

BIRDS OBSERVED DURING TWO CROSSINGS OF THE PACIFIC OCEAN

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Several recent papers have dealt with the distribution of pelagic birds in one or more areas of the Pacific Ocean. Yocom (1947) reported on birds from four oceanic stations in the North Pacific. Thompson (1951) added valuable data on the Black-footed Albatross (*Diomedea nigripes*) observed between San Francisco and Hawaii. Arnold (1948), Kuroda (1955), and Hamilton (1958) reported general observations and gave data on the Black-footed Albatross in several areas of the North Pacific. Dixon and Starrett (1952) published observations on seabirds of the Western Pacific Ocean and King and Pyle (1957) discussed observations made in the South Pacific.

In July, 1959, I crossed the Pacific Ocean on a passenger ship enroute to Australia. A return trip was made between August 3 and September 3, 1960. The courses of the crossings are shown in figure 1. Both ships maintained an average speed of 22 knots. A total of 36 days of observations at sea was possible. Table 1 lists the daily noon position of the ships, the air and water temperatures, humidity, and approximate wave height. Observations were carried out from the upper boat deck astern. From this vantage point, approximately 80 feet above the ocean surface, the sky overhead and astern plus both port and starboard beams could be observed by walking a few feet to either rail. Four hours of observations with 7×50 binoculars were conducted daily during the following periods: 7:00 to 8:00 a.m., 11:00 a.m. to noon, and 4:00 to 6:00 p.m. In addition the boat deck was checked almost every night for any birds that might have settled thereon after having been attracted by the ship's lights. No such birds were found. The numbers of individuals observed and identified are listed in the species accounts. All figures represent accumulated daily totals.

On the basis of water masses and currents the Pacific Ocean can be divided into the following regions: North Pacific with Subarctic, Western Central and Eastern Central water masses and the Kuroshio, Northern Pacific, Subarctic and California currents; Equatorial region with a single water mass of remarkably uniform character and North Equatorial and South Equatorial currents, and Equatorial Counter-current; South Pacific with the Subantarctic, western South Pacific and eastern South Pacific water masses and the poorly understood Perú Current (Sverdrup, Johnson, and Fleming, 1942). With the possible exception of the eastern South Pacific Water Mass all the areas just mentioned were transited.

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ANNOTATED LIST OF SPECIES

The following species of birds were observed and recorded during the 36 days spent at sea. Peters (1931-1934) has been followed in respect to scientific names and order of listing. Common names are as given in Alexander (1954).

Diomedea exulans. Wandering Albatross. This species was observed on three occasions on the voyage in 1959 and not at all in 1960. It was observed only in the vicinity of New Zealand, either on the day preceding our entry to Auckland Harbor or the two days following our departure. On all but the last day two other species of albatrosses (Light-mantled Sooty and Black-browed) and many

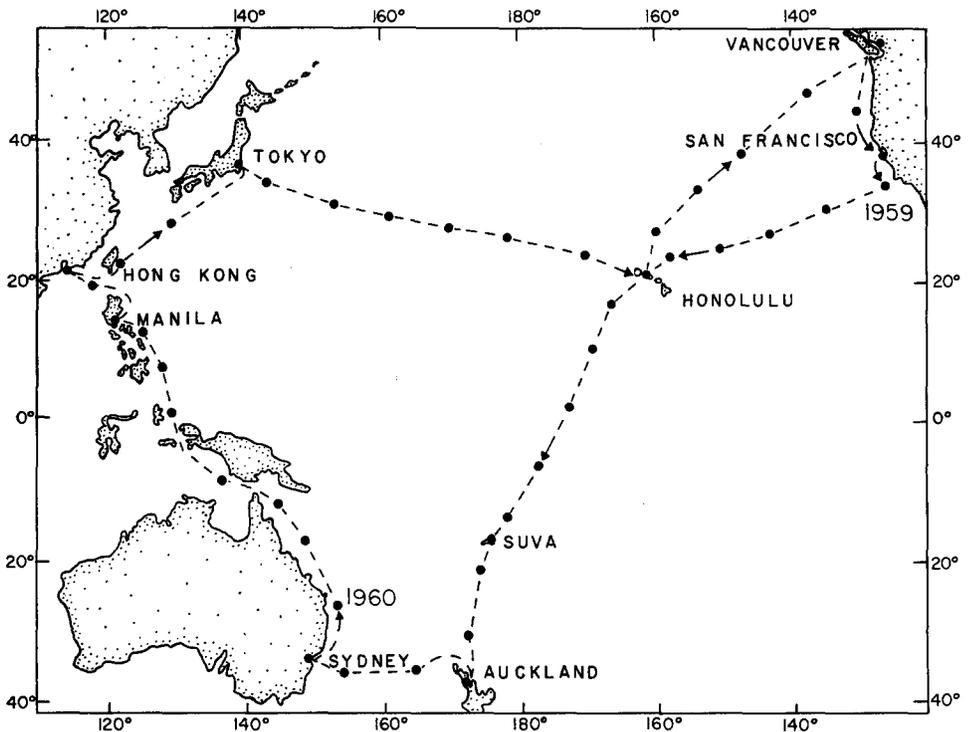


Fig. 1. Daily positions of ship during two crossings of the Pacific Ocean. The ports of Los Angeles and Kobe are not included in the figure.

unidentified petrels were also observed. July 28, 1959, $31^{\circ} 24' S$, $175^{\circ} 46' E$, 6 birds; July 30, 1959, $34^{\circ} 14' S$, $168^{\circ} 45' E$, 6 birds; July 31, 1959, $34^{\circ} 04' S$, $158^{\circ} 16' E$, 3 birds.

Diomedea nigripes. Black-footed Albatross. The occurrence of nonbreeding concentrations and factors influencing such concentrations of this species has interested several writers. Miller (1940), in the course of systematic cruises in the waters off the southern California coast found concentrations of Black-footed Albatrosses in waters which were relatively cold, turbulent, and rich in nutrients and zooplankton. Thompson (1951) found higher concentrations of birds following his ship in the cooler waters of the California Current than in the warmer waters to the west. He concurs with Miller that concentrations of birds appear greater in waters of relatively low temperature. It is assumed here that it is not the water temperature itself which is influencing the distribution of albatrosses but rather the apparent higher concentrations of food in the relatively cooler waters. Farther north Yocom (1947) found a more constant distribution in both warm and cold waters. Kuroda (1955) found the greatest number of this species in the warmest waters he encountered (see table 2), although his "warmest" is only $14^{\circ} C$. Hamilton (1958:161) reports: "Further, the abundance of this species in the warm (14° - $17^{\circ} C$.) waters off Japan suggests that concentrations are not actually confined to waters of low temperature."

Because of the previous interest in this species the writer was especially alert in observing it. Noted beyond are dates, localities, water temperature, and numbers of birds observed. Table 2 is a comparison of numbers of birds seen in waters of different temperatures as recorded by Kuroda, Hamilton and myself.

The large concentration observed on August 11, 1960, was farther south than one might expect, especially for the time of year, although Cogswell (1946) reported observing this species in the vicinity of Johnson Island ($18^{\circ} N$ latitude) in the month of April, and Swinhoe (1863) reported these albatrosses as being common throughout the year in the Formosa Channel ($25^{\circ} N$ latitude). Tem-

TABLE 1

NOON POSITIONS OF SHIP AND AIR AND WATER TEMPERATURES ENCOUNTERED
IN CROSSING PACIFIC OCEAN

1959	Noon position		Air temp. °C.	Water temp. °C.	Humidity per cent	Waves (height)
	Latitude	Longitude				
July 13	35° 40' N	121° 05' W	13.0	14.5	....	4-6 ft.
14	Port					
15	32° 52' N	122° 38' W	16.0	17.0	80	3-4
16	30° 50' N	132° 34' W	18.0	20.0	80	3-4
17	27° 58' N	142° 11' W	22.0	22.0	72	1-2
18	24° 24' N	151° 01' W	26.0	25.0	64	1-2
19	Port					
20	17° 44' N	159° 56' W	28.0	26.5	72	3-4
21	10° 08' N	164° 40' W	27.5	28.5	88	3-4
22	02° 32' N	168° 52' W	27.5	28.5	92	1-2
23	05° 33' S	173° 11' W	27.5	29.0	72	1-2
24	13° 37' S	177° 18' W	29.0	29.0	78	1-2
25	Lost this day by crossing International Date Line					
26	Port					
27	23° 47' S	177° 04' E	20.0	22.0	86	1-2
28	31° 24' S	175° 46' E	20.0	19.0	76	1-2
29	Port					
30	34° 14' S	168° 45' E	14.5	17.0	90	2-4
31	34° 04' S	158° 16' E	14.5	20.0	96	2-4
1960						
Aug. 3	27° 20' S	153° 30' E	15.5	22.5	56	2-4
4	19° 47' S	148° 17' E	20.5	22.5	45	1-2
5	13° 22' S	143° 40' E	23.0	26.5	60	1-2
6	09° 20' S	137° 07' E	22.5	29.0	80	1-2
7	04° 51' S	129° 21' E	29.0	29.0	85	1-2
8	02° 51' N	124° 48' E	30.0	29.0	87	1-2
9	10° 06' N	121° 45' E	30.5	30.0	86	1-2
10	Port					
11	16° 05' N	119° 02' E	29.5	30.0	83	3-4
12	Port					
13	Port					
14	Port					
15	22° 05' N	121° 22' E	27.5	29.0	85	1-2
16	27° 22' N	129° 13' E	27.5	27.5	82	3-4
17	Port					
18	34° 25' N	139° 15' E	25.0	27.5	65	1-2
19	Port					
20	Port					
21	34° 09' N	146° 29' E	24.5	26.5	92	Typhoon
22	34° 56' N	157° 00' E	24.5	25.5	78	3-4
23	33° 36' N	168° 14' E	25.0	25.5	50	1-2
24 E	30° 35' N	178° 15' E	25.5	26.5	82	1-2
24W	27° 19' N	172° 25' W	25.0	27.5	90	1-2
25	24° 21' N	163° 30' W	25.5	27.5	82	1-2
26	Port					
27	25° 10' N	154° 48' W	25.0	26.5	75	1-2
28	30° 47' N	148° 15' W	24.5	24.5	73	1-2
29	37° 19' N	140° 19' W	22.0	24.5	74	1-2
30	43° 32' N	132° 21' W	16.0	25.5	80	1-2
31	Port					
Sept. 1	Port					
2	44° 15' N	126° 01' W	15.0	20.0	75	1-2

All readings were taken at noon each day with the exception of the sea water temperature which was obtained at 8:00 a.m.

porary climatic conditions might have had considerable influence on the position of these birds, as there had been two severe typhoons between Japan and Formosa just before my observations.

The data reported here would support Hamilton's contention that concentrations are not actually confined to waters of low temperature at least during the summer months. As he further pointed out, extensive observations, a better knowledge of the food habits of this species, and data on the abundance of food in various bodies of water are essential before any final determination can be made of the cause of such concentrations.

Date	Locality		Number	Water temperature
1959				
July 13	35° 40' N	121° 05' W	6	14.5°C.
July 15	32° 52' N	122° 38' W	2	17.0°C.
July 16	30° 50' N	132° 34' W	31	20.0°C.
July 17	27° 58' N	142° 11' W	1	22.0°C.
1960				
August 11	16° 05' N	119° 02' E	70+	30.0°C.
August 22	34° 56' N	157° 00' E	3	25.5°C.
August 25	24° 21' N	163° 30' W	50+	27.5°C.
August 29	37° 19' N	140° 19' W	13	24.5°C.
August 30	43° 32' N	132° 21' W	15	22.5°C.
September 2	44° 15' N	126° 01' W	9	20.0°C.

Diomedea immutabilis. Laysan Albatross. Only one individual was observed; it flew along the starboard side of the ship for about 5 minutes and then flew back over the wake in rather characteristic albatross manner. August 22, 1960, 34° 56' N, 157° 00' E.

Diomedea melanophris. Black-browed Albatross. Three of this species were observed in the afternoon one day before entering Auckland Harbor. Two other species of albatrosses (Light-mantled Sooty and Wandering) were observed early in the afternoon, but by 4:00 p.m. only two of the Black-browed Albatrosses were still foraging in the wake of the ship. Several small black and white petrels were also observed, but no positive identification could be made. July 28, 1959, 31° 24' S, 175° 46' E.

TABLE 2

NUMBER OF BLACK-FOOTED ALBATROSSES OBSERVED AND TEMPERATURE OF SEA WATER IN THE NORTH AND CENTRAL PACIFIC IN JUNE, JULY, AND AUGUST*

Temperature °C.	Numbers			Total
	Kuroda	Hamilton	Wilhoft	
0-1	....	....	....	....
2-3	0	....	....	....
4-5	3	....	....	3
6-7	2	....	....	2
8-9	3	3	....	6
10-11	10	48	....	58
12-13	17	3	....	20
14-15	0	15	5	20
16-17	11	14	2	27
18-19	....	0	0	0
20-21	....	25	12	37
22-23	....	....	16	16
24-25	....	....	6	6
26-27	....	....	50+	50+
28-29	....	....	70+	70+
30-31	....	....	....	....

* Compiled from Kuroda (1955), Hamilton (1958) and Wilhoft. Dots (....) signify temperatures not encountered during observations.

Diomedea cauta. Shy Albatross. Three of these albatrosses were observed in the Tasman Sea together with 6 either female or immature Wandering Albatrosses. July 30, 1959, 34° 14' S, 168° 45' E.

Phoebastria palpebrata. Light-mantled Sooty Albatross. Six of this species were observed on two occasions, each only one day out of Auckland Harbor. It is interesting to note that the two previously recorded species plus the Wandering Albatross were only observed in the immediate vicinity of New Zealand and not farther out at sea. July 28, 1959, 31° 24' S, 174° 46' E, 4 birds; July 30, 1959, 34° 14' S, 168° 45' E, 2 birds.

Puffinus leucomelas. White-faced Shearwater. The day before entering Yokohama Harbor several hundred shearwaters and petrels were observed. Of these birds, 22 were positively identified as White-faced Shearwaters. The others were too far off for positive identification. August 18, 1960, 34° 25' N, 139° 15' E.

Pterodroma phaeopygia. Hawaiian Petrel. For three days (two days before entering Honolulu and one after) these petrels were very numerous. On the first day they were sighted, only three were observed during each of the first two observation periods (7:00 and 11:00 a.m.), but by 4:00 p.m. there were at least fifty birds around the ship. On the second day they were numerous between 11:00 a.m. and noon. Only one was sighted before this hour, even though observations were continuous from 7:00 a.m. By 4:00 p.m. there were literally thousands of them in the vicinity. They appeared to be in groups of a few hundred and as the ship approached, the entire group would lift off the water and fly away from the ship. During this period observations were made from the bow rather than from the stern. On the morning of August 27, when we were east of the Hawaiian Islands, only six petrels were observed and none after this day. I can offer no explanation for the large numbers of these birds to the west of the Hawaiian Island chain and the relatively few to the east. August 24, 1960, 27° 19' N, 172° 25' W, 60 + birds; August 25, 1960, 24° 21' N, 163° 30' W, 2000 + birds; August 27, 1960, 25° 10' N, 154° 48' W, 6 birds.

Phaethon rubicauda. Red-tailed Tropic Bird. This spectacular species was observed on three occasions. On the first and second observation only one individual was seen and on neither occasion did the bird remain in close proximity to the ship for very long. Tropic birds seemed to be curious and would fly over the stern rather low looking at the deck and then fall astern of the ship. During the third observation six of these birds were seen early (7:00 a.m.) in the morning and continued to follow the ship closely for the day. They came very near to the stern and on several occasions flew over the bridge. July 20, 1959, 17° 44' N, 159° 56' W, 1 bird; July 24, 1959, 13° 37' S, 177° 18' W, 1 bird; August 24, 1960, 27° 19' N, 172° 25' W, 6 birds.

Sula dactylatra. Blue-faced Booby. These birds were observed on seven different occasions in the course of the two crossings. Often they would fly close to the ship, apparently curious about it. Although on at least one occasion (August 7, 1960) these birds were seen simultaneously with flying fish, there was no indication of predatory behavior on the part of the boobies. The last two observations of these birds were made somewhat far north for this species, but the typhoons mentioned previously plus a third off the coast of Japan on August 21, just three days previous to these observations, might account for the birds' rather northerly position.

Date	Locality		Number
July 20, 1959	17° 44' N	159° 56' W	1
July 24, 1959	23° 47' S	177° 04' E	2
August 4, 1960	19° 47' S	148° 17' E	18
August 7, 1960	04° 51' S	129° 21' E	12
August 9, 1960	10° 06' S	121° 45' E	69
August 24, 1960	30° 35' N	178° 15' E	1
August 25, 1960	24° 21' N	163° 30' W	11

Sula leucogaster. Brown Booby. Although more individuals of this species were observed than of *S. dactylatra*, they were not as frequently encountered. They were seen on only three occasions and then reasonably close to land. On the two days in 1959 when they were numerous we were in close proximity to small islands situated northeast of Fiji. Likewise in 1960 when these birds were observed, we were close to land passing through the Manipa Straits. At this location they occurred with *S. dactylatra*. On one occasion (August 7, 1960) a booby was observed to dive into the water from a height

of approximately fifty feet, but nothing was seen in its bill when it reappeared. July 23, 1959, 05° 33' S, 173° 11' W, 100+ birds; July 24, 1959, 13° 37' S, 177° 18' W, 50+ birds; August 7, 1960, 04° 51' S, 129° 21' E, 12 birds.

Fregata minor. Great Frigate Bird. Four of these birds were observed on the trip. Three of them were seen when we were only a day out of Honolulu. On each occasion they hovered over the stern of the ship for a few minutes. They appeared to be rather curious and once having looked over the ship they glided away. July 18, 1959, 24° 24' N, 151° 01' W, 1 bird; August 9, 1960, 10° 06' N, 121° 45' E, 1 bird; August 25, 1960, 24° 21' N, 163° 30' W, 2 birds.

Larus novaehollandiae. Silver Gull. Of the several types of gulls that were observed in harbors, the Silver Gull was the only species also observed at sea. It should be pointed out that the last two observations here recorded were made while we were passing between the Great Barrier Reef and the eastern coast of Australia. August 4, 1960, 19° 47' S, 148° 40' E, 24 birds; August 5, 1960, 13° 22' S, 143° 40' E, 50+ birds; August 6, 1960, 09° 20' S, 137° 07' E, 40+ birds.

SUMMARY

Birds observed in the course of 36 days at sea in the Pacific Ocean between San Francisco and Australia, Australia and Japan, and Japan and San Francisco are recorded. The correlation of water temperature with the occurrence of nonbreeding concentrations of Black-footed Albatrosses is compared with results of two other workers. Based on this comparison it is suggested that such concentrations occur in a wide range of water temperatures, from 11° to 29°C. More extensive observations, plus a more precise knowledge of feeding habits of this albatross are needed before final determinations can be made of the causes of concentrations.

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