The Short-tailed Albatross, *Diomedea albatrus*, its status, distribution and natural history

With reference to the breeding biology of other northern hemisphere albatrosses

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THE SHORT-TAILED ALBATROSS *(Diomedea albatrus)* is presently an Endangered Species that was formerly abundant in the North Pacific. Owing to the activities of feather hunters operating on the albatross's nesting grounds for a 50-year period in the late 19th and early 20th centuries, the species was almost reduced to extinction.

The Short-tailed Albatross is the largest of the three species of *Diomedea* that breed in the North Pacific (Table 1) and when mature is the only albatross in the North Pacific with a white back. Adults in the definitive plumage are mostly white with a yellowish-buff wash on the head and back of neck. The tip of the tail and distal portions of the wings are dark brown. The bill is stout and predominantly pink with a bluish tip and the feet are pale blue. Juveniles are chocolate brown with large pinkish bills and flesh-colored legs.

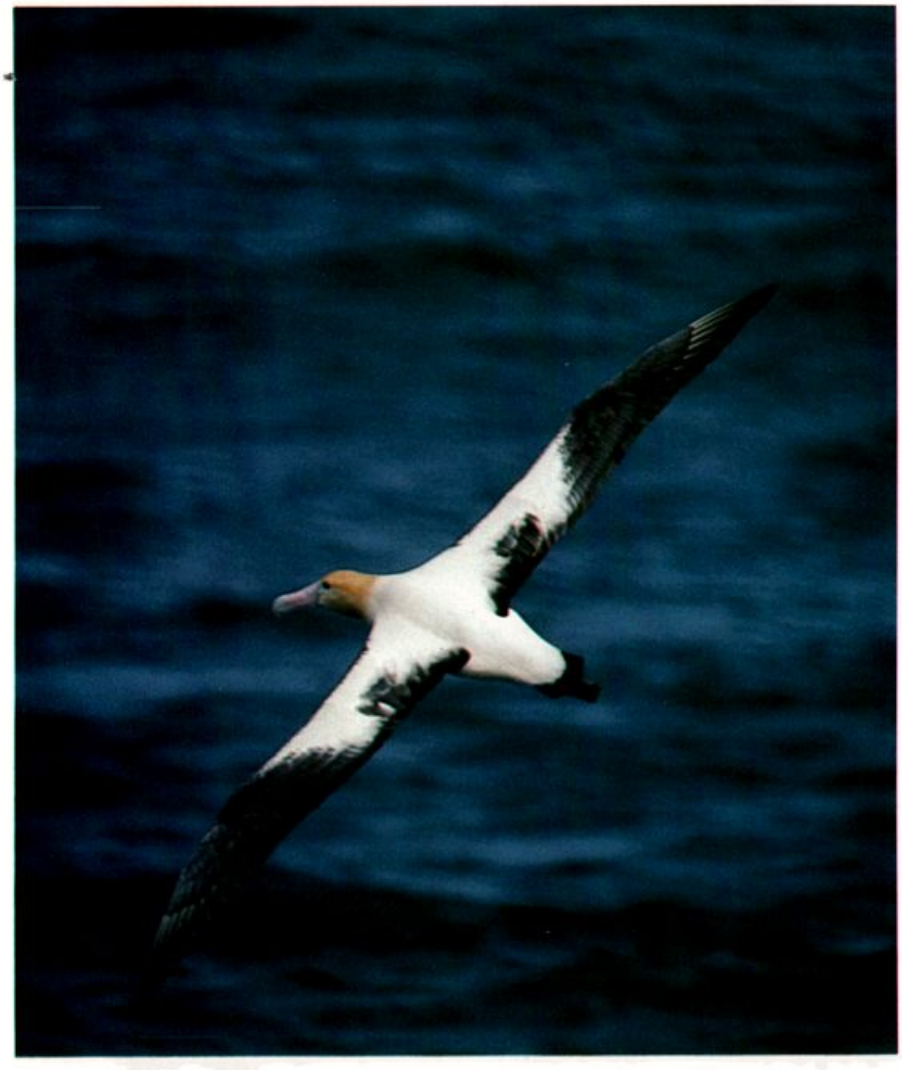

Fig. 1. A fully adult Short-tailed Albatross. All photos/Hiroshi Hasegawa.

Table 1. Approximate measurements of North Pacific Albatrosses (from Palmer 1962).

Species	*Length (cm)*	*Wingspan (cm)*
Diomedea albatrus	94	213
Diomedea nigripes	69–74	193–213
Diomedea immutabilis	79–81	203

As the birds grow older they become progressively more white, beginning with the face, legs and rump. The change in plumage is gradual, taking ten or more years. Tickell (1975) states that the population of Short-tailed Albatrosses contains many individuals in intermediate plumage and both he and the senior author concur that some birds commence breeding before the definitive plumage is attained.

Short-tailed Albatrosses most closely resemble the Wandering and Royal albatrosses *(D. exulans* and *D epomophora)* of the southern oceans, the only other albatrosses with white backs. However, confusion with these species is unlikely since they occur in different hemispheres. Mature Short-tailed Albatrosses are most likely confused with mature Laysan Albatrosses *(D. immutabilis)* although the latter are considerably smaller and have dark backs. Immature Short-tailed Alba-

trosses could be confused with Black-footed Albatrosses *(D. nigripes)* but the latter are smaller and have dark bills and feet In all plumages, the large size and stout pinkish bill (Fig. 2) readily distinguish Short-tailed Albatrosses from their two relatives in the North Pacific.

PRESENT STATUS

THE SIZE OF THE population of Short-tailed Albatross prior to exploitation is not known, but it was certainly large Hattori (1889, *in* Austin 1949) estimated over 100,000 birds on Torishima Island during the busiest time of feather gathering. During a 17-year period over 5 million Short-tailed Albatrosses were supposedly taken from their nesting islands. Currently the population of Short-tailed Albatrosses is slowly increasing and numbers at least 250 individuals (Hasegawa 1982).

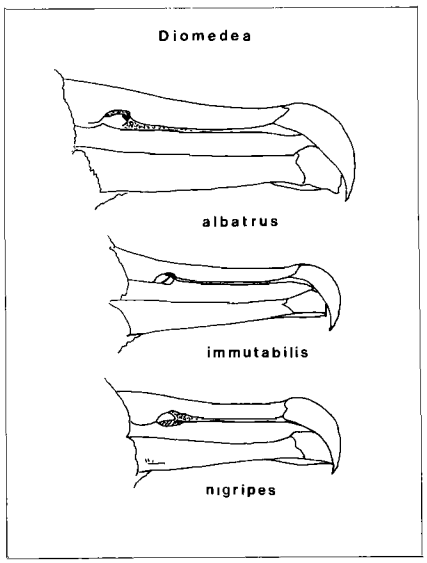

Fig 2. A comparison of bills of North Pacific albatrosses. Adapted from Handbook of North American Birds, Palmer, R.S., Ed. Yale 1962.

Torishima, the last known nesting place of the Short-tailed Albatross, was designated a no-hunting area by the Japanese Government in 1933, and later a national monument in 1958. The albatross itself became protected by the Japanese Government in 1947. The endangered status of the albatross was internationally recognized at the I.C.B.P. Congress in Tokyo in 1960, and the Japanese Government correspondingly designated the species a national monument in 1962. The United States Fish and Wildlife Service listed the Short-tailed Albatross on the Endangered Species list in June 1970 (Federal Register No. 8495).

BREEDING DISTRIBUTION

SHORT-TAILED ALBATROSSES were restricted as breeding birds to islands in the North Pacific west of the Izu-Bonin Island chain. The most comprehensive list of former breeding sites (Hasegawa 1979) shows the species breeding on at least nine sites in the western North Pacific (Fig. 3). Conceivably a number of other islands also would have been suitable nesting sites.

Early naturalists in Alaska, among them Kotzebue and Dall thought that Short-tailed Albatrosses nested in the Aleutian Islands. These naturalists were unaware of the winter nesting season of the albatross on islands to the southwest and mistook the abundance of albatrosses near the Aleutian Islands during summer as evidence of local nesting.

Short-tailed Albatrosses now nest only on Torishima (Bird Island) in the Seven Islands of Izu, which lie 580 km south of Tokyo (Fig. 3). Following a period of intense fowling and two volcanic eruptions it was feared that the albatross was extinct. However, a few nests were found in 1950 by a member of the meteorological station on Torishima and the species has continued to thrive there.

Short-tailed Albatrosses have also been observed during the breeding season recently in two other areas: Minami-kojima in the Senkaku Islands (southern Ryukyu Islands, Fig. 3) and the leeward Hawaiian Islands. Short-tailed Albatrosses were observed on Minami-kojima, a historical breeding site, as early as 1971 (Ikehara and Shimojana 1971). Ikehara and Okada (*pers. comm., in* Hasegawa 1982) observed 35 birds there in 1980. Breeding is suspected but unconfirmed at this time. Both adult and immature albatrosses have appeared in recent years on Midway Island, French Frigate Shoals, and Tern Island in the Hawaiian chain (C.S. Harrison, *pers. comm.*). One persistent individual has returned to Midway yearly since 1971. Breeding is not known at these islands.

MARINE RANGE

FORMERLY Short-tailed Albatrosses ranged south to the coast of China, in the Japan and Okhotsk seas, north into the Bering Sea from the Komandorskie Islands to the Diomede Islands in Bering Strait and Norton Sound and throughout the North Pacific from Alaska to Baja California (Fig. 4, A.O.U. Check-list 1957). They were especially common in regions of high biological productivity such as along the Pacific coast of North America, in the Aleutian Islands, and Bering Sea. In contrast to Laysan and Black-footed albatrosses, which infrequently venture onto the shallow waters of the continental shelf (Gould *et al., in press*). Short-tailed Albatrosses were abundant in shallow waters of coastal North America, especially Alaska. Turner (1886) found Short-tailed Albatrosses in great abundance near Cape Newenham in Bristol Bay, Alaska and even observed them at the mouth of the Kuskokwim River. Both Turner and Nelson (1887) found them near St. Lawrence Island and as far north as Bering Strait. Bean (*cf.* Nelson 1887) found them in the Gulf of Alaska and considered the vicinity of the Barren Islands in Lower Cook Inlet to be one of their favorite haunts. Elliot (1898) notes that they were formerly abundant near the Pribilof Islands where they fed on the wastes from the whaling fleets that plied the waters of the Bering Sea. Furthermore, Short-tailed Albatrosses once ventured close enough to land to be regularly captured by North American natives for food from California north to St. Lawrence Island (Howard and Dodson 1933, Friedman 1934, Murie 1959). Bean states that natives from Kodiak Island sometimes speared them from their kayaks. Subsistence use of Short-tailed Albatrosses was particularly evident in the Aleutian Islands where they were the greatest overall contributor to the avian portion of the Aleut diet (Yesner 1976, Yesner and Aigner 1976). Yesner suggests that Short-tailed Albatrosses concentrated in inter-island passes, thereby becoming available to Aleut hunters.

Other than observations in Hawaii and on Minami-kojima, there have been few recent sightings of Short-tailed Albatross away from their breeding island on Torishima (Table 2). Most of the sightings in the eastern Pacific have occurred close to land in regions of heavy ship traffic often frequented by experi-

enced birders. Much of this species' historic marine range is rarely under observation. Even in Alaska where the species was once very abundant, it is rarely seen although recent activity in the western Aleutian Islands and Bering Sea has resulted in a number of sightings (Table 2). A measure of the species' current rarity is available through the United States Fish and Wildlife Service's marine bird program in Alaska. Since 1975 only one sighting has been made during the summer months on shipboard and aerial surveys that have covered 15,000 km^2.

SEASONAL MOVEMENTS

THE SEASONAL MOVEMENTS of the Short-tailed Albatross are poorly known. Birds begin arriving at Torishima in early October, increasing in number until breeding begins in late October. Failed breeders and nonbreeders depart Torishima in winter and spring, and successful breeders and fledglings depart from late May to June. Short-tailed Albatrosses probably scatter widely but may concentrate in nutrient-rich waters. The relatively few sightings of Short-tailed Albatross in the past 20 years suggest that the species still wanders over much of its original marine range, but in greatly reduced numbers.

HISTORY OF EXPLOITATION

THE HISTORY OF NEAR TOTAL extermination of Short-tailed Albatrosses from Torishima is well known (Austin 1949, Tickell 1975, Harrison 1979, Hasegawa 1979). Settlement of Torishima dates back to 1887 and fowling began then or several years earlier. The demand for albatross feathers increased, since they made excellent feather quilts. Carcasses were rendered into oil and fertilizer. By 1900 the human settlement on Torishima had increased to 300, largely supported by harvesting albatrosses. In 1902 the volcano on Torishima erupted, killing 125 people, but despite this the island remained inhabited and the slaughter continued until 1922 when the inhabitants withdrew. Torishima was resettled by man again in 1927 and fowling began anew. By 1929 fewer than 2000 albatrosses remained.

Fowling on Torishima was initially banned by the Japanese government in 1933 but nevertheless it persisted. A last great slaughter occurred in 1932 in anticipation of the new government edict in 1933. By 1933, only 30-50 birds were seen. The volcano on Torishima erupted again in 1939, burying much of the albatross's nesting grounds.

A Japanese naval garrison of 300 men was stationed on Torishima during World War II. Only one albatross was seen during this time. The garrison was withdrawn in 1945 and Torishima remained uninhabited until 1947 when a civilian meteorological station was established. Austin (1949) circumnavigated Torishima in 1949 but did not see any albatrosses. However in 1950 a few nests were rediscovered on the south side of the island and the population has been increasing ever since.

NATURAL HISTORY

TORISHIMA IS PRESENTLY an uninhabited, active volcanic island 403 m high and 2.6 km in diameter. It is characterized by four low peaks, 353 m or higher and two lava flows that breach the caldera, which lines the periphery of most of the island (Fig. 5). Short-tailed Albatrosses now nest only at Tsubamezaki (Swallow Point) on the south side of the island.

The breeding season of the Short-

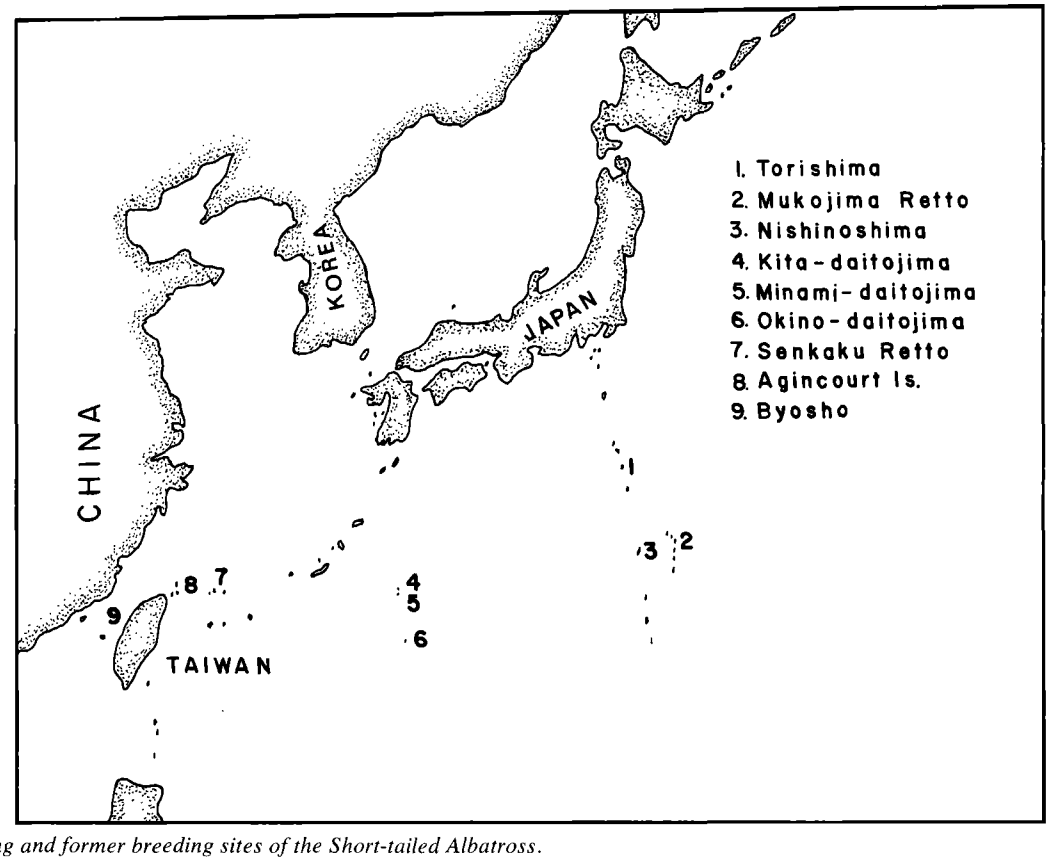

Fig. 3. Breeding and former breeding sites of the Short-tailed Albatross.

Table 2. Summary of recent pelagic or vagrant sightings of Short-tailed Albatrosses (updated from Sanger 1972).

Location	*Date*	*Remarks*	*Source*
NORTHEASTERN PACIFIC			
Gulf of Alaska	6/9/1940	No distinguishing marks noted	Gabrielson 1944
70 mi off San Francisco	2/17/1946	Adult, valid record	Traylor 1950
Gulf of Alaska *ca.* 59°N, 141°W	11/25/1947	Imm. valid record	Kenyon 1950
Off SE Alaska 57°30′N, 130°14′W	5/14/1956	Imm., distinguishing marks limited	Sanger 1964
40 mi off Vancouver I.	6/11/1960	Imm. photographed	Lane 1962
32 mi off Oregon	12/11/1961	Imm. photographed	Wyatt 1963
38 mi off S. Washington	5/3/1970	Sub-adult, photographed; questionable record	Wahl 1970
Ocean Station Papa, 50°N, 145°W	6/24–26/71	Imm., photographed	Gruchy *et al.*, 1972
100 km w. of San Diego	8/1977	Characters noted	McCaskie (1978)
Monterey Bay, Calif.	4/20/1978	Sub-adult, photographed	Helm (1980)
25 km off Westport, Oreg.	9/30/1979	Doubtful record	Hunn and Mattocks (1979)
Near Sanak I., Alas., 54°02′N. 162°11′W	4/29/1980	Adult	Kessel and Gibson, unpubl.
NORTHWESTERN PACIFIC			
Near W. Aleutians	6/7/1944	Distinguishing marks not noted.	Arnold 1948
Open ocean, 40°04′N, 147°55′W	5/17/1951	Adult, valid record photographed	MacDonald 1952
Open ocean, 49°N, 176°E	4/22/1954	Adult, probably valid	Poole 1966
12 mi SW of Kushiro, Japan	4/18/1957	Questionable record	Kuroda 1963
Open ocean, 33°N, 140°E	12/4/1959	Two adults	Tramontano 1970
Open ocean, 30°N, 140°E	2/17/1961	Immature	Tramontano 1970
Open ocean, 33°N, 145°E	3/30/1962	Adult and immature	Tramontano 1970
34°N, 164°E	4/5/1962	Sub-adult, valid record	J.P. Mihlbauer *(in litt.)*
SW Attu I.	8/16/1962	Characters not noted	Boggs and Boggs 1964
NE Attu I.	8/16/1962	Possibly Laysan	Boggs and Boggs 1964
Off Honshu, 37°41′N, 141°30′E	12/15/1963	Juvenile, valid record	Kuroda 1963
Open ocean, 35°N, 145°E	2/4/1966	One adult	Tramontano 1970
Amchitka Pass	5/23/1968	Adult, characters noted	Sowl *(pers. comm.)*
39°10′N, 145°E	4/19/1976	Adult and sub-adult	Taniguchi 1976
W Aleutians, 52°N, 177°47′E	8/27/1976	Adult	Gibson and Byrd 1977
Off Kagalaska I., c. Aleutian Is.	6/26/1978	Sub-adult, not a positive I.D.	Kessel and Gibson, unpubl.
Enoshima, Japan, 38°25′N, 141°35′E	8/2/1978	Dead adult, collected	Kurechi *(pers. comm.)*
Bering Sea, 57°30′N, 177°W	7/21/1979	Immature, photographed	DeGange, unpubl.
33°55′N, 139°15′E	2/23/1980	Immature, photographed	Hasegawa, unpubl.
28°40′N, 143°17′E	3/17/1981	Adult	Tanaka *(pers. comm.)*
30°30′N, 142°21′E	3/18/1981	Immature	Tanaka *(pers. comm.)*
38°30′N, 141°45′E	4/18/1981	Adult	Kurechi *(pers. comm.)*
S Amchitka Pass, 50°46′N, 179°31′E	6/7/1981	Immature, photographed	Everett *(pers. comm.)*
31°26′N, 143°24′E	1/23/1982	Immature, photographed	Tanaka *(pers. comm.)*
32°30′N, 134°E	2/21/1982	Immature	Brasil *(pers. comm.)*
50°57′N, 174°24′E	7/18/1982	Immature, photographed	Rowlett *(pers. comm.)*
Bering Sea, 52°17′N, 177°23′E	7/31/1982	Sub-adult	Rowlett *(pers. comm.)*
CENTRAL PACIFIC			
Open ocean, 32°33′N., 138°05′W	4/10/1962	Young bird	Kuroda 1963
Eastern I., Midway, Haw.	3/18/1966	Adult, banded	C.S. Robbins *(pers. comm.)*
Midway, Haw.	Winter 1972–1975	Adult	Sekora 1977
Tern I., French Frigate Shoals, Haw.	11/75–2/76	Immature	Sekora 1977
Laysan Island, Haw.	3/28/76	Immature (possibly same as on Tern I.)	Sekora 1977
Midway, Haw.	Fall/winter 1977/78, 1978/79 1979/80, 1980/81	Adult (same as in 1972–1975)	Harrison *(pers. comm)*
Midway	Winter 1981	Juvenile	Harrison *(pers. comm)*
Tern I., French Frigate Shoals	Winter 1981	Adult	Harrison *(pers. comm)*

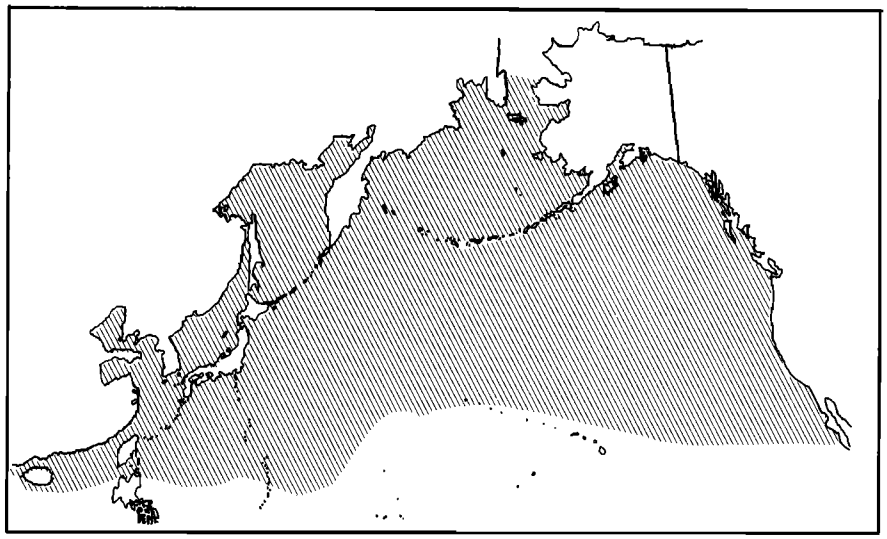

Fig. 4. Marine range of the Short-tailed Albatross.

tailed Albatross begins in early October with the arrival of adults on Torishima. Previously paired adults return to nearly-identical sites each year. Albatrosses are monogamous; they usually pair with the same mate year after year. Pair bonds normally remain intact until broken by the death or disappearance of one of the partners. "Divorces" are very rare. Courtship consists of a highly ritualized series of displays and vocalizations. A detailed study of the breeding behavior of Short-tailed Albatrosses has not been undertaken but it is probably similar to other albatrosses. In Laysan Albatrosses copulation begins within hours of the arrival of the first experienced females and reunion with their mates on the territory (Fisher 1971). The nest site becomes the focal point for the breeding pair during the nesting season.

Historically, Short-tailed Albatrosses seemed to prefer level, open areas adjacent to tall clumps of the grass *Miscanthus sinensis* for nesting. They now nest only on the open, sparsely vegetated slopes of Tsubame-zaki. Although since the last eruption, grasses have never been abundant at Tsubame-zaki, there is some evidence that as the albatross became more numerous the grass became stunted and began to disappear, probably as the result of trampling. A composite *(Chrysanthemum pacificum)* has replaced the grass in part but nevertheless the soils have become more unstable. During the 1960s and early 1970s Short-tailed Albatrosses nested primarily in the eastern subcolony at Tsubame-zaki where the grass was tall and abundant, but as the grass disappeared there has been a gradual shift to the west subcolony where more grass is found. As a result of albatross activity there, some vegetation has been trampled and eliminated (Hasegawa 1978). Loss of vegetation with the resultant destabilization of loose volcanic soils have made the albatrosses more susceptible to strong winds and blowing ash which may be responsible in part for the lower reproductive success of Short-tailed Albatrosses in the mid-to late 1970s (Hasegawa 1980).

Tickell (1975) describes the nests of Short-tailed Albatrosses as scoops in the volcanic ash lined with and built up with grass. Hattori (*in* Austin 1949) visited Torishima when albatrosses were still abundant and found concave nests of earth about two feet in diameter usually constructed in an open, grassy area. Like other albatrosses, nest building in Short-tailed Albatrosses probably occurs throughout incubation.

The nestling periods of Short-tailed Albatrosses are long, usually five months or more and the fledglings depart Torishima by mid-June (Hasegawa 1980).

Short-tailed Albatrosses lay a single egg which Godman (*in* Bent 1922) describes as dull white and marked at one end with a profusion of red spots and blotches, many of which are confluent and form a distinct cap. Egg measurements of 43 eggs averaged 116.1mm × 74.2mm (Bent 1922).

Egg laying by Short-tailed Albatrosses occurs from late October through early November (Hasegawa 1980). Incubation of the egg is shared by

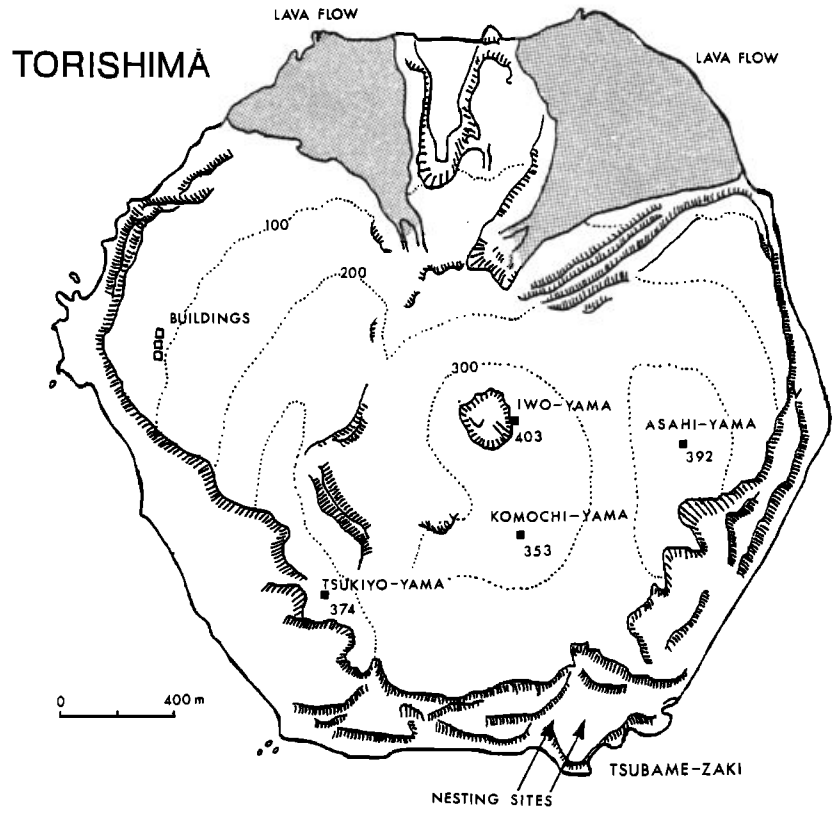

Fig. 5. Map from Hasegawa, 1982.

both parents. The incubation spans vary considerably and are dictated by how long the off-duty member of the pair remains at sea. In Laysan Albatrosses the first span by the female is usually less than three or four days. The second span by the male is much longer, averaging 22 days but may be as long as 32 days The third span by the female is only slightly shorter than the second. The following spans are significantly shorter until hatching, which most often occurs during the fifth span (Rice and Kenyon 1962). Laysan Albatrosses lose from 2.5 to 22% of their weight during incubation. Comparable information is not available for Short-tailed Albatrosses.

THE INCUBATION PERIOD for Short-tailed Albatross eggs is about 64-65 days which is similar to Black-footed Albatrosses (63-67 days, Rice and Kenyon 1962), Laysan Albatrosses (62-67 days, Rice and Kenyon 1962; 55-72 days, Fisher 1971), Black-browed Albatrosses, *D. melanophris,* (68 days, Tickell and Pinder 1975) and Gray-headed Albatrosses, *D. chrysostoma,* (72 days, Tickell and Pinder 1975). Hatching occurs from late December through early January. Initially, albatross chicks are brooded and then "guarded" by their parents. It is known that some species do not recognize their own eggs or chicks. Rice and Kenyon (1962), experimenting with Laysan Albatrosses, found that breeding adults will ignore their egg or chick if they are displaced as little as two meters from the original nest site. They are fed a mixture of stomach oil and partially digested food which is regurgitated by the adults. The nestling diet varies but squid, flying fish and large crustacea are the most important foods (Hasegawa, unpubl.)

Albatrosses are surface feeders. They are thought to often feed nocturnally because of their fondness for squid, which come to the surface primarily at night. Bent (1922) states that the species feeds heavily on squid. Hattori (*in* Austin 1949) lists crustacea, squid, and miscellaneous fish as food. Short-tailed Albatrosses were known to follow whaling vessels and feed on offal and scraps from whale carcasses. They still follow ships and occasionally feed on galley scraps and fish offal (DeGange unpubl. obs , R.A. Rowlett, *pers. comm.*).

Most Short-tailed Albatrosses probably first return to Torishima to breed as eight- or nine-year-olds although there are individual records of a five-, a six-, and a seven-year-old breeding (Hasegawa, unpubl.). [Age at first breeding for Laysan Albatrosses is five-to-ten years with most individuals breeding at eight or nine years of age (Fisher 1969)]. Rice and Kenyon (1962) suspect that Blackfooted Albatrosses first return to breed as seven-year-olds. Tickell (1968) found that Wandering Albatrosses first return to breed when between nine and eleven years of age.

Table 3. Reproductive Success of Short-tailed Albatrosses on Torishima.

Year	*No. Eggs*	*No. Hatched*	*% Hatched*	*No. Fledged*	*% Fledged*	*Chicks fledged/ Egg laid*
1955/56[1]	12	4	33	3	75	.25
1956/57[1]	12	8	67	8	100	.67
1957/58[1]	13	5	38	5	100	.38
1958/59[1]	12	9	75	9	100	.75
1959/60[1]	10	7	70	0	0	.00
1960/61[2]	19	10	53	7	70	.37
1961/62[2]	24	11	46	10	91	.42
1962/63[2]	23	11	48	10	91	.43
1963/64[2]	26	12	46	11	92	.42
1964/65[2]	28	12	43	11	92	.39
1972/73[3]	—	—	—	24	—	—
1973/74[4]	40	—	—	11	—	.28
1975/76[4]	—	—	—	No data	—	—
1976/77[4]	40+	—	—	15	—	.38
1977/78[5]	40+	—	—	12–20	—	.30–.50
1978/79[5]	—	—	—	22	—	—
1979/80[6]	50	—	—	20	—	.40
1980/81[6]	54	—	—	2–32	—	.53
1981/82[7]	63	—	—	21	—	.33

[1]from Yamashina Inst. for Ornithology (*in* Tickell 1974).
[2]from staff of Torishima Meteorological Station (*in* Hasegawa 1980).
[3]Tickell (1975). [4]Hasegawa (1978). [5]Hasegawa (1980). [6]Hasegawa (1982).
[7]Hasegawa (unpubl.)

IN MANY ALBATROSS colonies, there will be some individuals which do not return to breed in successive seasons. In fact species such as the Wandering and Royal albatrosses are considered by some to be biennial breeders. The biennial cycle is attributed to the long period of time and great expenditure of energy needed to raise a chick. Thus the period of time between the end of one successful breeding season and the start of another is not sufficiently long for a breeding adult to recover. Fisher (1976) maintains that Laysan Albatrosses are physiologically capable of breeding every year. That some birds do not do this Fisher relates to the availability of food, the number of times a bird pairs and the length of successive pairings, the time required to form a pair bond, the mate's previous experience in breeding and its success at raising a chick. The frequency at which Short-tailed Albatrosses breed is currently unknown.

Tickell (1968) found that annual survival of adult breeding Wandering Albatrosses is about 96%. Assuming that mortality remains constant throughout the life of an adult bird, then a hypothetical 3.8% of the population will reach 40 years of age. Annual survival rates of 93% or higher have also been determined for Laysan Albatrosses (Fisher 1975), Black-browed Albatrosses and Gray-headed Albatrosses *(D. chrysostoma)* (Tickell and Pindr 1975). Annual adult survival rates over 90% are common in other Procellariiformes as well (Ashmole 1973). Estimates of survival and length of life are not known for Short-tailed Albatrosses but several birds banded as nestlings in 1964 are still nesting on Torishima, making them 18 years old (Hasegawa, unpubl.).

HATCHING SUCCESS of Short-tailed Albatross eggs has varied from 33% to 75% during the 10 years for which data exist. In only three of these years has hatching success exceeded 60% (Table 3). Prior breeding experience may influence hatching success In Laysan Albatrosses, hatching success in experienced birds ranged from 68% to 77% and for inexperienced birds, 46% to 66% (Fisher 1971).

Fledging success of Short-tailed Albatrosses for the same ten years with the exception of 1959–1960 was uniformly high (Table 3) but overall reproductive success varied considerably (Table 3). The 1980-1981 season was the best in terms of number of fledglings produced (32) and the second highest in terms of reproductive success (0.59).

Fig. 6. Tsubami-zaki, Torishima.

Fig. 7. The nesting grounds of the Short-tailed Albatross.

Little information is available on causes of mortality in Short-tailed Albatrosses. Rats *(Rattus rattus)* are abundant on Torishima but probably do little damage to the albatrosses (Hasegawa 1982). Fisher (1971) also discounts rats *(Rattus norvegicus)* as a major factor in loss of Laysan Albatross eggs but says they will kill small chicks that are left unattended. Feral cats were present on Torishima for many years but they are believed to have disappeared. Hattori (*in* Austin 1949) cited starvation after losing a parent, death from parasitic insects (probably ticks) and attacks of crows as the principal causes of chick mortality, accounting for one-third of all the chicks on the island. He added that young and even adults often die when trapped in bushy places. Losses of eggs or chicks from desertion, storms, interference from other albatrosses, accidental egg puncturing, disease, and the rolling of eggs from nests are potential sources of mortality. Harrison (1979) suggests that sharks may get some hatching-year birds after they have fledged.

CAUSES FOR CONCERN

TORISHIMA IS AN active volcanic island that has erupted twice in the present century. An eruption during the breeding season could kill many birds as well as destroy the breeding area. Fortunately a small but separate population has established itself on Minami-kojima which could act as a reservoir of birds for later recolonization.

Black-footed Albatrosses also nest on Torishima and are increasing in number more rapidly than Short-tailed Albatrosses (Hasegawa 1978). Several hundred of this species now visit the island. Black-footed Albatrosses have always nested on the lower slopes of Tsubame-zaki in the more rank vegetation but with their increase in numbers they are expanding their nesting area up the slope, even into the nesting area of the Short-taileds. It is too early to assess the impact that enroaching Black-footed Albatrosses will have on the Short-taileds but it is cause for concern and should be watched closely.

The Senkaku Islands are being discussed as a possible site for oil exploration. No such activity is planned for the vicinity of Torishima but tar balls have been found on the beaches.

SURVIVAL

SEABIRDS HAVE LONG LIFE spans, high adult survival from year to year and deferred maturity. Albatrosses represent the extremes of each of these traits. Albatrosses return to the colony for several years before reaching sexual maturity. During these visits albatrosses gain some experience in breeding activities and they establish a pair bond which often lasts for life. The age at which Short-tailed Albatrosses first return to Torishima is not precisely known. The few data available on Short-tailed Albatrosses indicate that some four-year olds arrive on the colony at the beginning of the breeding season in October and that a small portion of two and three-year olds arrive ater in March (Hasegawa 1978; unpubl.). A small percentage of Laysan Albatrosses first return to the colony as

Fig. 8. Adult incubating egg, Torishima.

Fig. 9. A program to improve the nesting habitat of the albatross by transplanting grasses was carried out in June 1981.

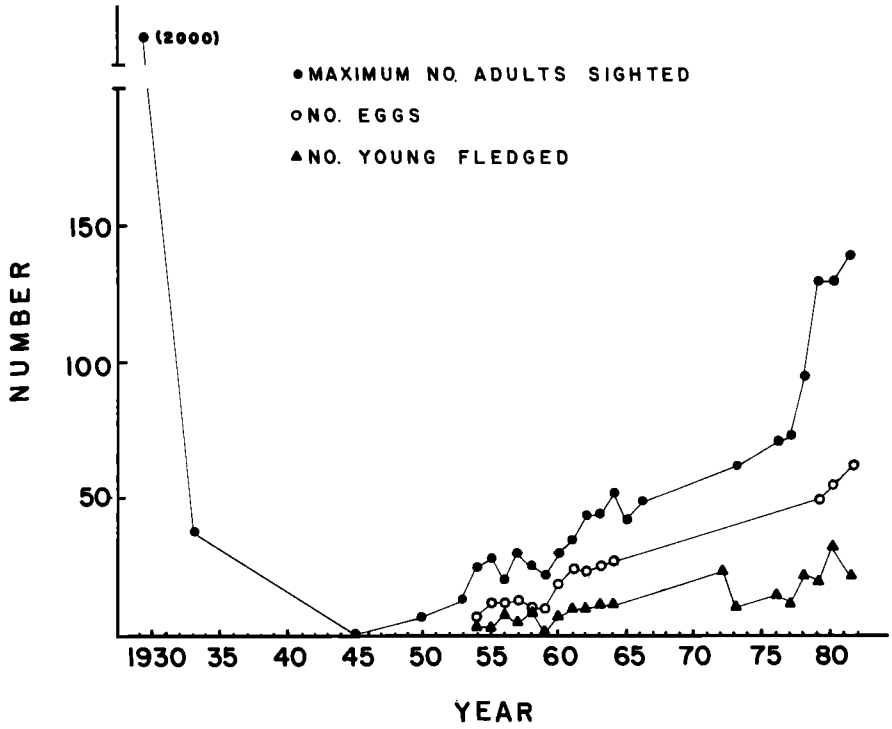

Fig 10. Population growth of Short-tailed Albatross on Torishima.

two-year-olds (Fisher and Fisher 1969). Increasingly more three- and four-year-olds return to the colony for the first time Black-footed Albatrosses also return to the colonies first as two-year-olds but in small numbers (Rice and Kenyon 1962). Wandering Albatrosses first return as four-year-olds (Tickell 1968).

ONGOING RESEARCH

THE SENIOR AUTHOR visits Torishima two or three times yearly to assess reproductive success, band individuals and more recently to transplant grass into the nesting area to stabilize the volcanic soils. Visits are made in November to count incubating adults and eggs and in March to count large chicks and further band birds. Not until June, when all birds have left the island, is the grass-planting project implemented. The senior author has also visited Minami-kojima and along with other Japanese scientists, will continue to monitor this distant sub-population.

Protection almost came too late for the Short-tailed Albatross, yet another victim of over-exploitation and ignorance of wildlife conservation principles. Fortunately, the population of Short-tailed Albatrosses continues to slowly increase and now numbers at least 250 individuals. Given this increase in albatross numbers, strict protection along with the present limited management plan may be the best way to insure the species' survival. Hopefully, more intensive propagation techniques will not be needed in the future. We are optimistic that this impressive bird will once again be seen with regularity along the coastlines of its vast marine range.

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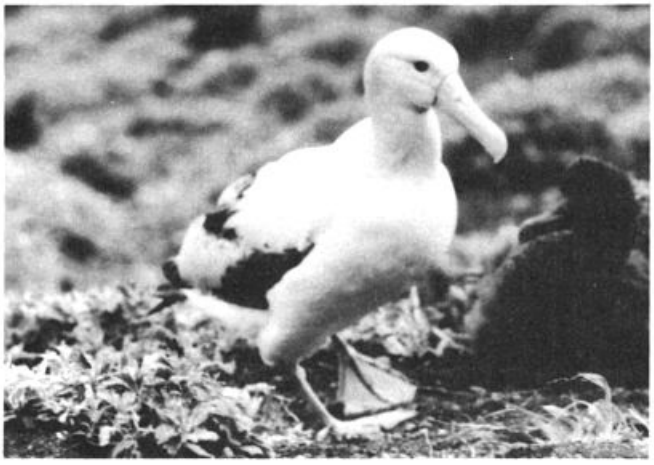

Fig. 11. Parent bird with chick, Torishima.

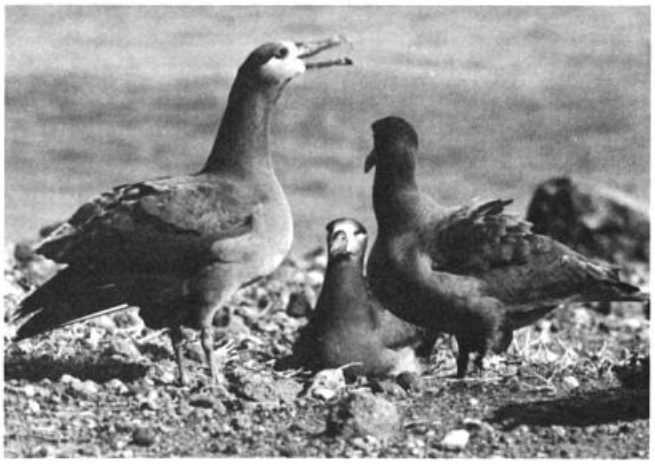

Fig. 12. At the lower slope of Tsubami-zaki another species of albatross, Black-footed (Diomedea nigripes), *is nesting.*

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