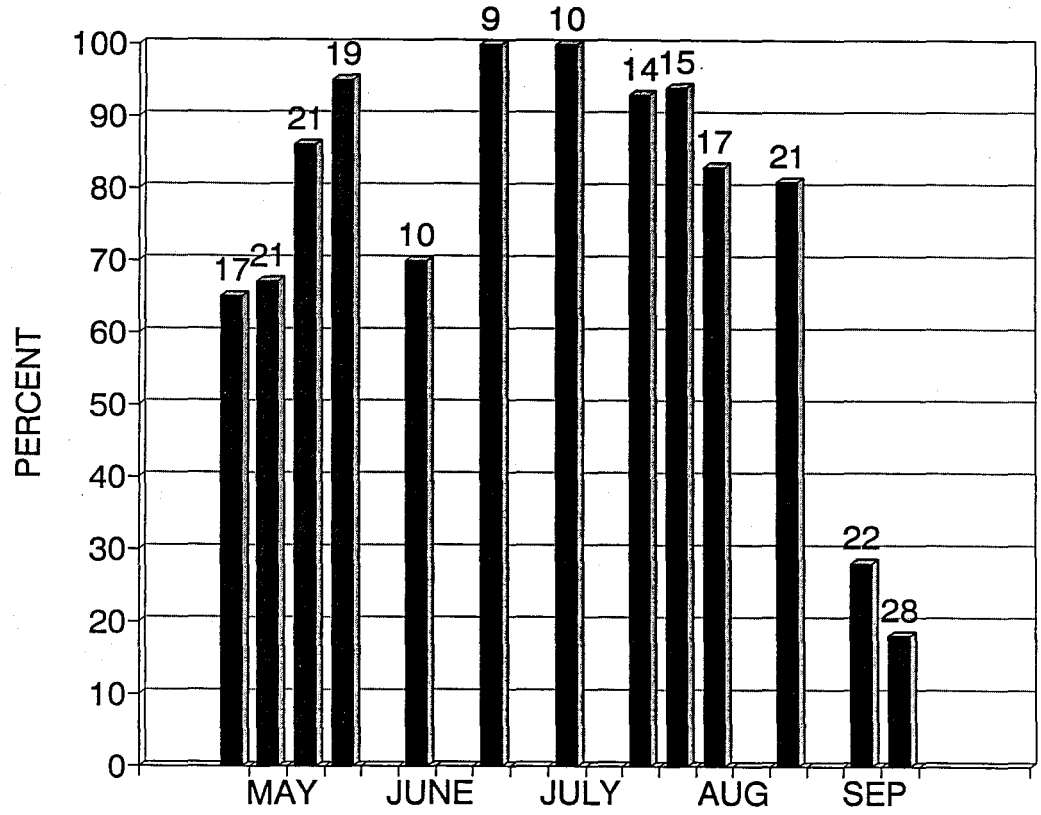


Figure 8. Percentages of dislodged toothpicks of those placed during 1990 season at nest site entrances. Numbers at top of columns indicate sample size from which percentages were taken.

these nests eggs or young were later noted in the nest. The 32 observations (out of 1,092 records) indicates that without an egg or chick in the nest adults are unlikely to remain in the nest during the daytime.

Egg Stage

The first fresh egg during this study, with an adult in attendance, was discovered on 13 May 1989. Likewise, the first eggs of the 1990 season were found on 12 May. Thus it appears the onset of egg-laying begins in the second week of May. Eggs continue to be laid up to the first week of August. Figure 9 indicates the numbers of eggs in the colony recorded during the 1990 study season. The greatest number of eggs were present in study nests during first two weeks of June. As the season progressed, numbers declined as eggs hatched or were broken by adults, or permanently abandoned.

It is common for eggs of many procellariiform birds to be temporarily abandoned for periods up to several days during incubation (Pefaur 1974, Boersma and Wheelwright 1979). Embryos can tolerate limited chilling, and the effect is often to lengthen the incubation period. During this study, there were 18

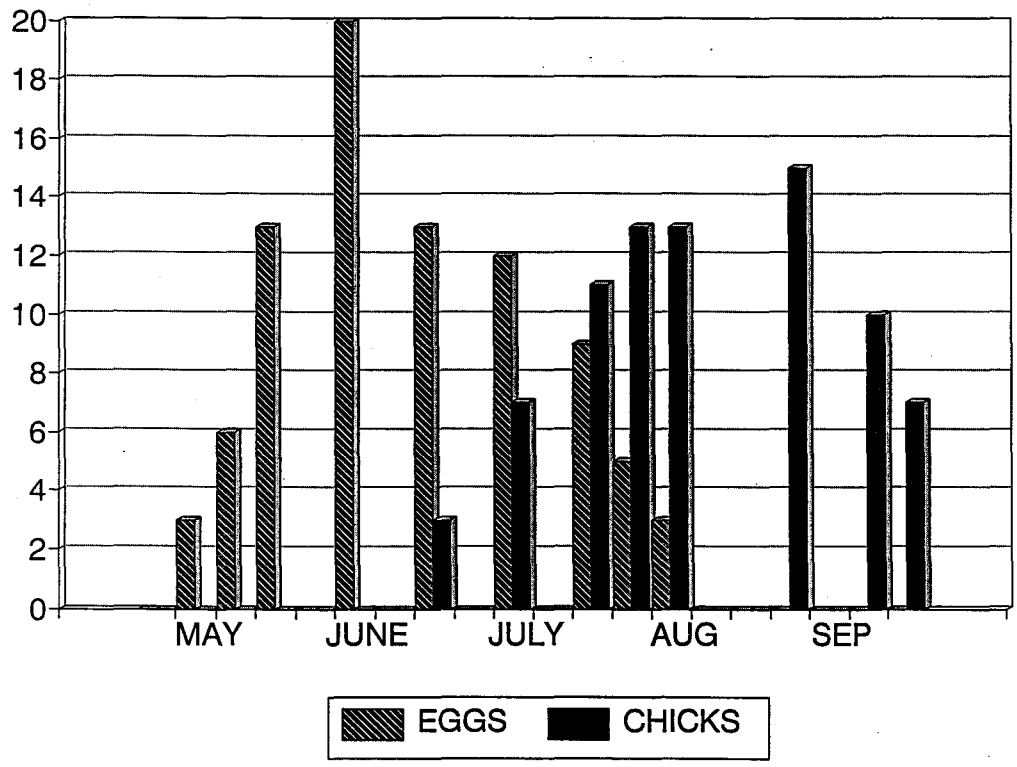


Figure 9. Numbers of eggs and chicks present in the study colony throughout the 1990 season.

cases recorded of neglected eggs in nests. Of these, three eggs were subsequently successfully hatched and a chick fledged, and the others resulted in broken eggs or nest desertions. Although egg neglect normally occurs in the early stages of incubation, in at least one case in this study an egg was neglected during the third week of incubation and successfully hatched.

Although all procellariiform birds lay only one egg per clutch, there is much speculation regarding the ability of Storm-Petrels to lay replacement eggs after an initial failure (Allan 1962, Harris 1969, Wilbur 1969, Beck and Brown 1972, Brothers 1981, Plant 1989). Because nest sites may be visited at night throughout the breeding season by birds other than the nesting pair (as suggested by the toothpick data from this study), documenting relaying is very difficult. It would require direct observation of egg-laying in progress twice by a known bird. Nevertheless, the above cited references provide much circumstantial evidence suggesting this takes place in other storm-petrel species. The question is of sufficient interest to warrant a detailed discussion of the instances of multiple eggs and possible egg replacement by Black Storm-Petrels during this study:

A. In nest # 8504 an egg with attending adult was found on 3 June 1989. The same adult was incubating the egg on 10 June, but on 24 June only a cracked and rotten egg was present. On 2 July two eggs were present (one of them the cracked egg from the previous visit), but no adults. The second egg was never found attended and ultimately rotted. On 14 June 1990, in the same nest, a different adult (unbanded and not captured) was found incubating an egg. This egg was found unattended on 23 June, and two unattended eggs were found on the next check on 14 July. On 23 July an adult (not the 1989 bird, but possibly the bird seen on 14 June 1990) was incubating one of the eggs. Again, both eggs were abandoned and failed to hatch.

B. Nest # 8513 was found to contain an adult with egg on 3 June 1989. On 10 June only a broken egg was present. On 2 July a different adult was again on an egg in the same nest. The second egg also resulted in failure.

C. On 12 May 1990 an adult bird was incubating an egg in nest # 8523. On 29 May the egg was being attended by an adult (Band # 8041-03467) known to have successfully produced a chick in the same burrow in 1989. The following day the egg was unattended, and was found

broken on 14 June. On 23 June the nest was vacant, but on 14 July the other bird of the 1989 pair (Band # 8041-03412) was on the nest incubating an egg. This egg was found broken and abandoned on 28 July, but on 29 July adult 8041-03412 was in the nest site with the broken egg. From that date for the remainder of the 1990 season only the broken egg was found in the nest.

D. On 19 May 1990 an adult (Band # 8041-03433) from the previous season and same nest site was found incubating an egg in nest # 8524. On five successive visits, from 14 June to 23 July, neither egg nor adult was found in the nest. On 28 July the same bird was present again on an egg. A different bird was incubating the egg on 7 August, but for the remainder of the season the egg was not found attended.

E. Nest # 8545 was found to contain an adult incubating an egg on 13 May 1989. On the 3rd and 10th of June the nest appeared empty. The same bird was again found on an egg on 24 June. Subsequent 1989 visits resulted in no further records of eggs or adults in this nest. Because of the configuration of this nest, the possibility exists that an adult moved the original egg out of view, then returned it to its original position at a later date.

F. On 30 May 1990 nest # 8555 contained a fresh egg only. The same egg was present but broken on 14 June. On 14 July an adult was present on a new egg. A different adult was present in the nest on 28 July, but no egg was seen. The same bird was present with an egg on 7 August. This egg was subsequently found broken and abandoned.

These observations are difficult to interpret, but strongly suggest the likelihood of replacement eggs being laid. In no instance were two apparently viable eggs found together in the same nest. In some cases inexperience in egg-handling on the part of the adults, or fighting with intruding Black Storm-Petrels or other species, may have resulted in broken eggs. When efforts were made to catch adults on eggs, they would frequently attempt to elude capture by scurrying to the rear of the nest site or hiding in any available crevice. When handled they would often struggle to escape. Less frequently they would bite, squawk in protest, eject oil or regurgitate food. In their efforts to elude capture, some eggs could have been broken.

During this study there were several instances of eggs being moved within the nest site. Presumably, this

was done by the adults to re-position the egg to a safer, less accessible location. Although some eggs may have been broken as an indirect result of handling of adults, there were cases where broken eggs were found in burrows where the adults had never been handled.

In two cases, both in 1989, three different adults were identified within the same nests. In nest # 8503 the first adult (Band # 8041-03402) was present on 3 June, but no egg was noted. Another adult (Band # 8041-03429) was on an egg on 10 and 24 June. It had gained 3.5 grams between these dates, indicating it had gone to sea and fed at least once in the interim. On 2 July a third adult (Band # 8041-03470) was incubating the egg. On subsequent nest checks only a broken egg was noted. Nest # 8506 contained an adult (Band # 8041-03405) on an egg on 3 June. A different adult (Band # 8041-03427) was on the egg on 10 June, and the third adult (Band # 8041-03439) was on the same egg on 24 June. A chick was successfully fledged from this nest.

Chick Stage

Because visits to the study site were periodic, exact determination of incubation duration was obtained in only two cases, both in 1990. The egg in nest # 8536

hatched in 40 days, and the egg in nest # 8507 hatched in 53 days. In an additional instance (nest # 8516), the exact laying date was known, and the egg was incubated for at least 45 days and not longer than 50 days. In 1990, the mean number of days between first observation of egg and first observation of a chick is 48.2 days (n = 10, sd = 9.19). This suggests that the two known incubation periods may be extremes, within which some variation would be expected.

The first chicks were found during the 1989 season on 24 June (nest #s 8525 and 8536), and the first chicks of the 1990 season on 23 June (nest #s 8536, 8548, and 8557). First hatching, as with the onset of egg laying, occurred at nearly the same dates in both years of the study.

Peak numbers of chicks were present in the 1990 season in late July (Figure 9). Eggs continue to hatch into the second week of August. The latest recorded hatchling in this study was a chick found on 14 August 1989 in nest # 8542 (weight = 17.0 g., tarsus = 15.8 mm). This chick apparently subsequently fledged. Eggs, and adults on eggs, have been previously found as late as early September (Bent 1922). Studies of other procellariiformes have demonstrated that adults will

continue to incubate addled eggs for extended periods (Tickell 1962). In general, eggs laid very late in the season have a poor chance of hatching, and those that do hatch are usually unsuccessful in fledging chicks. Hatching success was 55% in 1989 and 48% in 1990 (Table 2).

Adults typically brood newly-hatched chicks for several days. In only 3 out of 18 instances (16.6 %) were chicks weighing less than 23 grams found in nests with adults not present. No chicks weighing greater than 23 grams were found with adults in attendance.

All procellariiformes produce altricial young that take a relatively long time to develop. Because precise hatching dates were usually not known, determination of age (within a week) for fitting in growth curves was made for most chicks by comparison of tarsus length with chicks of a known age. This was a more accurate approach to age determination than weight differences because it was less likely to be affected by recent feeding or food depravation. Growth curves for chicks in 1990 are presented in Figures 10, 11, 12 and 13, and are summarized as follows:

Weight generally increases rapidly during the first

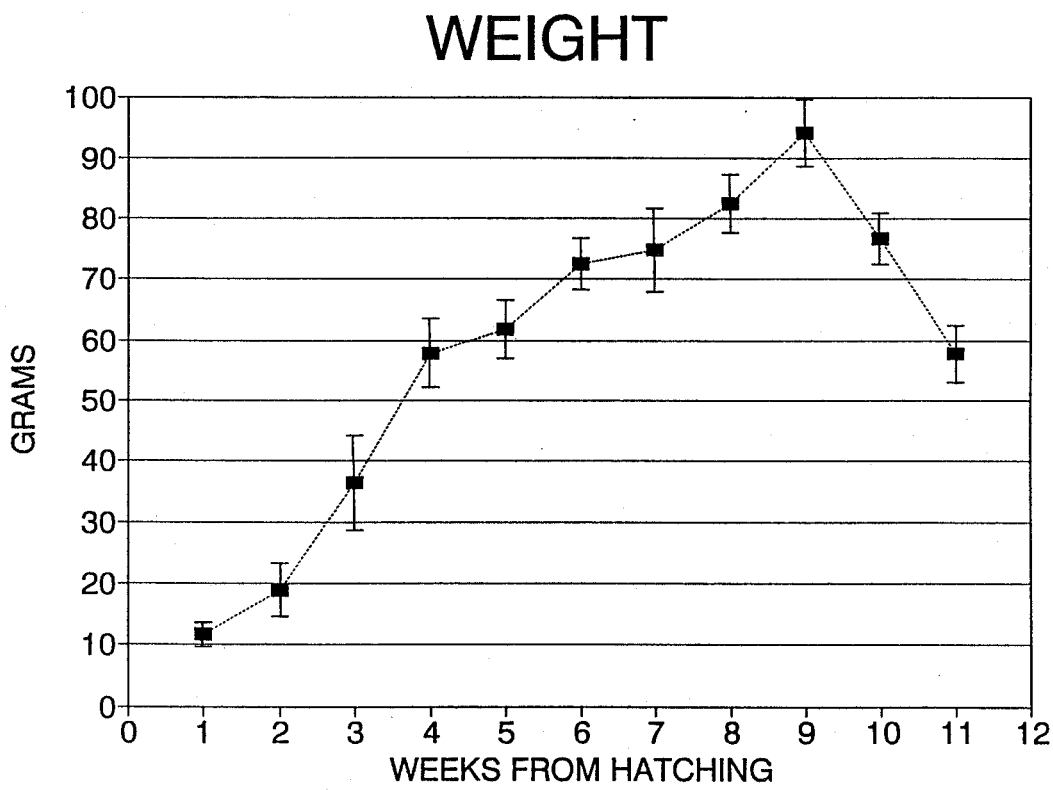


Figure 10. Mean weight gain for chicks during 1990 season, with indication of one Standard Deviation (sd).

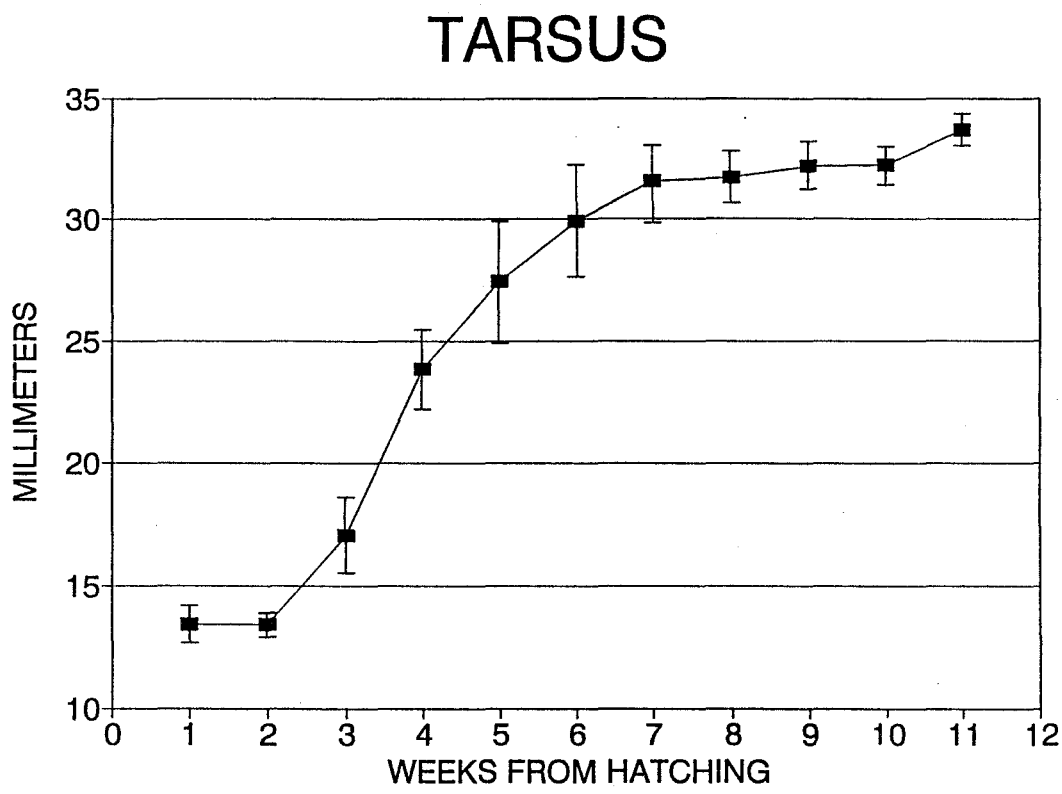


Figure 11. Mean growth of tarsometatarsus for chicks during 1990 season, with indication of one Standard Deviation (sd).

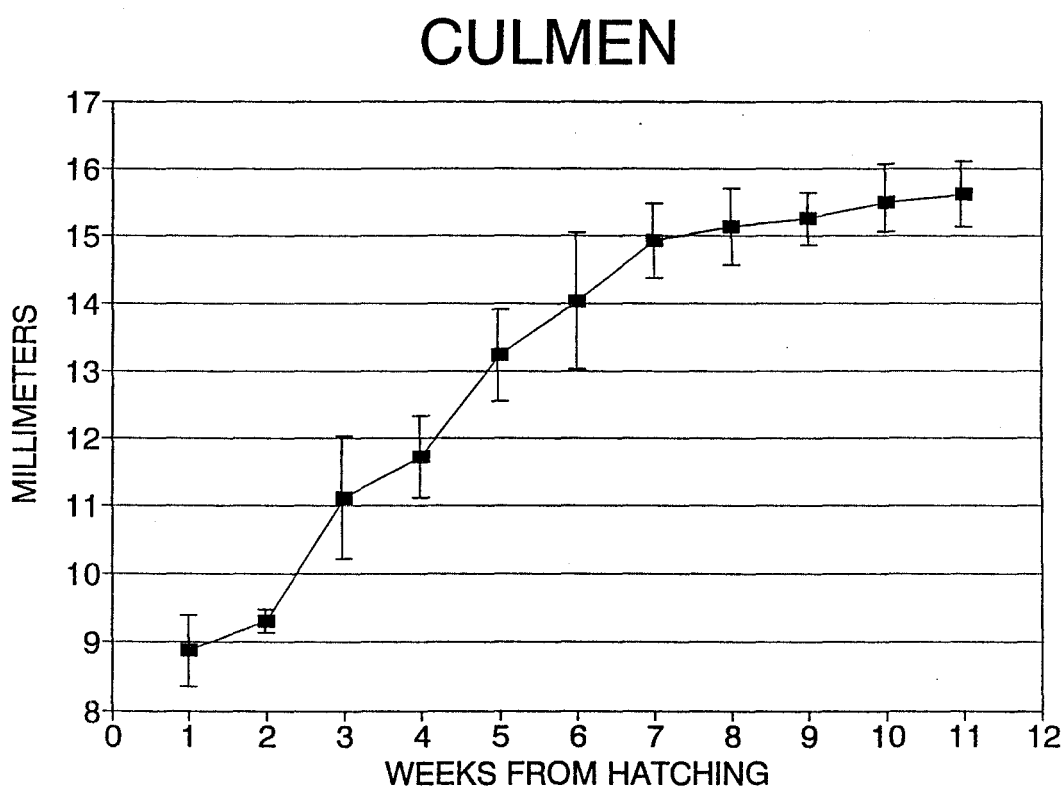


Figure 12. Mean growth of culmen for chicks during 1990 season, with indication of one Standard Deviation (sd).

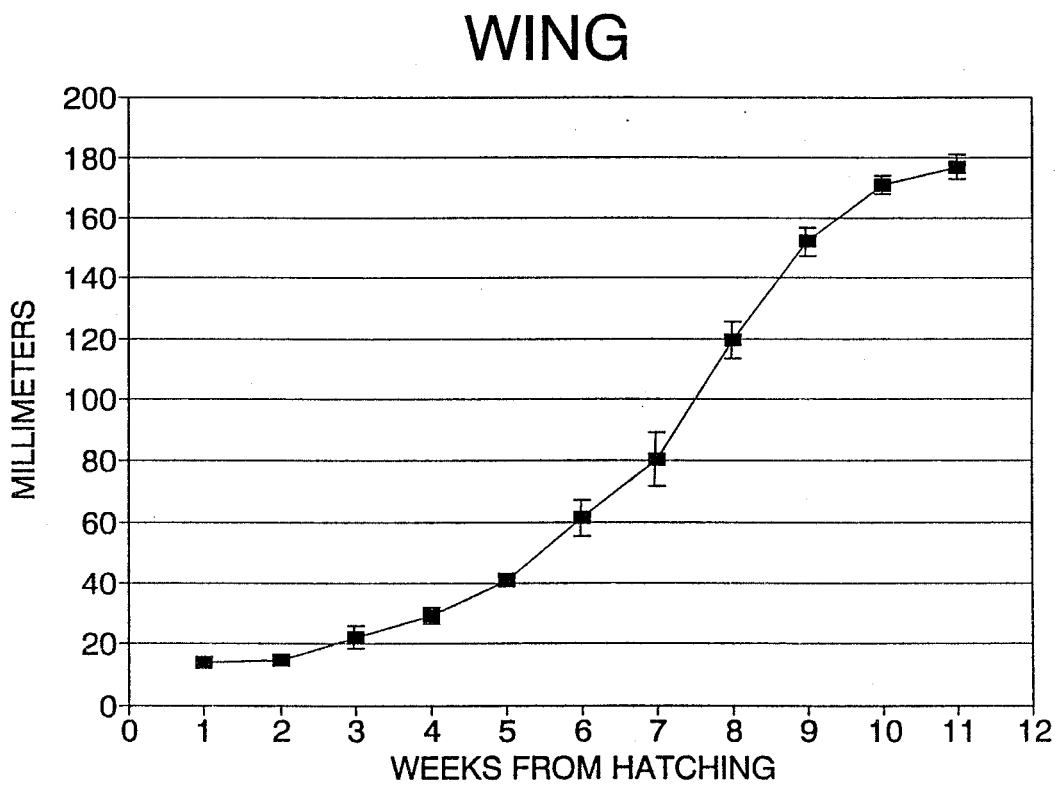


Figure 13. Mean growth of wing for chicks during 1990 season, with indication of one Standard Deviation (sd).

four weeks after hatching, then the rate slows until a peak weight, equivalent to about 150 % of mean adult weight, is achieved during the ninth week. Weight then decreases rapidly for the next two or three weeks as the chicks prepare to fledge. At fledging the chicks weigh the same or slightly less than the adults.

The culmen and tarsometatarsus show typical growth ogives, with initial positive acceleration to about seven weeks. At about this point the remiges emerge from their sheaths and begin rapid development. This high rate of flight and tail feather growth continues until the chicks are ready to fledge.

Notes on the sequence and development of plumages were made on 15 chicks during the 1990 season. The following is a generalized description of plumage development based on these observations. Individual variation in these growth patterns and timing is to be expected.

Chicks are ptilopaedic at hatching and are nidicolous for the first few weeks. The protoptyle is dark gray and continues to grow for the first few weeks (Figure 14). The first juvenile feathers to appear are the remiges and then the retrices, which begin to

Figure 14. Newly hatched Black Storm-Petrel.

Figure 15. Black Storm-Petrel chick at about 6 weeks, with freshly emerging remiges.

emerge from sheaths about the sixth week (Figure 15). Up to this point the chick is experiencing rapid gains in weight and development of bones. The first contour feathers emerge on the back and crown starting between the sixth and eighth weeks, during which time the wings grow rapidly (Figure 16). The contour feathers are a continuation of the mesoptyle, which remains attached to the tip of the juvenile feathers but soon wears off as they emerge. Breast feathers sprout next and contour feather development progresses towards the vent. By the ninth and tenth weeks chicks are usually fully feathered except for traces of down remaining on the vent and hindneck (Figure 17).

In several instances chicks varied from the typical growth pattern, in that they did not experience weight gain past the mean adult weight, and development was correspondingly slower. This did not seem to affect their ultimate fledging success. In only one case was an adult found attending a dead chick. Three other dead chicks were found in nests but were unattended.

As chicks develop they become more mobile, and some begin to wander within the confines of their nest site. This tendency increases as fledging nears. In both 1989 and 1990 several well-developed chicks were discovered

Figure 16. Black Storm-Petrel chick at about 8 weeks.

Figure 17. Black Storm-Petrel chick at about 11 weeks.

late in the season, presumably individuals that emerged from undiscovered nests.

Fledging occurs after the chicks have remained in the colony for at least 10 weeks, and usually takes from 11 to 12 weeks. Thus, the first chicks to hatch begin departing in the last days of August and first week of September. Most have fledged by mid-September, and some chicks are still in the colony in early October, with the last departures probably taking place in mid-October.

Breeding Success

Results of breeding efforts for the 39 nests followed in both 1989 and 1990 are presented in Table 2. In 1989, 45% of nests with eggs eventually apparently fledged young. In 1990 50% of nests with eggs fledged young. Substantial efforts were made in 1990 to reduce disturbance to incubating birds, but the overall success rate remained nearly the same. It is possible that some of the 32% fewer eggs laid in 1990 (of the 39 sites studied both years) resulted either from general abandonment caused in 1989 or was a result of normal annual fluctuation in breeding attempts.

TABLE 2. BREEDING SUCCESS OF 39 NESTS MONITORED IN BOTH 1989 AND 1990.

	1989		1990	
	N	%	N	%
NESTS WITH EGGS	38	97	26	68
EGGS HATCHED	21	55	13	50
CHICKS FLEDGED	17	81	13	100
CHICKS DIED	4	19	0	0
NESTS WITH EGGS THAT FLEDGED YOUNG	17	45	13	50

Nine of the 17 nests that fledged young in 1989 also produced fledglings in 1990. Of the 8 other successful 1989 nests, in 1990 1 was destroyed between seasons by erosion, 5 had eggs that failed, 1 was empty the entire season, and 1 was recorded with only a single adult, with no egg or chick noted. Four nests that failed in 1989 produced fledglings in 1990.

Failed and Non-Breeders

It is clear that many more birds attend the colony at night than can be accounted for by known or suspected breeding pairs. Observations of birds captured in mist nets (see below) support this conclusion, as well as data from toothpicks placed at nest site entrances (Figure 8). Throughout the 1990 season, whenever an unoccupied nest site (one without an egg or chick) that was previously known to be used by a Black Storm-Petrel was encountered, a toothpick was placed upright in the entrance. This presented no obstacle to visiting birds, but a displaced toothpick on subsequent nest checks suggests the nest was visited in the interim. As discussed in the Pre-egg section, the presence of other species render these data less reliable early in the season. However, as the season progresses other species depart, and from May through

September the trends in toothpick displacement shed light on Black Storm-Petrel colony and nest site attendance.

These data suggest that non-breeding birds and perhaps failed breeders continue nocturnal visits to unoccupied nests throughout the season (Figure 8) with peak attendance in late June and early July. After the first of September the rate of unoccupied nest site investigation declines substantially.

Nest Site and Pair Bond Tenacity

During the 1989 season 56 adults were captured in nests and banded. Of these, 24 were recovered in nests during the 1990 season (Table 3). All of these except one were found in the same nest as the previous year, the exception being a bird whose 1989 nest was usurped in 1990 by a Cassin's Auklet. This bird was found in 1990 in a newly discovered nest.

In 16 of the 39 nests studied in 1989, both adults of the pair were captured and banded. In 1990, pairs were identified in 12 of the 1989 nests, but only three of these were nests that had pairs the previous year. All three of these nests (#'s 8518, 8523, and 8546) had

TABLE 3. RESULTS OF BANDING AND RECAPTURES.

ADULTS BANDED IN BURROWS, 1989	56
ADULTS BANDED IN NETS, 1989	29
TOTAL ADULTS BANDED IN 1989	85
CHICKS BANDED IN BURROWS, 1989	18
TOTAL BANDED IN 1989	103
ADULTS BANDED IN BURROWS, 1990	23
ADULTS BANDED IN NETS, 1990	73
TOTAL ADULTS BANDED IN 1990	96
CHICKS BANDED IN BURROWS, 1990	15
TOTAL BANDED IN 1990	111
GRAND TOTAL ADULTS BANDED IN BURROWS	79
GRAND TOTAL ADULTS BANDED IN NETS	102
GRAND TOTAL ADULTS BANDED	181
GRAND TOTAL CHICKS BANDED	33
GRAND TOTAL, BIRDS BANDED IN 1989 & 1990	214

TABLE 3, CONTINUED

TOTAL ADULTS BANDED IN BURROWS IN 1989, AND RECOVERED IN A BURROW IN 1990	24
TOTAL ADULTS BANDED IN NETS IN 1989, CAUGHT AGAIN IN 1990	2
TOTAL ADULTS BANDED IN BURROWS AND SUBSEQUENTLY NETTED	2
TOTAL ADULTS BANDED IN NETS SUBSEQUENTLY FOUND IN BURROWS	0

the same pairs in both years. No instances of apparent mate-switching were recorded. Low frequency of nest checks could explain the small number of pair-recaptures; nevertheless it appears that generally the birds return to the same nest site each year and maintain pair bonds.

Mist Net Captures

During the course of this study mist nets were deployed on ten nights (Table 1). The primary purpose of mist netting was to band obtain weights and brood patch data from as many different adults as possible. A summary of Black Storm-Petrel banding is given in Table 3. Only 2 of the 29 birds (7%) banded in mist nets in 1989 were again captured in 1990. The substantial differences in levels of effort and net positioning, variation in the amount of moonlight, availability of food, cloud cover, and wind, combine to render a comparison and detailed analysis of capture rates unproductive. The substantial biases introduced by these and other factors (Furness and Baillie 1981, Simons 1981, Watanuki 1986) render much analysis of capture-recapture data unreliable. Since many of the assumptions of population estimation procedures (e.g. Lincoln-Peterson Index) were not met, I make no attempt

to use them here. Some anecdotal aspects of the operations, however, warrant the following discussion.

On a daily basis, Black Storm-Petrels did not arrive at the colony until the onset of complete darkness. This corresponded with the point at which most of the Western Gulls (predators) on the island settled down for the night. Typically, several storm-petrels arrived immediately after the onset of total darkness, and circled within 8 meters of the ground around the amphitheater where the nets were located. Every 5-10 seconds they gave the four-syllable call described below. Aerial activity peaked within the first hour after darkness, then tapered off until midnight. This pattern is reflected in half-hourly capture rates at the peak of the season (Figure 18). Judging from vocalizations, activity began increasing again about 0200, with a peak and then followed by a rapid decline at 0400 as birds departed from the island.

This pattern was followed unless the sky was clear and the moon cast substantial light on the colony. Overall, fewer birds came to the colony on such nights, and gulls were much more active. If the moon rose late in the evening, activity continued as normal until

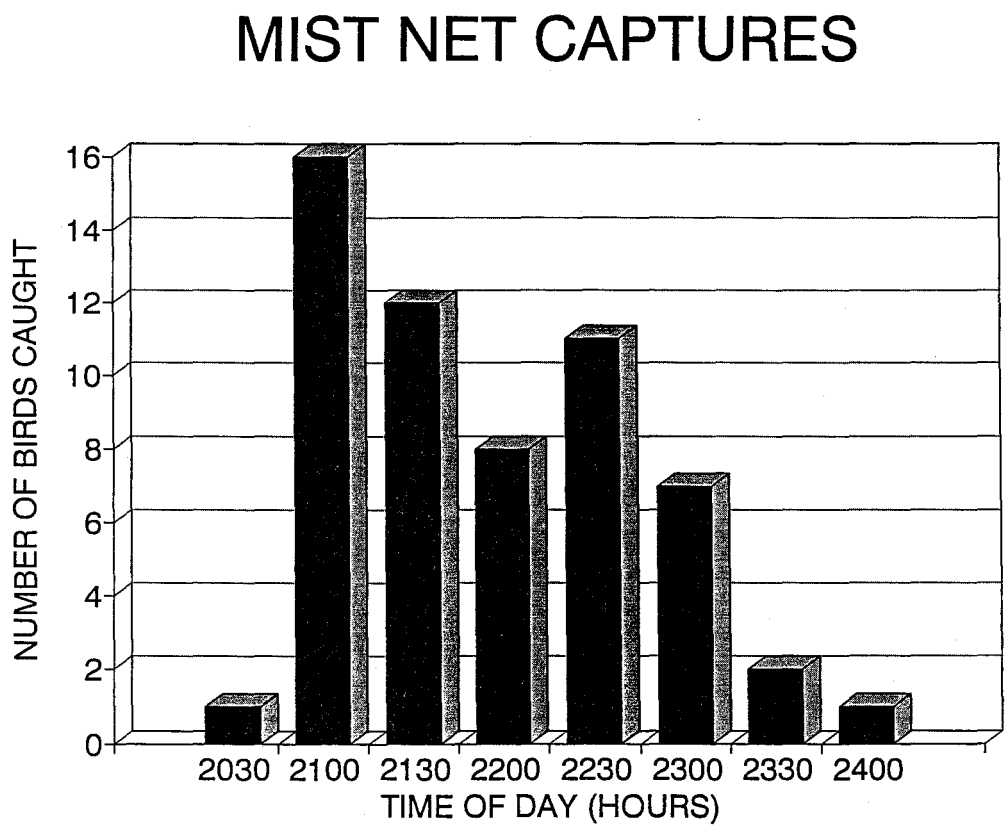


Figure 18. Half-hourly captures of Black Storm-Petrels on night of 14 July 1990.

moonrise, at which point it decreased dramatically.

The greatest numbers of birds were caught in the nets in late June and July. No birds were captured in the February and September deployments, and few were captured in March, May, or August.

When captured, most birds would struggle briefly then relax. Some individuals would become severely entangled. Regurgitation of stomach oil was not uncommon, but vomiting of identifiable prey items was rare. Some birds would struggle continuously while being handled, and occasionally bite the person extracting it from the net, or even bite itself on the wing in its frenzy.

Molt

Throughout the course of this study, no evidence of wing or tail feather replacement or molt was noted in any of the 181 adult birds examined. General body molt was not noted. Some species (e.g. Ashy Storm-Petrel) begin to show flight and tail feather molt before departing the nesting colonies (Ainley et al. 1976).

Brood Patch

During the 1989 season, 103 adult birds were examined for the presence and status of brood patches. All these birds had mostly defeathered or bare brood patches. This sample includes both birds captured on nests and in mist nets.

Adult Weights

Weights were recorded at least once for 112 different adult birds. Twenty-six of these were subsequently recaptured and weighed again during the same year (1989). The mean of the original sample was 61.5 grams (range = 53.0 - 77.0, sd 5.052). Figure 19 shows the distribution of these weights. These data correspond closely with those from the 44 individuals weighed by Crossin (1974), but increases the maximum weight reported for the species by 10 grams. In this study, the mean difference of birds captured and weighed a second time was 1.02 grams (n = 26, range = -7.5 - +14.0, sd 5.11). The greatest variation in weight for a single individual was 16.0 grams.

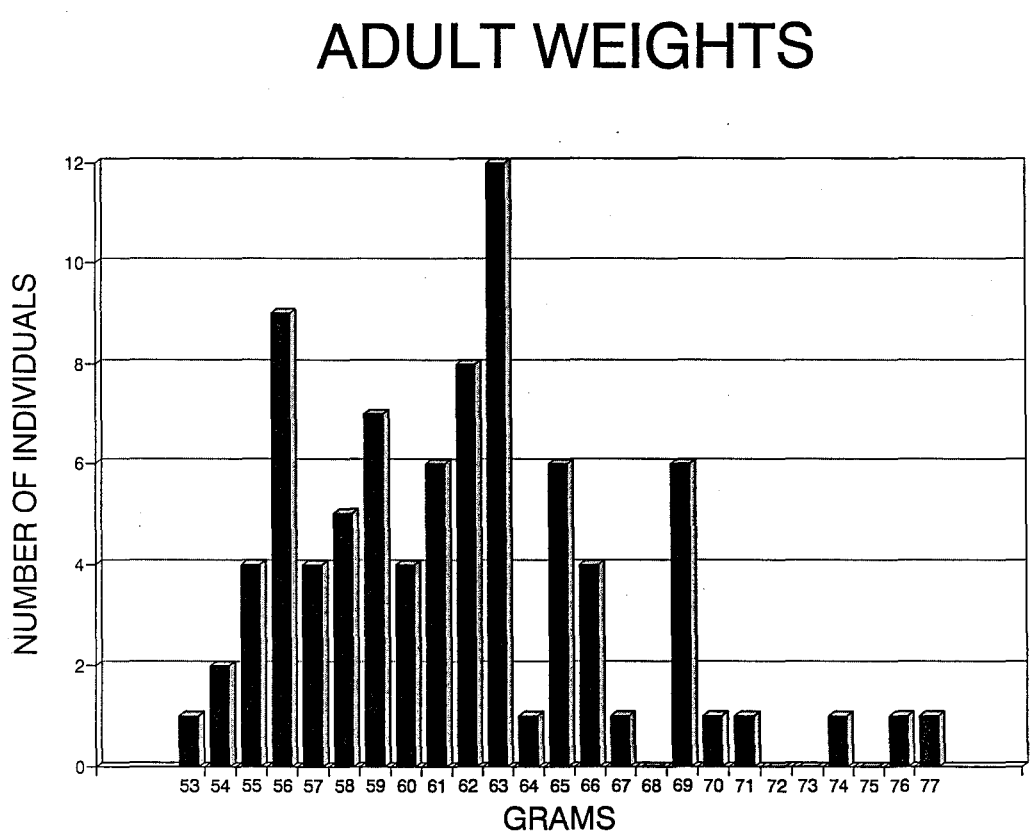


Figure 19. Distribution of adult weights (n = 112).

Voice

Black Storm-Petrels give at least two distinct vocalizations. The one most frequently issued while on the ground is an extended twitter or trill. This call was first described by Dickey and van Rossem (in Bent 1922), who had made several visits to Los Islas Coronados in the early 1900's and likened the sound to that of the call of the Wrentit *Chamaea fasciata*. Crossin (1974) also reported this vocalization from his 1968 visits. An audio-spectrogram of a call typical of this variety is shown in Figure 20.

The only other vocalization identified during this study, and given quite regularly by birds in flight at night over the colony, is a weird shriek. Howell (in Bent 1922) reports "this [call] I am unable to describe, except that it consists of four notes." The term "notes" is a misnomer: the cry is not at all musical; "syllables" or "phrases" would be more descriptive. An audio spectrogram of this call is shown in Figure 21.

Palmer (1962) gives a phonetic rendering of another call as "puck-a-ree, puck-puckaroo." Crossin (1974) also apparently makes reference to this same call,

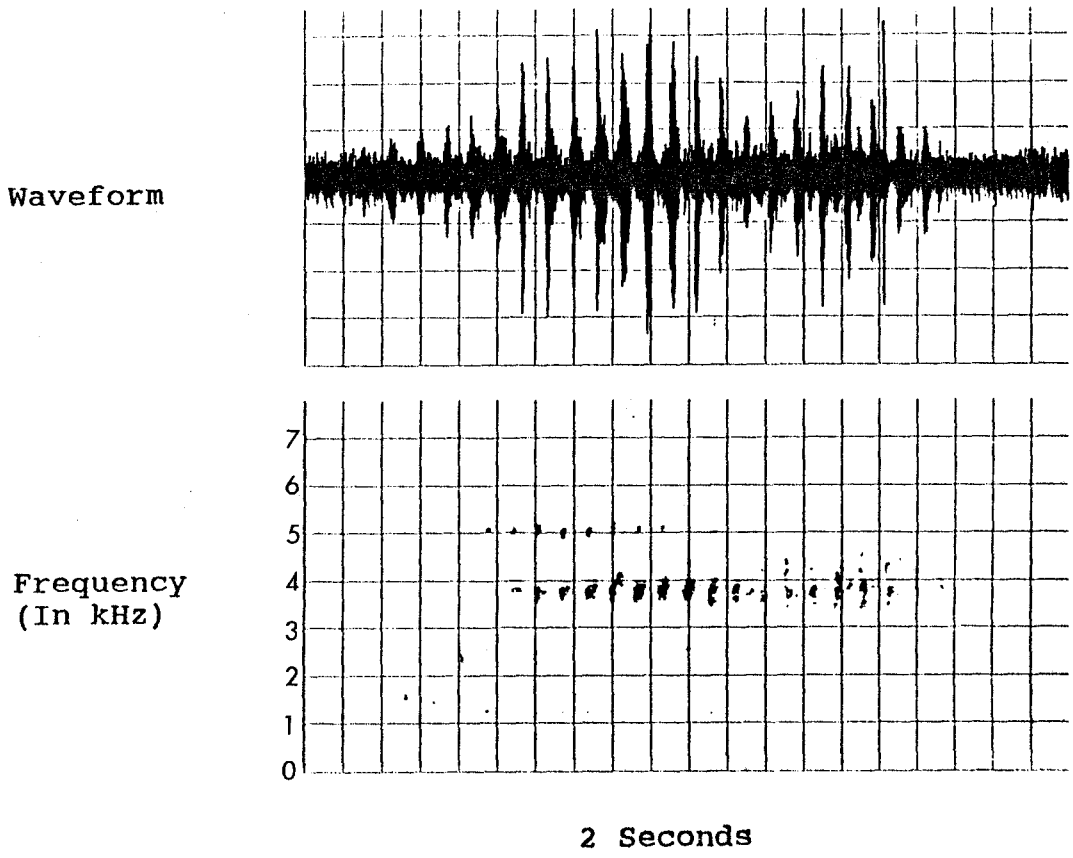


Figure 20. Sonagram of Black Storm-Petrel twitter call.

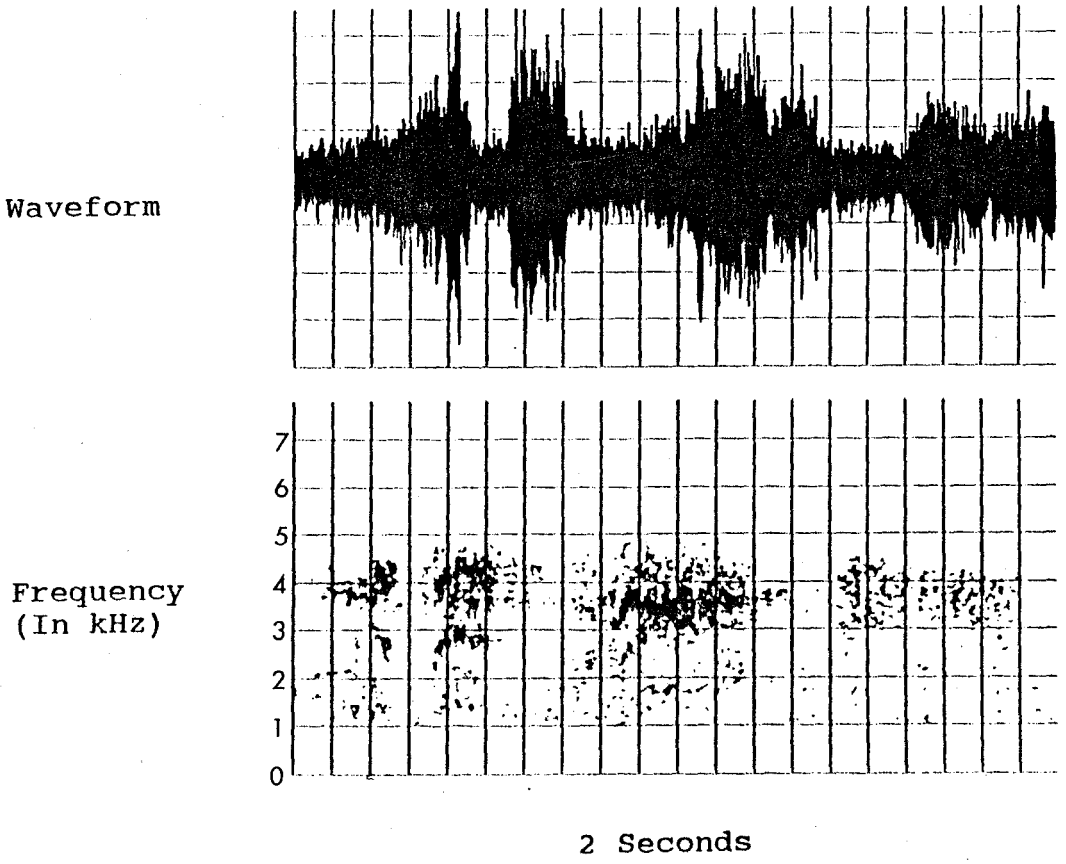


Figure 21. Sonagram of Black Storm-Petrel screech call.

without specifically stating that he heard it himself. I do not believe the Black Storm-Petrel gives such a call, and I attribute this probable error to one or both of two possible explanations. First, at colonies visited by the earlier investigators, both Black and Leach's Storm-Petrels are present. It is often difficult in the darkness and the chaos of the colony at night to determine exactly what call is given by which species, and the phonetic rendering under discussion is certainly more similar to the call of Leach's Storm-Petrel. Second, and apparently more likely, is a *lapsus* on the part of Palmer in quoting Anthony (1898) who reported the call of Leach's Storm-Petrel) as "tuc-a-roo, tuc-tuc-a-roo."

At no time in the present study was an unprompted vocalization heard during the daytime. When handled, either at night or during daytime, adults on rare occasions shriek in protest. Chicks are usually quiet when captured, but in some cases they give a soft "peeping" call when in the hand.

Food

During the course of the study notes were made on the regurgitations of birds handled when nests were

being checked. In addition, six food samples were collected from the regurgitations of chicks in 1990. Recording of weight and volume data on samples was not possible, since the contents often had to be scraped from the ground. Samples were preserved in 70% ethanol and returned to the laboratory for identification.

Most often, adults and chicks vomited a clear, pungent orange oily liquid. On two occasions birds produced a creamy apricot-colored vomit and a creamy, white vomit. The six collected samples contained parts of skeletons, flesh and skin of small fish, euphausiids, Caridean shrimp, and squid tentacles. Of greatest interest was a nearly intact gammariid amphipod, *Eurythenes obesus*. This species is widespread throughout the world's oceans, but occurs primarily at mesopelagic and bathypelagic depths (Thurston 1990). This specimen is now in the marine invertebrate collection of the San Diego Natural History Museum.

Previous reports of food items of Black Storm-Petrels include those of Anthony (1898), who reported the larval stage of spiny lobster *Panulirus interruptus* as the chief prey item, Nelson (1899), who observed feeding on offal, Hallinan (1924), who found "seaweed" in stomachs of two birds collected in the Gulf of

Panama, Miller (1936), who reported tiny fish scales and squid parts in stomachs examined from specimens taken off southern California, and Murphy (1958), who found lantern fishes (Scopelidae) in the gullet and stomach of a female collected off southern Mexico.

In general, Storm-Petrels eat a wide variety of items, with crustaceans, fish, and squid being major dietary components (Croxall et al. 1988, Vermeer and Devito 1988). They are exclusively surface feeders, and will scavenge opportunistically for prey of the proper size (Ridoux and Offredo 1989).

Ectoparasites

During the course of this study one bird was noted with an obvious infestation of ectoparasites. An approximately four-week old chick in nest # 8518 was observed on 26 August 1990 with 12-15 insects attached to the bare skin of the face and head. Samples were collected, returned to the laboratory, and subsequently identified as fleas in the family *Pulicidae*. The species is *Actenopsylla suavis*. This monotypic genus was described from specimens collected from the burrow of a Cassin's Auklet on Islas Los Coronados in May 1913 (Hubbard 1947, Turner 1971).

Fleas were still present on the chick on 13 August, but were gone by 22 September. The chick apparently suffered no lasting ill effects from the infestation. Since Cassin's Auklets and Black Storm-Petrels occasionally share burrows, finding these fleas on both species is not surprising. This is the first report of ectoparasites on Black Storm-Petrels.

Abnormalities

All birds handled and banded were examined for abnormalities. No physical deformities (e.g. missing legs, feet, or holes in webs between toes) were noted. Four adults did have albinistic feathers; two had tiny white feathers around the base of the bill or eye, and two had tiny white feathers on the vent. Baptista (1966) reported the presence of albinistic feathers on museum specimens of Black Storm-Petrels and 9 other species of Storm-Petrel.

CONCLUSIONS

The results of this study suggest the breeding biology of the Black Storm-Petrel is similar in most aspects with that of other species of the family *Oceanitidae*. The protracted breeding season with long

incubation periods, occasional egg neglect, and extended fledging periods are characteristic of the burrow-nesting Procellariiformes, although the adaptive significance of this regime is unclear (Ricklefs 1984; 1990).

Although not the focus of this study, an interesting factor in the breeding strategy of the Black Storm-Petrel appears to be competition for nesting space. Three additional species (Xantus' Murrelet, Cassin's Auklet, and Leach's Storm-Petrel) also breed at the study site and occupy similar, and in some cases identical, nesting sites. Xantus Murrelets nest early in the season and produce precocious young that depart the island within days of hatching. Few Cassin's Auklets currently breed on Middle Rock, but in at least one case apparently usurped a Black Storm-Petrel nest site. Leach's Storm-Petrels are approximately half the mass of the Black Storm-Petrels, and would likely be unable to compete for nest space. The overall sizes of the two Storm-Petrel populations on the island are similar, but the Leach's Storm-Petrels nest almost exclusively in soft soil burrows in the central amphitheater. Assuming this type of nest site is undesirable for Black Storm-Petrels, the nest preference of Leach's Storm Petrels could be an

adaption to competition. Whereas Black Storm-Petrels would not be able to evict the larger alcids from nest sites, egg-laying later in the season after departure of Xantus' Murrelet could be an adaption to competition.

The relative scarcity of suitable nest sites could also lead to intraspecific competition, and could explain the large number of apparently non-breeding birds present at the colony. This "floating" population is apparently capable of breeding, as suggested by the overall occurrence of defeathered brood patches.

Thus it appears a shortage of nest sites leads to a kind of balanced adaptive coexistence within physical and temporal constraints, wherein size and aggression dictate the overall timing of breeding and allocation of nest sites. Such a scenario is in accordance with many theories of island biogeography and seabird ecology (Hutchinson 1953, Manual 1974, Stamps and Buechner 1985, Furness and Monaghan 1987, Ainley and Boekelheide 1990).

Several important aspects of the population dynamics of the Black Storm-Petrel will only be able to be determined after additional years of research. Age

of first breeding, longevity of adults, fledging survival and population recruitment all require years of monitoring and continued banding studies to become elucidated (Gross 1947, Nisbet 1989, Nichols et al. 1990).

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APPENDIX A. BANDING DATA

Band #	Species	Date	Comments
(1441-30 801-900) SIZE 1B			
30801	**BLSP**	13 MAY 89	NEST 8501
		24 JUN 89	8501
		14 JUN 90	**8545**
30847	BLSP	24 JUN 89	NEST 8522
		2 JUL 89	8522
(8041-03 401 TO 500) SIZE 1A			
3401	BLSP	3 JUN 89	NEST 8502
3402	BLSP	3 JUN 89	8503
3403	BLSP	3 JUN 89	8504
		10 JUN 89	8504
3404	BLSP	3 JUN 89	8505
3405	BLSP	3 JUN 89	8506
3406	BLSP	3 JUN 89	8507
		2 JUL 89	8507

3407	BLSP	3 JUN 89	8546
		10 JUN 89	8546
		29 MAY 90	**8546**
		23 JUN 90	**8546**
		14 JUL 90	**8546**
		28 JUL 90	**8546**
3408	BLSP	3 JUN 89	8511
		2 JUL 89	8511
3409	BLSP	3 JUN 89	8512
		10 JUN 89	8512
		24 JUN 89	8512
3410	BLSP	3 JUN 89	8513
3411	BLSP	3 JUN 89	8514
3412	BLSP	3 JUN 89	8523
		10 JUN 89	8523
		24 JUN 89	8523
		14 JUL 90	**8523**
		23 JUN 90	**8523**
		28 JUL 90	**8523**

3413	BLSP	3 JUN 89	8516
		10 JUN 89	8516
		24 JUN 89	8516
		14 JUL 90	**8516**
3414	BLSP	3 JUN 89	8517
		10 JUN 89	8517
		24 JUN 89	8517
		2 JUL 89	8517
		14 JUN 90	**8517**
		11 JUL 90	**8517**
3415	BLSP	3 JUN 89	NET
3416	BLSP	3 JUN 89	NET
3417	BLSP	3 JUN 89	NET
3418	BLSP	3 JUN 89	NET
3419	BLSP	3 JUN 89	NET
		14 JUL 90	**NET**
3420	BLSP	3 JUN 89	NET
3421	BLSP	3 JUN 89	NET
3422	BLSP	3 JUN 89	NET
3423	BLSP	3 JUN 89	NET

3424	BLSP	4 JUN 89	NEST 8518
		24 JUN 89	8518
		14 JUN 90	**8518**
		14 JUL 90	**8518**
		23 JUL 90	**8518**
3425	BLSP	4 JUN 89	NEST 8519
		2 JUL 89	8519
		13 MAY 90	**8519**
		19 MAY 90	**8519**
		29 MAY 90	**8519**
3426	BLSP	10 JUN 89	NEST 8505
		24 JUN 89	8505
		23 JUN 90	**8505**
		14 JUL 90	**8505**
3427	BLSP	10 JUN 89	NEST 8506
3428	BLSP	10 JUN 89	NEST 8520
3429	BLSP	10 JUN 89	NEST 8503
		24 JUN 89	8503
3430	BLSP	10 JUN 89	NEST 8521
		2 JUL 89	8521
		14 JUL 90	**8521**

3431	BLSP	10 JUN 89	NEST 8522
		24 JUN 89	NET
3432	BLSP	10 JUN 89	NEST 8514
		28 JUL 90	**8514**
3433	BLSP	10 JUN 89	NEST 8524
		2 JUL 89	8524
		10 MAY 90	**8524**
		28 JUL 90	**8524**
3434	BLSP	10 JUN 89	NEST 8525
3435	BLSP	10 JUN 89	NEST 8526
3436	BLSP	10 JUN 89	NEST 8518
		2 JUL 89	8518
		23 JUN 90	**8518**
3437	BLSP	10 JUN 89	NEST 8519
		24 JUN 89	8519
		14 JUN 90	8519
3438	BLSP	10 JUN 89	NEST 8527
		24 JUN 89	8527
		2 JUL 89	8527
		23 JUN 90	**8527**

3439	BLSP	24 JUN 89	NEST 8506
		22 JUL 89	8506
3441	BLSP	24 JUN 89	NEST 8530
		2 JUL 89	8530
3442	BLSP	24 JUN 89	NEST 8531
		2 JUL 89	8531
3443	BLSP	24 JUN 89	NEST 8532
3444	BLSP	24 JUN 89	NEST 8546
		2 JUL 89	8546
		22 JUL 89	8546
		14 JUL 90	**8546**
		23 JUN 90	**8546**
3445	BLSP	24 JUN 89	NEST 8511
3446	BLSP	24 JUN 89	NEST 8533
		2 JUL 89	8533
		23 JUN 90	**8558**
3447	BLSP	24 JUN 89	NEST 8525

3448	BLSP	24 JUN 89	NEST 8536
		29 MAY 90	**8536**
		14 JUN 90	**8536**
		23 JUN 90	**8536**
3449	BLSP	24 JUN 89	NET
3450	BLSP	24 JUN 89	NET
3451	BLSP	24 JUN 89	NET
3452	BLSP	24 JUN 89	NET
		14 JUL 90	**NET**
3453	BLSP	24 JUN 89	NET
3454	BLSP	24 JUN 89	NET
3455	BLSP	24 JUN 89	NET
3456	BLSP	24 JUN 89	NET
3457	BLSP	24 JUN 89	NET
3458	BLSP	24 JUN 89	NET
3459	BLSP	24 JUN 89	NET
3460	BLSP	24 JUN 89	NET
3461	BLSP	24 JUN 89	NET
3462	BLSP	24 JUN 89	NET
3463	BLSP	24 JUN 89	NET

3464	BLSP	25 JUN 89	NEST 8541
		29 MAY 90	**8541**
		23 JUN 90	**8541**
3465	BLSP	25 JUN 89	NEST 8542
		22 JUL 89	8542
3466	BLSP	25 JUN 89	NEST 8543
3467	BLSP	25 JUN 89	NEST 8523
		29 MAY 90	**8523**
3468	BLSP	2 JUL 89	NEST 8501
3469	BLSP	2 JUL 89	NEST 8502
3470	BLSP	2 JUL 89	NEST 8503
		19 MAY 90	**8503**
3471	BLSP	2 JUL 89	NEST 8512
3472	BLSP	2 JUL 89	NEST 8513
3473	BLSP	2 JUL 89	NEST 8542
		14 JUL 90	**8542**
3474	BLSP	2 JUL 89	NEST 8543

3475	BLSP	22 JUL 89	8505/CHICK
		14 AUG 89	CHICK
		27 AUG 89	CHICK
3476	BLSP	22 JUL 89	NEST 8530
3477	BLSP	22 JUL 89	8521/CHICK
		27 AUG 89	CHICK
3478	BLSP	22 JUL 89	NEST 8510R
		12 MAY 90	**NET**
		14 JUL 90	**NET**
3479	BLSP	22 JUL 89	NEST 8533
3480	BLSP	22 JUL 89	8523/CHICK
		27 AUG 89	CHICK
3481	BLSP	22 JUL 89	8516/CHICK
		14 AUG 89	CHICK
		27 AUG 89	CHICK
3482	BLSP	22 JUL 89	8517/CHICK
		14 AUG 89	CHICK
		27 AUG 89	CHICK

3483	BLSP	22 JUL 89	8540/CHICK
		14 AUG 89	CHICK
3484	BLSP	22 JUL 89	8519/CHICK
		14 AUG 89	CHICK
		27 AUG 89	CHICK
3485	BLSP	22 JUL 89	8541/CHICK
		14 AUG 89	CHICK
		27 AUG 89	CHICK
3486	BLSP	14 AUG 89	NEST 8507
		14 JUL 90	**8507**
		23 JUL 90	**8507**
3487	BLSP	14 AUG 89	8510L/CHICK
		27 AUG 89	CHICK
3488	BLSP	14 AUG 89	8527/CHICK
		27 AUG 89	CHICK
3489	BLSP	14 AUG 89	NEST 8547
		6 MAY 90	**8547**
3490	BLSP	14 AUG 89	8536/CHICK
		27 AUG 89	CHICK

3491	BLSP	27 AUG 89	8506/CHICK
3492	BLSP	27 AUG 89	8542/CHICK
		1 OCT 89	CHICK
3493	BLSP	27 AUG 89	8548/CHICK
3494	BLSP	27 AUG 89	8549/CHICK
3495	BLSP	27 AUG 89	8550/CHICK
3496	BLSP	27 AUG 89	8551/CHICK
3497	BLSP	27 AUG 89	NET
3498	BLSP	27 AUG 89	NET
3499	BLSP	27 AUG 89	NET
3500	BLSP	1 OCT 89	8559/CHICK

(8041- 19 701-800) SIZE 1A

701	BLSP	27 AUG 89	NET

1990

702	BLSP	24 MAR 90	NET
703	BLSP	22 APR 90	NEST 8551
704	BLSP	12 MAY 90	NEST 8536
705	BLSP	12 MAY 90	NET
706	BLSP	12 MAY 90	NET
707	BLSP	12 MAY 90	NET
708	BLSP	12 MAY 90	NET
709	BLSP	12 MAY 90	NET
710	BLSP	12 MAY 90	NET

711	BLSP	13 MAY 90	NEST 8540
		29 MAY 90	8540
712	BLSP	19 MAY 90	NET
713	BLSP	29 MAY 90	NEST 8521
714	BLSP	29 MAY 90	NEST 8548
715	BLSP	29 MAY 90	NEST 8517
716	BLSP	30 MAY 90	NEST 8553
717	BLSP	14 JUN 90	NEST 8557
718	BLSP	14 JUN 90	NEST 8556
719	BLSP	14 JUN 90	NEST 8548
720	BLSP	14 JUN 90	NEST 8541
721	BLSP	23 JUN 90	NEST 8557
722	BLSP	23 JUN 90	NEST 8559
723	BLSP	23 JUN 90	NEST 8549
724	BLSP	14 JUL 90	8557/CHICK
		23 JUN 90	CHICK
		28 JUL 90	CHICK
		7 AUG 90	CHICK
		26 AUG 90	CHICK
		13 SEP 90	CHICK
725	BLSP	14 JUL 90	NEST 8559

726	BLSP	14 JUL 90	8548/CHICK
		23 JUN 90	CHICK
		28 JUL 90	CHICK
		7 AUG 90	CHICK
		26 AUG 90	CHICK
727	BLSP	14 JUL 90	8541/CHICK
		23 JUN 90	CHICK
		28 JUL 90	CHICK
		7 AUG 90	CHICK
		26 AUG 90	CHICK
728	BLSP	14 JUL 90	8536/CHICK
		23 JUN 90	CHICK
		28 JUL 90	CHICK
		7 AUG 90	CHICK
		26 AUG 90	CHICK
729	BLSP	14 JUL 90	NET
		28 JUL 90	NET
730	BLSP	14 JUL 90	NET
		28 JUL 90	NET
731	BLSP	14 JUL 90	NET
732	BLSP	14 JUL 90	NET

733	BLSP	14 JUL 90	NET
734	BLSP	14 JUL 90	NET
735	BLSP	14 JUL 90	NET
736	BLSP	14 JUL 90	NET
737	BLSP	14 JUL 90	NET
738	BLSP	14 JUL 90	NET
739	BLSP	14 JUL 90	NET
740	BLSP	14 JUL 90	NET
741	BLSP	14 JUL 90	NET
742	BLSP	14 JUL 90	NET
743	BLSP	14 JUL 90	NET
744	BLSP	14 JUL 90	NET
745	BLSP	14 JUL 90	NET
746	BLSP	14 JUL 90	NET
747	BLSP	14 JUL 90	NET
748	BLSP	14 JUL 90	NET
749	BLSP	14 JUL 90	NET
750	BLSP	14 JUL 90	NET
751	BLSP	14 JUL 90	NET
752	BLSP	14 JUL 90	NET
753	BLSP	14 JUL 90	NET
754	BLSP	14 JUL 90	NET
755	BLSP	14 JUL 90	NET
756	BLSP	14 JUL 90	NET
757	BLSP	14 JUL 90	NET
758	BLSP	14 JUL 90	NET

759	BLSP	14 JUL 90	NET
760	BLSP	14 JUL 90	NET
761	BLSP	14 JUL 90	NET
762	BLSP	14 JUL 90	NET
763	BLSP	14 JUL 90	NET
764	BLSP	14 JUL 90	NET
765	BLSP	14 JUL 90	NET
766	BLSP	14 JUL 90	NET
767	BLSP	14 JUL 90	NET
768	BLSP	14 JUL 90	NET
769	BLSP	14 JUL 90	NET
770	BLSP	14 JUL 90	NET
771	BLSP	14 JUL 90	NET
772	BLSP	14 JUL 90	NET
773	BLSP	14 JUL 90	NET
774	BLSP	14 JUL 90	NET
775	BLSP	14 JUL 90	NET
776	BLSP	14 JUL 90	NET
777	BLSP	14 JUL 90	NET
778	BLSP	14 JUL 90	NET
779	BLSP	14 JUL 90	NET
780	BLSP	14 JUL 90	NET
781	BLSP	14 JUL 90	NET
782	BLSP	14 JUL 90	NET
783	BLSP	14 JUL 90	NET
784	BLSP	14 JUL 90	NET

785	BLSP	23 JUL 90	8503/CHICK
		28 JUL 90	CHICK
		7 AUG 90	CHICK
		26 AUG 90	CHICK
		13 SEP 90	CHICK
786	BLSP	14 JUL 90	NET
787	BLSP	23 JUL 90	NEST 8504
788	BLSP	23 JUL 90	8549/CHICK
		28 JUL 90	CHICK
		7 AUG 90	CHICK
		26 AUG 90	CHICK
		13 SEP 90	CHICK
789	BLSP	28 JUL 90	8505/CHICK
		7 AUG 90	CHICK
		26 AUG 90	CHICK
		13 SEP 90	CHICK
		22 SEP 90	CHICK
790	BLSP	28 JUL 90	NEST 8532
791	BLSP	28 JUL 90	NEST 8555
		7 AUG 90	8555

792	BLSP	28 JUL 90	NEST 8527
793	BLSP	28 JUL 90	NEST 8558
794	BLSP	28 JUL 90	NEST 8562
795	BLSP	28 JUL 90	NET
796	BLSP	28 JUL 90	NET
797	BLSP	28 JUL 90	NET
798	BLSP	28 JUL 90	NET
799	BLSP	28 JUL 90	NET
800	BLSP	28 JUL 90	NET
801	BLSP	28 JUL 90	NET
802	BLSP	28 JUL 90	NET
803	BLSP	29 JUL 90	NEST 8562
804	BLSP	7 AUG 90	8506?/CHICK
		26 AUG 90	CHICK
		13 SEP 90	CHICK
		22 SEP 90	CHICK
805	BLSP	7 AUG 90	8514/CHICK
		26 AUG 90	CHICK
		13 SEP 90	CHICK
		22 SEP 90	CHICK
806	BLSP	7 AUG 90	NEST 8524

807	BLSP	7 AUG 90	8516/CHICK
		26 AUG 90	CHICK
		13 SEP 90	CHICK
		22 SEP 90	CHICK
808	BLSP	7 AUG 90	8518/CHICK
		26 AUG 90	CHICK
		13 SEP 90	CHICK
		22 SEP 90	CHICK
809	BLSP	26 AUG 90	8507/CHICK
		13 SEP 90	CHICK
		22 SEP 90	CHICK
810	BLSP	26 AUG 90	8552/CHICK
		13 SEP 90	CHICK
		22 SEP 90	CHICK
811	BLSP	26 AUG 90	8550/CHICK
812	BLSP	26 AUG 90	8540/CHICK
		13 SEP 90	CHICK
		22 SEP 90	CHICK

APPENDIX B. NEST RECORDS: NOTES FROM ALL BLACK STORM-PETREL NESTS FOR 1989 AND 1990 SEASONS.

NEST RECORD

Nest # 8502

Date	
3 JUN 89	Adult, new band # 3401, weight 62.0 g., on egg.
10 JUN 89	No adult or egg visible.
24 JUN 89	Adult, new band # 3469, weight 61.0 g., on egg, brood patch # 4.
22 JUL 89	Broken, rotten egg only.
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Toothpick down, reset.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick down, reset.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick down, reset.
14 JUN 90	Toothpick down, reset.
23 JUN 90	Toothpick down, reset.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick down, reset.
23 JUL 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8502

Date	
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick down, reset.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8503

Date	
3 Jun 89	Adult, new band # 3402, weight 55.5 g., no egg visible.
10 JUN 89	Adult, new band # 3429, weight 69.0 g., on egg.
24 JUN 89	Adult, band # 3429, weight 72.5 g., on egg, brood patch #4.
2 JUL 89	Adult, new band # 3470, weight 60.0 g., on egg, brood patch # 4.
22 JUL 89	Empty
14 AUG 89	Empty, broken egg.
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Toothpick down, reset.
6 MAY 90	Toothpick up.
12 MAY 90	Toothpick up.
13 MAY 90	Toothpick up.
19 MAY 90	Adult, band # 3470, on egg.
29 MAY 90	Adult on egg, could not capture to read band number.
30 MAY 90	Adult on egg, could not capture to read band number.

NEST RECORD (CONTINUED)

Nest # 8503

Date	
14 JUN 90	Adult on egg, could not capture to read band number.
23 JUN 90	Adult on egg, could not capture to read band number.
14 JUL 90	Chick, 33.0 g., tarsus 19.7, culmen 11.2, wing 20.
15 JUL 90	Chick still present.
23 JUL 90	Chick, new band # 19785, 51.5 g., tarsus 25.0, culmen 14.0, wing 33. Flight feathers not yet emerged.
28 JUL 90	Chick, 61.0 g., tarsus 28.7, culmen 13.1, wing 40.
29 JUL 90	Chick still present.
7 AUG 90	Chick, 80.5 g., tarsus 31.5, culmen 14.4, wing 70. No juvenile contour feather development yet.
26 AUG 90	Chick, 94.0 g., tarsus 33.7, culmen 15.0, wing 128. Entire ventral area still downy, head partially downy.

NEST RECORD (CONTINUED)

Nest # 8503

Date	
13 SEP 90	Chick, 54.5 g.,
	tarsus 33.7, culmen 15.5, wing 171.
	Down remaining on belly and vent only.
22 SEP 90	Empty, toothpick set.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8504

Date	
3 JUN 89	Adult, new band # 3403, weight 62.0 g., on egg.
10 JUN 89	Adult, band # 3403, weight 61.0 g., egg not noted.
24 JUN 89	Empty. Cracked egg only, marked and replaced.
2 JUL 89	Empty. Two Black Storm-Petrel eggs, 1 cracked.
22 JUL 89	Empty. Cold egg only (12 g.).
14 AUG 89	Two rotten eggs.
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Toothpick down, reset.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick down, reset.
19 MAY 90	Toothpick up.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick up.
14 JUN 90	Adult, unbanded, not able to capture, on egg.

NEST RECORD (CONTINUED)

Nest # 8504

Date	
23 JUN 90	Egg only.
14 JUL 90	Two eggs (11.0 & 12.5 g.), no adults.
15 JUL 90	Same as yesterday.
23 JUL 90	Adult, new band # 19787, two eggs, one warm.
28 JUL 90	Two cold eggs. Toothpick set.
29 JUL 90	Toothpick down, reset.
7 AUG 90	Toothpick down, reset. Two broken eggs.
26 AUG 90	Toothpick down, reset. " " "
13 SEP 90	Toothpick down, reset. " " "
22 SEP 90	Toothpick down, reset. " " "
23 SEP 90	Toothpick up. " " "

NEST RECORD

Nest # 8505

Date	
3 JUN 89	Adult, new band # 3404, weight 61.5 g., on egg.
10 JUN 89	Adult, new band # 3426, weight 56.0 g., egg not noted.
24 JUN 89	Adult, band # 3426, weight 69.0 g., on egg, brood patch # 4.
2 JUL 89	Adult, unable to capture (but banded). Chick, 13.0 g., culmen 10.4.
22 JUL 89	Chick, new band # 3475, 49.5 g., tarsus 22.5, culmen 10.7.
14 AUG 89	Chick, 92.0 g., tarsus 31.6, culmen 18.8, wing 78. Juvenile feathers developing in wings, tail, and dorsal area only.
27 AUG 89	Chick, 82.0 g., tarsus 31.5, culmen 14.4, wing 130. Heavy down remaining on ventral side only.
1 OCT 89	Empty
22 APR 90	Empty, toothpick set.
6 MAY 90	Toothpick up.
12 MAY 90	Toothpick up.

NEST RECORD (CONTINUED)

Nest # 8505

Date	
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick up.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick up.
14 JUN 90	Toothpick up.
23 JUN 90	Adult, band # 3426, on egg.
14 JUL 90	Chick, 20.0 g.,
	tarsus 13.3, culmen 9.4, wing 18.
	Adult # 3426 also in nest.
15 JUL 90	Chick in nest, no adult present.
23 JUL 90	Chick, 46.5 g.,
	tarsus 17.8, culmen 11.3, wing 18.
28 JUL 89	Chick, new band # 19789 44.0 g.,
	tarsus 22.4, culmen 11.5, wing 26.
	No juvenile feathering yet.
29 JUL 90	Same as yesterday.
7 AUG 90	Chick, 66.5 g.,
	tarsus 28.9, culmen 13.2, wing 42.
	No juvenile feathering yet.
26 AUG 90	Chick, 84.0 g.,
	tarsus 31.7, culmen 14.8, wing 86.
	All downy except wings and tail.

NEST RECORD (CONTINUED)

Nest # 8505

Date	
13 SEP 90	Chick, 97.0 g., tarsus 31.5, culmen 15.5, wing 155. Down remaining on belly only.
22 SEP 90	Chick, 71.0 g., tarsus 31.6, culmen 15.2, wing 173. Small amount of down, on belly only.
23 SEP 90	Chick still present.

NEST RECORD

Nest # 8506

Date	
3 JUN 89	Adult, new band # 3405, weight 56.5 g., on egg.
10 JUN 89	Adult, new band # 3427, weight 69.0 g., on egg.
24 JUN 89	Adult, new band # 3439, weight 63.5 g., on egg, brood patch # 4.
2 JUL 89	Adult, unable to capture (but banded), on egg.
22 JUL 89	Adult band # 3439, weight 60.0 g., on egg, brood patch # 4.
14 AUG 89	Chick, 45.0 g., tarsus 19.5, culmen 14.9, wing 22.
27 AUG 89	Chick, new band #3491, 71.0 g., tarsus 26.4, culmen 14.6, wing 35.
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Toothpick down, reset.
6 MAY 90	Toothpick up.
12 MAY 90	Toothpick up.
13 MAY 90	Toothpick down, reset.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8506

Date	
30 MAY 90	Toothpick down, reset.
14 JUN 90	Toothpick down, reset.
23 JUN 90	Adult, unable to catch, no egg visible.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick up.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick down, reset.
7 AUG 90	Chick, new band # 19804, 31.0 g., tarsus 17.9, culmen 10.2, wing 20. Found slightly to left of last year's site.
26 AUG 90	Chick, 74.0 g., tarsus 26.9, culmen 12.3, wing 47. Wing feathers starting to emerge, no other juvenile feathering developing. Food sample collected.
13 SEP 90	Chick, 73.5 g., tarsus 31.3, culmen 14.0, wing 95. Still mostly downy. Bird "peeped" vociferously.

NEST RECORD, CONTINUED

Nest # 8506

Date	
22 SEP 90	Chick, 100.0 g., tarsus 31.8, culmen 15.0, wing 127. Down remaining on back, back of head, belly, and vent (still much down). Food sample collected.

NEST RECORD

Nest # 8507

Date	
3 JUN 89	Adult, new band # 3406, weight 63.5 g., on egg.
10 JUN 89	No adult present, egg collected.
24 JUN 89	Two Xantus' Murrelet eggs (1 cracked), collected.
2 JUL 89	Adult, band # 3406, weight 58.0 g., on egg.
22 JUL 89	Egg only, 11.0 g.
14 AUG 89	Adult, new band # 3486, weight 63.0 g., Brood patch # 4. Chick, 9.0 g., tarsus 13.1, culmen 9.8, wing 17.6.
27 AUG 89	Empty, eggshell only.
1 OCT 89	Empty
25 MAR 90	Adult Xantus' Murrelet in nest, 2 eggs collected.
22 APR 90	Empty, toothpick set.
6 MAY 90	Toothpick up.
12 MAY 90	Toothpick up.
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8507

Date	
30 MAY 90	Adult, unable to reach, on egg. ***EGG LAID LAST NIGHT***
14 JUN 90	Adult, unable to reach (banded), on egg.
23 JUN 90	Egg only.
14 JUL 90	Adult, band # 3486, on egg.
15 JUL 90	Adult, band # 3406, on egg.
23 JUL 90	Adult, band # 3486 Chick, 10.5 g., tarsus 14.4, culmen 8.0, wing 15.
28 JUL 90	Chick, 13.0 g., tarsus 14.0, culmen 8.0, wing 14.
29 JUL 90	Same as yesterday.
7 AUG 90	Chick, 30.0 g., tarsus 16.5, culmen 9.5, wing 20.
26 AUG 90	Chick, new band # 19809, 55.0 g., tarsus 24.4, culmen 12.3, wing 38.
13 SEP 90	Chick, 56.0 g., tarsus 30.0, culmen 14.0, wing 76. Still mostly downy.
22 SEP 90	Chick, 82.0 g., tarsus 31.2, culmen 15.0, wing 113. All downy except upper breast and upper back. Regurgitated oil only.

NEST RECORD (CONTINUED)

Nest # 8507

Date	
23 SEP 90	Chick still present.

NEST RECORD

Nest # 8509

NOTE: See nest # 8546 for details on this nest.

NEST RECORD

Nest # 8510

Date	
3 JUN 89	Adult Leach's Storm-Petrel, new band # 30802, weight 44.0 g., tarsus 21.9, culmen 14.8, middle toe and claw 21.5.
10 JUN 89	Empty
24 JUN 89	Bird visible (not certain of species) but unreachable. Egg also visible.
22 JUL 89	Adult Black Storm-Petrel in right-hand chamber of nest. New band # 3478, weight 60.0 g., no egg visible.
14 AUG 89	Right-hand chamber empty, but in left chamber: Chick, new band # 3487 (Black Storm-Petrel), 70.0 g., tarsus 28.7, culmen 15.6, wing 45
27 AUG 89	Chick, 90.0 g., tarsus 32.3, culmen 15.9, wing 75. Still all downy. Only remiges emerging.

NEST RECORD

Nest # 8511

Date	
3 JUN 89	Adult, new band # 3408, weight 63.0 g., on egg. White feather at base of hindneck.
10 JUN 89	Adult, banded, unable to capture, on egg.
24 JUN 89	Adult, new band # 3445, weight 57.5 g., on egg, brood patch # 4.
2 JUL 89	Adult, band # 3408, weight 62.0 g., with dead chick.
22 JUL 89	Empty
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) down, reset.
22 APR 90	Toothpick down, reset.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick down, reset.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick up.
14 JUN 90	Toothpick down, reset.
23 JUN 90	Toothpick down, reset.
14 JUL 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8511

Date	
15 JUL 90	Toothpick down, reset.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick up.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8512

Date	
3 JUN 89	Adult, new band # 3409, weight 69.0 g., on egg.
10 JUN 89	Adult, band # 3409, weight 73.0 g., on egg.
24 JUN 89	Adult, band # 3409, weight 59.0 g., on egg, brood patch # 4.
2 JUL 89	Adult, new band # 3471, weight 59.0 g., on egg, brood patch # 4.
22 JUL 89	Empty
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty

NOTE: This nest collapsed between nesting seasons, and was rendered unusable for the 1990 season. There were no visible signs of attempts to re-establish the nest.

NEST RECORD

Nest # 8513

Date	
3 JUN 89	Adult, new band # 3410, weight 60.0 g., on egg.
10 JUN 89	Empty, broken egg near entrance.
24 JUN 89	Empty
2 JUL 89	Adult, new band # 3472, 64.5 g., on egg.
22 JUL 89	Empty
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty

NOTE: This nest was completely obliterated between the 1989 and 1990 nesting seasons by a small landslide.

NEST RECORD

Nest # 8514

Date	
3 JUN 89	Adult, new band # 3411, weight 77.0 g., on egg.
10 JUN 89	Adult, new band # 3432, weight 67.0 g., on egg.
24 JUN 89	Empty, broken egg.
2 JUL 89	Empty, broken egg (very advanced embryo).
22 JUL 89	Empty, egg (cracked), 13.0 g.
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Adult Leach's Storm-Petrel, new band # 69707, weight 44.0 g., no egg.
6 MAY 90	Empty, toothpick set.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Two Adult BLSP's, not captured, no egg seen.
19 MAY 90	Egg only.
29 MAY 90	Egg only, toothpick set.
30 MAY 90	Egg only, Toothpick up.
14 JUN 90	Adult, banded, not captured, on egg.
23 JUN 90	Adult, banded, not captured, on egg.

NEST RECORD (CONTINUED)

Nest # 8514

Date	
14 JUL 90	Adult, band not seen, not captured, on egg.
15 JUL 90	Adult, band not seen, not captured, on egg.
23 JUL 90	Adult, band not seen, not captured, egg not seen.
28 JUL 90	Adult, band # 3432, Chick, 14.0 g., tarsus 12.9, culmen 8.9, wing 17.
29 JUL 90	Same as yesterday.
7 AUG 90	Chick, new band # 19805, 32.0 g., tarsus 16.3, culmen 10.5, wing 14.0
26 AUG 90	Chick, 71.0 g., tarsus 26.0, culmen 14.0, wing 42. Still all downy.
13 SEP 90	Chick, 87.0 g., tarsus 31.3, culmen 14.8, wing 92. All downy except lower back.
22 SEP 90	Chick, 93.0 g., tarsus 31.8, culmen 14.7, wing 125. Entire underside downy, also rump and back of head. Regurgitated oil only.
23 SEP 90	Chick still present.

NEST RECORD

Nest # 8515

NOTE: See nest # 8523 for data from this nest.

NEST RECORD

Nest # 8516

Date	
3 JUN 89	Adult, new band # 3413, weight 62.0 g., on egg. Tiny white feathers around base of bill and eye.
10 JUN 89	Adult, band # 3413, weight 60.0 g., on egg.
24 JUN 89	Adult, band # 3413, 53.5 g., on egg. Brood patch # 4.
2 JUL 89	Chick, 16.5 g., tarsus 12.9, culmen 10.8.
22 JUL 89	Chick, new band # 3481, 67.0 g., tarsus 23.0, culmen 13.7.
14 AUG 89	Chick, 88.5 g., tarsus 31.8, culmen 18.2?, wing 91. Juvenile feathering emerging on dorsal side.
27 AUG 89	Chick, 88.0 g., tarsus 32.0, culmen 15.0, wing 142. Ventral side still downy.
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Nest not checked.
6 MAY 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8516

Date	
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick down, not reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Adult, not banded, on egg. ***EGG LAID LAST NIGHT***
14 JUN 90	Adult, band not noted, on egg.
23 JUN 90	Adult, not captured, on egg.
14 JUL 90	Adult, band # 3413, on egg.
15 JUL 90	Adult, band # 3413, on egg.
23 JUL 90	Chick, 19.5 g., tarsus 13.5, culmen 9.1, wing 18.5.
28 JUL 90	Chick, 29.5 g., tarsus 14.9, culmen 11.0, wing 14.
29 JUL 90	Same as yesterday.
7 AUG 90	Chick, new band # 19807, 54.0 g., tarsus 21.5, culmen 12.6, wing 27.
26 AUG 90	Chick, 70.0 g., tarsus 29.0, culmen 15.0, wing 66. Flight feathers beginning to develop.
13 SEP 90	Chick, 60.5 g., tarsus 30.3, culmen 15.4, wing 111. Still mostly downy except back.

NEST RECORD (CONTINUED)

Nest # 8516

Date	
22 SEP 90	Chick, 90.0 g., tarsus 31.0, culmen 15.4, wing 153 Ventral side still all downy except lower belly, very slight down on back. Regurgitated oil only.
23 SEP 90	Chick still present.

NEST RECORD

Nest # 8517

Date	
3 JUN 89	Adult, new band # 3414, weight 69.0 g., egg not noted.
10 JUN 89	Adult, band # 3414, weight 72.0 g., egg not visible.
24 JUN 89	Adult, band # 3414, weight 60.0 g., egg not visible, brood patch # 3.
2 JUL 89	Adult, band # 3414, weight 56.0 g., brood patch # 3. Chick, 22.0 g., tarsus 12.7, culmen 11.1.
22 JUL 89	Chick, new band # 3482, 80.0 g., tarsus 23.8, culmen 14.8.
14 AUG 89	Chick, 90.5 g., tarsus 33.1, culmen 20.3, wing 98. Juvenile feathering on crown and back.
27 AUG 89	Chick, 91.0 g., tarsus 33.1, culmen 16.6, wing 148. Slight amount of down remaining on head and rump, heavy down still attached to ventral body surfaces.
1 OCT 89	Empty
6 MAY 90	Empty, no toothpick set.

NEST RECORD (CONTINUED)

Nest # 8517

Date	
12 MAY 90	Empty, no toothpick set.
13 MAY 90	Empty, no toothpick set.
19 MAY 90	Empty, no toothpick set.
29 MAY 90	Adult, new band # 19715, on egg.
30 MAY 90	Egg, no adult in attendance.
14 JUN 90	Adult, Band # 3414, on egg.
23 JUN 90	Egg (9.4 g.), no adult in attendance.
14 JUL 90	Adult, band # 3414, on egg.
15 JUL 90	Egg, no adult in attendance.
23 JUL 90	Adult, band # 3414, on egg.
28 JUL 90	Egg, no adult in attendance.
29 JUL 90	Egg (34.5 x 22.9 mm) collected, no adult in attendance.
7 AUG 90	Empty
26 AUG 90	Empty
13 SEP 90	Empty
22 SEP 90	Empty
23 SEP 90	Empty

NEST RECORD

Nest # 8518

Date	
4 JUN 89	Adult, new band # 3424, weight 59.0 g., on egg.
10 JUN 89	Adult, new band # 3436, weight 62.0 g., on egg.
24 JUN 89	Adult, band # 3424, weight 65.0 g., on egg, brood patch # 4.
2 JUL 89	Adult, band # 3436, weight 3436, on egg, brood patch # 4, regurgitated creamy apricot-colored vomit.
22 JUL 89	Chick, 49.5 g., tarsus 22.5, culmen 13.1.
14 AUG 89	Chick dead, approximate weight 70 g.
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Xantus' Murrelet in nest, two eggs collected.
22 APR 90	Nest not checked.
6 MAY 90	Toothpick set.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8518

Date	
30 MAY 90	Toothpick up.
14 JUN 90	Adult, band # 3424, on egg. Oiled # 2.
23 JUN 90	Adult, band # 3436, on egg.
14 JUL 90	Adult, band # 3424, on egg.
15 JUL 90	Adult, band # 3424, on egg.
23 JUL 90	Adult, band # 3424
	Chick, 13.5 g.,
	tarsus 14.0, culmen 9.4, wing 15
28 JUL 90	Chick, 29.0 g.,
	tarsus 15.6, culmen 10.2, wing 14
29 JUL 90	Same as yesterday.
7 AUG 90	Chick, new band # 19808, 54.5 g.,
	tarsus 22.7, culmen 12.4, wing 28
26 AUG 90	Chick, 76.0 g.,
	tarsus 32.9, culmen 15.6, wing 67
	Fleas collected from facial skin, wing feathers starting to emerge.
13 SEP 90	Chick, 75.0 g.,
	tarsus 33.6, culmen 15.5, wing 120
	Fleas removed from facial skin, down remaining on belly and around head only.

NEST RECORD (CONTINUED)

Nest # 8518

Date	
22 SEP 90	Chick, 78.0 g., tarsus 33.5, culmen 15.5, wing 157 Down on flanks and back of head only. Vomited oil only. No fleas observed.
23 SEP 90	Chick still present.

NEST RECORD

Nest # 8519

Date	
4 JUN 89	Adult, new band # 3425, weight 59.0 g., on egg.
10 JUN 89	Adult, new band # 3437, weight 69.5 g., on egg.
24 JUN 89	Adult, band # 3437, weight 70.0 g., on egg, brood patch # 4.
2 JUL 89	Adult, band # 3425, weight 56.5 g., brood patch # 3. Chick, 20.0 g., tarsus 14.0, culmen 10.9.
22 JUL 89	Chick, new band # 3484, 68.0 g., tarsus 28.3, culmen 14.8.
14 AUG 89	Chick, 75.0 g., tarsus 33.9, culmen 18.8, wing 91 Juvenile feathering on back.
27 AUG 89	Chick, 83.0 g., tarsus 33.9, culmen 14.5, wing 137 Down remaining only on head and vent.
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Nest not checked.
6 MAY 90	Toothpick up.

NEST RECORD (CONTINUED)

Nest # 8519

Date	
12 MAY 90	Toothpick up.
13 MAY 90	Adult, band # 3425, no egg visible.
19 MAY 90	Adult, band # 3425, on egg.
29 MAY 90	Adult, band # 3425, on egg.
30 MAY 90	Adult, not disturbed, on egg.
14 JUN 90	Adult, band # 3437, on egg.
23 JUN 90	Egg only. Toothpick set.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick down, reset.
23 JUL 90	Toothpick up.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick up.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick up.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8520

Date	
10 JUN 89	Adult, new band # 3428, weight 75.7 g., no egg visible, regurgitated white vomit.
24 JUN 89	Empty, no egg visible.
2 JUL 89	Empty, no egg visible.
22 JUL 89	Adult, unreachable, no egg visible.
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Empty (Note: no toothpick placed due to hardness of substrate).
22 APR 90	Empty
6 MAY 90	Empty
12 MAY 90	Empty
13 MAY 90	Empty
19 MAY 90	Empty
29 MAY 90	Empty
30 MAY 90	Empty
14 JUN 90	Empty
23 JUN 90	Empty
14 JUL 90	Empty
15 JUL 90	Empty
23 JUL 90	Empty

NEST RECORD (CONTINUED)

Nest # 8520

Date	
28 JUL 90	Empty
29 JUL 90	Empty
7 AUG 90	Empty
26 AUG 90	Empty
13 SEP 90	Empty
22 SEP 90	Empty
23 SEP 90	Empty

NEST RECORD

Nest # 8521

Date	
10 JUN 89	Adult, new band # 3430, weight 60.5 g., no egg visible.
24 JUN 89	Adult, unreachable, also egg of Xantus' Murrelet.
2 JUL 89	Adult, band # 3430, weight 53.0 g., no egg visible, brood patch # 4.
22 JUL 89	Chick, new band # 3477, 62.0 g., tarsus 26.5, culmen 13.6.
14 JUL 89	Chick, visible but unreachable.
27 AUG 89	Chick, 86.0 g., tarsus 33.6, culmen 15.6, wing 132
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Toothpick down, reset.
6 MAY 90	Toothpick up.
12 MAY 90	Adult, unreachable and unbanded. Also Xantus' Murrelet egg (collected and broken).
13 MAY 90	Empty, toothpick set.
19 MAY 90	Adult, unreachable but banded.
29 MAY 90	Adult, new band # 19713. Also old Xantus' Murrelet egg.

NEST RECORD (CONTINUED)

Nest # 8521

Date	
30 MAY 90	Adult, undisturbed, on egg.
14 JUN 90	Adult, unreachable but banded, on egg. Nest tag missing.
23 JUN 90	Adult, unreachable but banded, on egg.
14 JUL 90	Broken egg, no adult.
15 JUL 90	Adult, band # 3430, broken egg.
23 JUL 90	Empty, broken egg.
28 JUL 90	Empty, broken egg, toothpick set.
29 JUL 90	Toothpick down, reset.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick up.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8522

Date	
10 JUN 89	Adult, new band # 3431, weight 65.0, egg not visible.
24 JUN 89	Adult, new band # 30847, weight 60.0 g., on egg, brood patch # 4.
2 JUL 89	Adult, band # 30847, weight 55.5 g., on egg, brood patch # 3.
22 JUL 89	Egg only, broken.
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Toothpick down, not reset, nest partially collapsed.
6 MAY 90	Empty
12 MAY 90	Empty
13 MAY 90	Empty
19 MAY 90	Empty
29 MAY 90	Empty
30 MAY 90	Empty, toothpick set in nest adjacent to right.
14 JUN 90	Adult Leach's Storm-Petrel, band # 30855. Its egg broken by me.

NEST RECORD (CONTINUED)

Nest # 8522

Date	
23 JUN 90	Empty
14 JUL 90	Empty
15 JUL 90	Empty
23 JUL 90	Empty, toothpick set.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick up.
7 AUG 90	Toothpick up.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick down, reset.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8523

NOTE: This nest was originally marked # 8515, but original tag was lost and replaced with # 8523.

Date	
3 JUN 89	Adult, new band # 3412, weight 57.5 g., on egg.
10 JUN 89	Adult, band # 3412, weight 61.5 g., on egg.
24 JUN 89	Adult, band # 3412, weight 51.0 g., brood patch # 3. Chick, 20.0 g.
25 JUN 89	Adult, new band # 3467, weight 55.5 g., brood patch # 4.
2 JUL 89	Chick, 28.0 g., tarsus 13.9, culmen 12.5. Regurgitated orange oil.
22 JUL 89	Chick, new band # 3480, 78.0 g., tarsus 28.2, culmen 14.0
14 AUG 89	Chick not visible.
27 AUG 89	Chick, 98.0 g., tarsus 34.0, culmen 14.0, wing 150. Down remaining on belly and vent only.
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) down, reset.

NEST RECORD (CONTINUED)

Nest # 8523

Date	
22 APR 90	Toothpick down, reset.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Adult, not captured, on egg.
13 MAY 90	Adult, not captured, egg not visible.
19 MAY 90	Adult, not captured, egg not noted.
29 MAY 90	Adult, band # 3467, egg not noted.
30 MAY 90	Adult absent, egg present.
14 JUN 90	Broken egg in nest.
23 JUN 90	Empty, toothpick set.
14 JUL 90	Adult, band # 3412, no egg.
15 JUL 90	Adult, band # 3412, no egg.
23 JUL 89	Adult, band # 3412, on egg.
28 JUL 90	Empty, broken egg (33.0 x 26.6 mm) only.
29 JUL 90	Adult, band # 3412, and broken egg.
7 AUG 90	Empty, broken egg only.
26 AUG 90	Empty, toothpick set.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8524

Date	
10 JUN 90	Adult, new band # 3433, weight 66.0 g., on egg.
24 JUN 89	Adult, unreachable, on egg.
2 JUL 89	Adult, band # 3433, weight 63.5 g.,on egg, brood patch # 3.
22 JUL 89	Empty
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Xantus' Murrelet, 1 egg collected.
22 APR 90	Not checked.
6 MAY 90	Empty (NOTE: no toothpick placed due to hardness of substrate).
12 MAY 90	Empty
13 MAY 90	Empty
19 MAY 90	Adult, band # 3433, on egg.
29 MAY 90	Adult, unreachable but banded, on egg.
30 MAY 90	Adult, unreachable but banded, on egg.
14 JUN 90	No egg visible.
23 JUN 90	Empty
14 JUL 90	Empty
15 JUL 90	Empty

NEST RECORD (CONTINUED)

Nest # 8524

Date	
23 JUL 90	Empty
28 JUL 90	Adult, band # 3433, on egg.
29 JUL 90	Adult, band # 3433, on egg.
7 AUG 90	Adult, new band # 19806, on egg, oiled # 1.
26 AUG 90	Empty, egg only.
13 SEP 90	Empty, egg only.
22 SEP 90	Empty
23 SEP 90	Empty

NEST RECORD

Nest # 8525

Date	
10 JUN 89	Adult, new band # 3434, weight 59.0 g., on egg.
24 JUN 89	Adult, new band # 3447, weight 55.5 g., brood patch # 3. Missing 3 left outer retrices.
	Chick, 13.0 g.
2 JUL 89	Chick, 21.5 g.,
	tarsus 14.1, culmen 11.5.
22 JUL 89	Empty
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
6 MAY 90	Toothpick set.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick down, reset.
14 JUN 90	Toothpick down, reset.
23 JUN 90	Not checked.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8525

Date	
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick down, reset.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick down, reset.
22 SEP 90	Toothpick down, reset.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8526

Date	
10 JUN 89	Adult, new band # 3435, weight 65.0 g., on egg. Egg collected.
24 JUN 89	Empty
2 JUL 89	Empty
22 JUL 89	Adult, unreachable.
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
6 MAY 90	Empty (NOTE: toothpick not set due to hardness of substrate).
12 MAY 90	Empty
13 MAY 90	Empty
19 MAY 90	Egg visible, but no adult.
29 MAY 90	Adult, unreachable, on egg.
30 MAY 90	Adult, unreachable, on egg.
14 JUN 90	Egg, no adult visible.
23 JUN 90	Egg, no adult visible.
14 JUL 90	Broken egg, no adult visible.
15 JUL 90	Empty
23 JUL 90	Empty
28 JUL 90	Empty
29 JUL 90	Empty

NEST RECORD (CONTINUED)

Nest # 8526

Date	
7 AUG 90	Empty
26 AUG 90	Empty
13 SEP 90	Empty
22 SEP 90	Empty
23 SEP 90	Empty

NEST RECORD

Nest # 8527

Date	
10 JUN 89	Adult, new band # 3438, weight 63.0 g., on egg. Brood patch # 4.
24 JUN 89	Adult, band # 3438, weight 65.5 g., on egg. Brood patch # 4.
2 JUL 89	Adult, band # 3438, weight 62.0 g., on egg. Brood patch # 4.
22 JUL 89	Chick, 36.0 g., tarsus 16.5, culmen 11.5.
14 AUG 89	Chick, new band # 3488, 69.0 g., tarsus 30.7, culmen 18.5, wing 65
27 AUG 89	Chick, 86.5 g., tarsus 32.7, culmen 17.3, wing 104 Down remaining on head, rump, and vent only.
1 OCT 89	Empty
22 APR 90	Toothpick set.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick up.

NEST RECORD (CONTINUED)

Nest # 8527

Date	
14 JUN 90	Egg, no adult visible.
23 JUN 90	Egg, no adult visible.
14 JUL 90	Egg, no adult visible.
15 JUL 90	Egg, no adult visible.
23 JUL 90	Adult, band # 3438, on egg.
28 JUL 90	Adult, new band # 19792, no egg visible.
29 JUL 90	Not checked.
7 AUG 90	Adult, unreachable but banded, on egg.
26 AUG 90	Empty, toothpick set.
13 SEP 90	Toothpick down, reset.
22 SEP 90	Toothpick down, reset.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8530

Date	
24 JUN 89	Adult, new band # 3441, weight 59.0 g., no egg visible, brood patch # 3.
2 JUL 89	Adult, band # 3441, weight 62.0 g., on egg, brood patch # 4.
22 JUL 89	Adult, new band # 3476 weight 65.0 g., on egg, brood patch # 4.
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
22 APR 90	Toothpick set.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick up.
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick up.
30 MAY 90	Toothpick down, reset.
14 JUN 90	Toothpick down, reset.
23 JUN 90	Toothpick down, reset.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick up.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick up.

NEST RECORD (CONTINUED)

Nest # 8530

Date	
29 JUL 90	Toothpick up.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8531

Date	
24 JUN 89	Adult, new band # 3442, weight 57.0 g., on egg, brood patch # 4.
2 JUL 89	Adult, band # 3442, weight 60.0 g., on egg, brood patch # 4.
22 JUL 89	Empty
14 AUG 89	Empty, broken egg.
27 AUG 89	Empty
1 OCT 89	Empty
22 APR 90	Toothpick set.
6 MAY 90	Toothpick up.
12 MAY 90	Toothpick up.
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick up.
14 JUN 90	Toothpick up.
23 JUN 90	Toothpick down, reset.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick up.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8531

Date	
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8532

Date	
24 JUN 89	Adult, new band # 3443, weight 58.5 g., on egg, brood patch # 4.
2 JUL 89	Egg, no adult visible.
22 JUL 89	Empty
14 AUG 89	Empty, broken egg.
27 AUG 89	Empty, broken egg.
1 OCT 89	Empty
22 APR 90	Toothpick set.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick down, reset.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick down, reset.
14 JUN 90	Toothpick down, reset.
23 JUN 90	Toothpick down, reset.
14 JUL 90	Adult, unreachable, on egg.
15 JUL 90	Adult, unreachable, on egg.
23 JUL 90	Adult, unreachable, on egg.
28 JUL 90	Adult, new band # 19790, on egg.
29 JUL 90	Adult, not disturbed, on egg.
7 AUG 90	Adult, unreachable, egg not visible.

NEST RECORD (CONTINUED)

Nest # 8532

Date	
26 AUG 90	Empty (nothing visible) toothpick set.
13 SEP 90	Toothpick down, reset.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

(NOTE: Due to the obstructed view inside this nest, it was not always possible to determine with certainty whether or not it was occupied).

NEST RECORD

Nest # 8533

Date	
24 JUN 89	Adult, new band # 3446, weight 63.0 g., on egg, brood patch # 3.
2 JUL 89	Adult, band # 3446, weight 68.0 g., egg not visible, brood patch # 4.
22 JUL 89	Adult, new band # 3479, weight 55.0 g., on egg, brood patch # 3.
14 AUG 89	Empty Chick in nest adjacent to right, but at present unreachable. (NOTE: This nest assigned # 8552 in 1990).
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up. Xantus' Murrelet in nest adjacent to left, two eggs collected. (NOTE: This nest assigned # 8558 in 1990).
22 APR 90	Cassin's Auklet on egg.
6 MAY 90	Cassin's Auklet on egg. Two Black Storm-Petrels in nest to left (# 8558) not disturbed.
12 MAY 90	Cassin's Auklet on egg.
13 MAY 90	Cassin's Auklet on egg.

NEST RECORD (CONTINUED)

Nest # 8533

Date	
19 MAY 90	Cassin's Auklet with small chick.
29 MAY 90	Cassin's Auklet chick, unreachable.
30 MAY 90	Cassin's Auklet chick, unreachable.
14 JUN 90	Cassin's Auklet chick, down remaining everywhere except on head wings, and vent.
23 JUN 90	Empty
14 JUL 90	Toothpick set.
15 JUL 90	Toothpick up.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick up.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8536

Date	
24 JUN 89	Adult, new band # 3448, weight 57.5 g., brood patch # 3. Chick, 19.5 g.
2 JUL 89	Chick, 29.5 g., tarsus 16.2, culmen 12.5.
22 JUL 89	Chick, unreachable.
14 AUG 89	Chick, new band # 3490, 84.5 g., tarsus 35.0, culmen 19.9, wing 101 Juvenile feathering emerging on underside only.
27 AUG 89	Chick, 87.0 g., tarsus 34.0, culmen 15.0, wing 154 Down remaining on belly only. Cassin's Auklet egg in crevice to left of nest (NOTE: this site was assigned # 8562 in 1990).
1 OCT 89	Empty
6 MAY 90	Empty, no toothpick set. Two Black Storm-Petrels in crevice to left.
12 MAY 90	Adult, new band # 19704, egg not found. Oiled # 1.
13 MAY 90	Adult, banded but not captured, on egg.

NEST RECORD (CONTINUED)

Nest # 8536

Date	
19 MAY 90	Adult, not captured, on egg.
29 MAY 90	Adult, band # 3448, on egg.
30 MAY 90	Adult, band # 3448, on egg.
14 JUN 90	Adult, band # 3448, on egg.
23 JUN 90	Adult, band # 3448. Chick, 9.5 g., tarsus 13.3, culmen 8.7.
14 JUL 90	Chick, new band # 19728, 58.0 g., tarsus 21.8, culmen 11.6, wing 29
15 JUL 90	Same as yesterday. Adult Black Storm-Petrel in crevice to left.
23 JUL 90	Chick, 66.5 g., tarsus 28.1, culmen 13.1, wing 39 Adult Black Storm-Petrel in crevice to left.
28 JUL 90	Chick, 70.0 g., tarsus 30.0, culmen 13.0, wing 58 Juvenile feathering not yet emerging on body.
29 JUL 90	Same as yesterday.

NEST RECORD (CONTINUED)

Nest # 8536

Date	
7 AUG 90	Chick, 70.0 g., tarsus 32.4, culmen 14.2, wing 83 Tail feathers emerging, also some back feathers, no vent feathers.
26 AUG 90	Chick, 87.0 g., tarsus 32.5, culmen 15.2, wing 148 Down remaining on vent and belly only.
13 SEP 90	Empty
22 SEP 90	Empty
23 SEP 90	Empty

NEST RECORD

Nest # 8540

Date	
25 JUN 89	Adult, not banded, unreachable.
	Chick, 19.0 g.
2 JUL 90	Chick, 35.0 g.,
	tarsus 17.0, culmen 13.0.
22 JUL 90	Chick, new band # 3483, 67.0 g.,
	tarsus 28.0, culmen 13.7.
14 AUG 90	Chick, 76.0 g.,
	tarsus 33.2, culmen , wing 115
	Juvenile feathering on back and crown.
27 AUG 90	Empty, chick not found.
1 OCT 89	Empty
6 MAY 90	Empty, toothpick not set due to hardness
	of substrate.
12 MAY 90	Egg, but no adult.
13 MAY 90	Adult, new band # 19711, on egg.
19 MAY 90	Egg, adult not visible.
29 MAY 90	Adult, band # 19711, on egg.
30 MAY 90	Adult, band # 19711, on egg.
14 JUN 90	Empty (nothing visible).
23 JUN 90	Empty (nothing visible).
14 JUL 90	Empty
15 JUL 90	Empty

NEST RECORD (CONTINUED)

Nest # 8540

Date	
23 JUL 90	Empty
28 JUL 90	Empty
29 JUL 90	Empty
7 AUG 90	Empty
26 AUG 90	Chick, new band # 19812, 64.0 g., tarsus 27.3, culmen 13.0, wing 40 Remiges emerging. Tag on nest missing. Chick found slightly to right of nest depression where egg noted earlier in the season.
13 SEP 90	Chick, 75.0 g., tarsus 31.7, culmen 15.1, wing 86 All downy except back.
22 SEP 90	Chick, 83.5 g., tarsus 33.0, culmen 16.0, wing 117 Underside downy except upper breast and head. Vomited oil only. Old Xantus' Murrelet egg found in nest.
23 SEP 90	Chick not located.

NEST RECORD

Nest # 8541

Date	
25 JUN 89	Adult, new band # 3464, weight 65.0 g., on egg, brood patch # 4.
2 JUL 89	Chick, 21.0 g., tarsus 14.9, culmen 11.8.
22 JUL 89	Chick, new band # 3485, 56.0 g., tarsus 28.5, culmen 13.9.
14 AUG 89	Chick, 84.0 g., tarsus 32.6, culmen 18.4, wing 102 Only dorsal juvenile feathering emerging.
27 AUG 89	Chick, 77.0 g., tarsus 33.3, culmen 15.4, wing 150 Underside still entirely downy.
1 OCT 89	Empty
6 MAY 90	Toothpick set.
12 MAY 90	Adult, not captured, on egg.
13 MAY 90	Adult, not captured, on egg.
19 MAY 90	Adult, not captured, on egg.
29 MAY 90	Adult, band # 3464, on egg.
30 MAY 90	Adult, band # 3464, on egg.
14 JUN 90	Adult, new band # 19720, on egg.
23 JUN 90	Adult, band # 3464, on egg.

NEST RECORD (CONTINUED)

Nest # 8541

Date	
14 JUL 90	Chick, new band # 19727, 46.0 g., tarsus 23.0, culmen 11.8, wing 28
15 JUL 90	Same as yesterday.
23 JUL 90	Chick, 65.0 g., tarsus 28.6, culmen 13.0, wing 42
28 JUL 90	Chick, 70.0 g., tarsus 30.0, culmen 13.7, wing 54 Juvenile feathering not yet developing on body.
29 JUL 90	Same as yesterday.
7 AUG 90	Chick, 66.5 g., tarsus 32.5, culmen 15.2, wing 78 Retrices emerging, also juvenile feathering on lower back. No other body feathering emerging.
26 AUG 90	Chick, 76.5 g., tarsus 33.0, culmen 15.0, wing 145 Down remaining on vent only.
13 AUG 90	Empty, toothpick set.
22 SEP 90	Toothpick down, reset.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8542

Date	
25 JUN 89	Adult, new band # 3465, weight 63.0 g., on egg, brood patch # 4.
2 JUL 89	Adult, new band # 3473, weight 68.5 g., on egg, brood patch # 4.
22 JUL 89	Adult, band # 3465, weight 60.0 g., egg not noted, brood patch # 4.
27 AUG 89	Chick, 17.0 g., tarsus 15.8, culmen 10.0, wing 28.5 No juvenile feathers emerging yet.
1 OCT 89	Chick, 87.0 g., tarsus 32.2, culmen 15.4, wing 115 Down remaining on head belly, and vent only.
22 APR 90	Toothpick set.
6 MAY 90	Toothpick up.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick up.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick down, reset.
14 JUN 90	Egg, but no adult visible.
23 JUN 90	Egg, but no adult visible.

NEST RECORD (CONTINUED)

Nest # 8542

Date	
14 JUL 90	Adult, band # 3473, on egg.
15 JUL 90	Adult, band # 3473, on egg.
23 JUL 90	Empty except for cold egg.
28 JUL 90	Empty, Toothpick set.
29 JUL 90	Toothpick down, reset.
7 AUG 90	Toothpick up.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8543

Date	
25 JUN 89	Adult, new band # 3466, weight 73.5 g., on egg, brood patch # 4.
2 JUL 89	Adult, new band # 3474, weight 59.0 g., on egg, brood patch # 4.
22 JUL 89	Empty
14 AUG 89	Empty
27 AUG 89	Empty
1 OCT 89	Empty
22 APR 90	Toothpick set.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick down, reset.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick down, reset.
14 JUN 90	Toothpick up.
23 JUN 90	Toothpick down, reset.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick down, reset.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick up.

NEST RECORD (CONTINUED)

Nest # 8543

Date	
7 AUG 90	Toothpick up.
26 AUG 90	Toothpick up.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8545

Date	
13 MAY 89	Adult, new band #30801, weight 60.0 g., on egg.
3 JUN 89	Empty
10 JUN 89	Empty
24 JUN 89	Adult, band # 30801, weight 60.5 g.,on egg, brood patch # 4.
2 JUL 89	Adult, new band # 3468, weight 57.0 g., on egg, brood patch # 4.
22 JUL 89	Empty
14 AUG 89	Empty, tag missing. Assigned # 8545. (Note: Adult, unreachable, in nest adjacent to right).
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) down, reset.
22 APR 90	Toothpick down, reset.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick down, reset.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8545

Date	
14 JUN 90	Adult, band # 30801, on egg.
23 JUN 90	Broken egg (collected).
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick down, reset.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick up.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8546

NOTE: The number of this nest was changed from 8509 to 8546 after the nest identification tag was lost.

Date	
3 JUN 89	Adult, new band # 3407, weight 57.5 g., on egg.
10 JUN 89	Adult, band # 3407, weight 59.0 g., on egg.
24 JUN 89	Adult, new band # 3444, weight 62.5 g., on egg, brood patch # 4.
2 JUL 89	Adult, band # 3444, weight 62.0 g., on egg, brood patch # 4.
22 JUL 89	Adult, band # 3444, weight 58.0 g., on egg, brood patch # 3.
14 AUG 89	Empty. Tag missing. Nest number changed from 8501 to 8545.
27 AUG 89	Empty
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Toothpick down, reset.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick down, reset.
19 MAY 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8546

Date	
29 MAY 90	Adult, band # 3407 (Band slightly worn) on egg.
30 MAY 90	Adult, band # 3407, on egg.
14 JUN 90	Adult, banded but not disturbed, on egg.
23 JUN 90	Adult, band # 3407, on egg.
14 JUL 90	Adult, band # 3444, on egg.
15 JUL 90	Adult, band # 3407 (oiled # 1), on egg.
23 JUL 90	Adult, band # 3444, on egg.
28 JUL 90	Adult, band # 3407, on egg.
29 JUL 90	Egg, no adult present.
7 AUG 90	Broken egg (38.8 X 25.8 mm). Toothpick set.
26 AUG 90	Toothpick up.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8547

Date	
14 AUG 89	Adult, new band # 3489, weight 58.0 g., on egg (12.0 g.), brood patch # 4.
27 AUG 89	Egg only, weight 12.25 g.
1 OCT 89	Empty.
25 MAR 90	Empty
22 APR 90	Nest not checked.
6 MAY 90	Adult, band # 3489.
12 MAY 90	Empty
13 MAY 90	Empty
19 MAY 90	Empty
29 MAY 90	Empty
30 MAY 90	Empty
14 JUN 90	Adult, not captured. Aberrant egg (collected).
23 JUN 90	Empty
14 JUL 90	Empty
15 JUL 90	Empty
23 JUL 90	Empty
28 JUL 90	Empty
29 JUL 90	Empty
7 AUG 90	Empty
26 AUG 90	Empty

NEST RECORD (CONTINUED)

Nest # 8547

Date	
13 SEP 90	Empty
22 SEP 90	Empty
23 SEP 90	Empty

NEST RECORD

Nest # 8548

Date	
27 AUG 89	Chick, new band # 3493, 70.0 g., tarsus 31.6, culmen 15.2, wing 160 Entire ventral side still downy.
1 OCT 89	Empty
25 MAR 90	Xantus' Murrelet on two eggs.
22 APR 90	Not checked.
6 MAY 90	Toothpick set.
12 MAY 90	Adult Black Storm-Petrel, not disturbed, on egg.
13 MAY 90	Adult, not disturbed, on egg.
19 MAY 90	Adult, not disturbed, on egg.
29 MAY 90	Adult, new band # 19714, on egg.
30 MAY 90	Adult, not disturbed, on egg.
14 JUN 90	Adult, new band # 19719, on egg.
23 JUN 90	Chick, 11.0 g., tarsus 12.5, culmen 8.1.
14 JUL 90	Chick, new band # 19726, 49.0 g., tarsus 24.0, culmen 12.9, wing 31. Adult in nest but not captured.
15 JUL 90	Same as yesterday.
23 JUL 90	Chick, 59.5 g., tarsus 30.0, culmen 14.1, wing 45.

NEST RECORD (CONTINUED)

Nest # 8548

Date	
28 JUL 90	Chick, 71.5 g., tarsus 31.2, culmen 14.0, wing 62 Still no juvenile feathers emerging on body.
29 JUL 90	Same as yesterday.
7 AUG 90	Chick, 81.0 g., tarsus 32.2, culmen 14.9, wing 88 Back and tail feathers emerging, none on vent.
26 AUG 90	Chick, 85.0 g., tarsus 33.2, culmen 15.2, wing 150. Down remaining on vent only, otherwise fully feathered.
13 SEP 90	Empty, toothpick set.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8549

Date	
27 AUG 89	Chick, new band # 3494, 92.0 g., tarsus 33.8, culmen 15.5, wing 130 Extensive down on vent.
1 OCT 89	Empty
12 MAY 90	Toothpick set.
13 MAY 90	Toothpick up.
19 MAY 90	Adult, not captured, on egg.
29 MAY 90	Adult, not captured, on egg.
30 MAY 90	Adult, not captured, on egg.
14 JUN 90	Adult, not captured, on egg.
23 JUN 90	Adult, new band # 19723, on egg.
14 JUL 90	Chick, 38.0 g., tarsus 17.9, culmen 11.2, wing 23
15 JUL 90	Same as yesterday.
23 JUL 90	Chick, new band # 19788, 60.0 g., tarsus 25.3, culmen 12.6, wing 31
28 JUL 90	Chick, 65.5 g., tarsus 28.8, culmen 14.0, wing 40 Food sample collected.
29 JUL 90	Same as yesterday.
7 AUG 90	Chick, 67.5 g., tarsus 32.0, culmen 14.8, wing 67

NEST RECORD (CONTINUED)

Nest # 8549

Date	
26 AUG 90	Chick, 85.0 g., tarsus 32.3, culmen 15.5, wing 117 Down remaining on head and ventral surface only.
13 SEP 90	Chick, 80.0 g., tarsus 32.5, culmen 16.3, wing 177 Down remaining on belly only.
22 SEP 90	Empty, toothpick set.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8550

Date	
27 AUG 89	Chick, new band # 3495, 88.0 g., tarsus 32.9, culmen 17.0, wing 145 Ventral surface all downy.
1 OCT 89	Empty
25 MAR 90	Toothpick (set last night) still up.
22 APR 90	Nest not checked.
6 MAY 90	Toothpick down, reset.
12 MAY 90	Toothpick down, reset.
13 MAY 90	Toothpick up.
19 MAY 90	Toothpick down, reset.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick up.
14 JUN 90	Toothpick down, reset.
23 JUN 90	Toothpick down, reset.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick down, reset.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick down, reset.
7 AUG 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8550

Date	
26 AUG 90	Chick, 71.5 g.,
	tarsus 31.8, culmen 15.6, wing 97
	Still all downy except wings and tail.
13 SEP 90	Empty, toothpick set.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8551

Date	
27 AUG 89	Chick, new band # 3496, 96.5 g., tarsus 31.7, culmen 16.1, wing 140 Down remaining on head only.
1 OCT 89	Empty
25 MAR 90	Xantus' Murrelet on eggs (not collected).
22 APR 90	Adult, new band # 19703, weight 60.0 g. no egg. Brood patch # 3, oiled # 2.
6 MAY 90	Empty except for one Xantus' Murrelet egg.
12 MAY 90	Two Xantus' Murrelet eggs (collected).
13 MAY 90	Empty
19 MAY 90	Empty
29 MAY 90	Empty
30 MAY 90	Adult, banded but unreachable. No egg visible.
14 JUN 90	Empty, toothpick set.
23 JUN 90	Toothpick down, reset.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick down, reset.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick up.
7 AUG 90	Toothpick down, reset.

NEST RECORD (CONTINUED)

Nest # 8551

Date	
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick down, reset.

NEST RECORD

Nest # 8552

NOTE: On 14 AUG 1989 a chick was noted in this nest, but was unreachable. A number was not assigned to this nest until 19 MAY 1990.

Date	
19 MAY 90	Empty, toothpick set.
29 MAY 90	Toothpick down, reset.
30 MAY 90	Toothpick down, reset.
14 JUN 90	Adult, unreachable. No egg visible.
23 JUN 90	Adult, unreachable, on egg.
14 JUL 90	Adult, unreachable, on egg.
15 JUL 90	Adult, unreachable, on egg.
23 JUL 90	Adult, unreachable, egg not noted.
28 JUL 90	No adult, egg fragment visible, chick possibly hidden to right.
29 JUL 90	Same as yesterday.
7 AUG 90	Empty, toothpick set.
26 AUG 90	Chick, new band # 19810, 86.5 g., tarsus 30.0, culmen 15.5, wing 67 Chick completely downy.
13 SEP 90	Chick, 100.0 g., tarsus 32.6, culmen 14.2, wing 125 Down remaining on belly and head only.

NEST RECORD (CONTINUED)

Nest # 8552

Date	
22 SEP 90	Chick, 79.5 g., tarsus 32.3, culmen 15.4, wing 158 Trace of down on vent only, vomited oil only.
23 SEP 90	Chick still present.

NEST RECORD

Nest # 8553

Date	
30 MAY 90	Adult, new band # 19716, no egg visible.
14 JUN 90	Empty, toothpick set.
23 JUN 90	Toothpick down, reset.
14 JUL 90	Toothpick down, reset.
15 JUL 90	Toothpick down, reset.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Toothpick down, reset.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick down, reset.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8554

Date	
29 MAY 90	Egg, no adult.
30 MAY 90	Egg, no adult.
14 JUN 90	Egg, no adult.
23 JUN 90	Broken egg (collected)

NEST RECORD

Nest # 8555

Date	
30 MAY 90	Egg, no adult.
14 JUN 90	Broken egg only.
23 JUN 90	Broken egg only.
14 JUL 90	Adult, unreachable, on egg. Broken egg in front of nest 29.0 X 22.4 mm.
15 JUL 90	Same as yesterday.
23 JUL 90	Adult, unreachable, egg not visible.
28 JUL 90	Adult, new band # 19791, egg not noted, oiled # 2.
29 JUL 90	Empty.
7 AUG 90	Adult, band # 19791, on egg.
26 AUG 90	Empty, broken egg. Toothpick set.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8556

Date	
30 MAY 90	Adult, unreachable, on egg.
14 JUN 90	Adult, new band # 19718, on egg.
23 JUN 90	Adult, unreachable, on egg.
14 JUL 90	Empty, toothpick set.
15 JUL 90	Toothpick down, reset.
23 JUL 90	Toothpick down, reset.
28 JUL 90	Toothpick down, reset.
29 JUL 90	Nest not checked.
7 AUG 90	Toothpick down, reset.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8557

Date	
14 JUN 90	Adult, new band # 19717, on egg.
23 JUN 90	Adult, new band # 19721
	Chick, 23.2 g.,
	tarsus 12.8, culmen 9.5.
14 JUL 90	Chick, new band # 19724, 66.0 g.,
	tarsus 26.5, culmen 14.0, wing 40
15 JUL 90	Same as yesterday.
23 JUL 90	Chick, 50.0 g.,
	tarsus 28.6, culmen 15.0, wing 59
28 JUL 90	Chick, 45.0 g.,
	tarsus 28.9, culmen 14.8, wing 66
	Juvenile feathers emerging on back.
29 JUL 90	Same as yesterday.
7 AUG 90	Chick, 50.0 g.,
	tarsus 30.0, culmen 14.5, wing 77
	Back mostly feathered, also upper breast.
26 AUG 90	Chick, 56.5 g.,
	tarsus 30.3, culmen 16.0, wing 128
	Down remaining on head and vent only.
13 SEP 90	Chick, 61.0 g.,
	tarsus 31.0, culmen 16.1, wing 165
	Down remaining on vent only.
22 SEP 90	Empty, toothpick set.

NEST RECORD, CONTINUED

Nest # 8557

Date	
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8558

Date	
25 MAR 90	Xantus' Murrelet, two eggs collected.
6 MAY 90	Two adults in nest, not handled.
14 JUN 90	Adult, unreachable, on egg.
23 JUN 90	Adult, band # 3446, on egg.
28 JUN 90	Adult, new band # 19793, on egg, oiled # 1.
29 JUN 90	Adult, not handled, on egg.
7 AUG 90	Broken egg. toothpick set.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick up.
22 SEP 90	Toothpick up.
23 SEP 90	Toothpick up.

NEST RECORD

Nest # 8559

Date	
14 JUN 90	Adult, unreachable, on egg. Also Xantus' Murrelet on eggs nearby.
23 JUN 90	Adult, new band # 19723, on egg.
14 JUL 90	Adult, new band # 19725, on egg.
15 JUL 90	No adult, egg visible.
23 JUL 90	Empty, broken egg.
28 JUL 90	Empty
29 JUL 90	Empty
7 AUG 90	Empty
26 AUG 90	Empty
13 SEP 90	Empty
22 SEP 90	Empty
23 SEP 90	Empty

NEST RECORD

Nest # 8561

NOTE: Adult visible but unreachable on 14 AUG 89, nest number assigned on 23 JUL 90.

Date	
23 JUL 90	Adult, unreachable, egg pipping.
28 JUL 90	Adult, unreachable.
	Chick, 21.0 g.,
	tarsus 13.9, culmen 9.2, wing 20
29 JUL 90	Same as yesterday.
7 AUG 90	Empty, toothpick set.
26 AUG 90	Toothpick down, reset.
13 SEP 90	Toothpick down, reset.
22 SEP 90	Toothpick down, reset.
23 SEP 90	Toothpick down, reset.

NEST RECORD

Nest # 8562

Date	
6 MAY 90	Adult, unreachable, no egg visible.
15 JUL 90	Adult, unreachable, no egg visible.
28 JUL 90	Adult, new band # 19794, no egg visible.
29 JUL 90	Adult, new band # 19803, no egg visible, oiled # 1.
7 AUG 90	Adult, not handled (banded), no egg visible.
26 AUG 90	Empty ?
13 SEP 90	Empty ?
22 SEP 90	Empty
23 SEP 90	Empty