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The Trade Wind Zone Oceanography Pilot Study
Part VII: Observations of Sea Birds
March 1964 to June 1965

By Warren B. King

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WARREN B. KING

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The Trade Wind Zone Oceanography Pilot Study
Part VII: Observations of Sea Birds
March 1964 to June 1965 [1]

By

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ABSTRACT

Sea birds were observed by scientists of the Smithsonian Institution's Pacific Ocean Biological Survey Program on a systematic basis in the central Pacific Ocean for 15 months as part of the Trade Wind Zone Oceanography Program of the Bureau of Commercial Fisheries Biological Laboratory, Honolulu, Hawaii. Two experienced observers alternated watches each day from sunrise to sunset. Every bird sighted was identified and logged, along with the time and location of observation, the number of birds in the sighting, and, when possible, their age, sex, plumage, molt, behavior, direction of flight, and any other information that might prove pertinent. Twenty-five birds that were captured alive were banded, and 18 birds were collected to help verify sight records of species seldom or never recorded previously in the central Pacific. In 3,561.1 hours of observation, 13,080 sightings were made of 65,707 birds along the replicate cruise track covering 34,384 nautical miles (63,610 km.)

The distribution and abundance of each of the 51 species or field-recognizable subspecies observed within the study area were treated on a monthly and seasonal basis and discussed in the light of the island of origin and breeding phenology of each species. The abundance of sea birds was examined in relation to environmental conditions to show the extent of their association. The composition, distribution, and abundance of flocks of sea birds were analyzed.

INTRODUCTION

From February 1964 through January 1966 the BCF (Bureau of Commercial Fisheries), Hawaii Area, conducted a pilot program as a precursor to a larger scale investigation of the oceanography of the Pacific Trade Wind Zone. Seventeen replicate cruises were made during this period on the BCF research vessel Townsend Cromwell. Each cruise lasted about 20 days and covered a fixed track of 4,460 nautical[2] miles (8,264 km.) to the east, north, and south of the Hawaiian Islands. A report on the oceanography of the Trade Wind Zone Oceanography Program pilot study has been made elsewhere (Charnell, Au, and Seckel, 1967a-f). On 15 of the 17 cruises, scientists of the Smithsonian Institution's POBSP (Pacific Ocean Bio-

[1] Paper No. 37, Pacific Ocean Biological Survey Program.

[2] All distances and areas are given in nautical miles. One nautical mile equals 1.853 km.

logical Survey Program) made systematic sea bird observations over 34,384 miles (63,610 km.) for a total of 3,561.1 hours. This report summarizes the observations made on these cruises.

The outer perimeter of the cruise track bounds about 500,000 square miles (171.2 million ha.) of which 5,204 square miles (1.78 million ha.) are land (Hawaii, Maui, Lanai, Molokai, Kahoolawe). Figure 1 indicates the position of the nominal cruise track in the Pacific Ocean. All except two cruises started and ended at Honolulu, Hawaii; one started at Kauai and one at Maui. Cruises were made each month of the study period except August 1964 and from July to December 1965. No POBSP observer participated in the cruises of February 1964 or January 1966. Table 1 gives departure and arrival dates of the cruises on which POBSP observers were present. Cruises are referred to in the text by the month of departure.

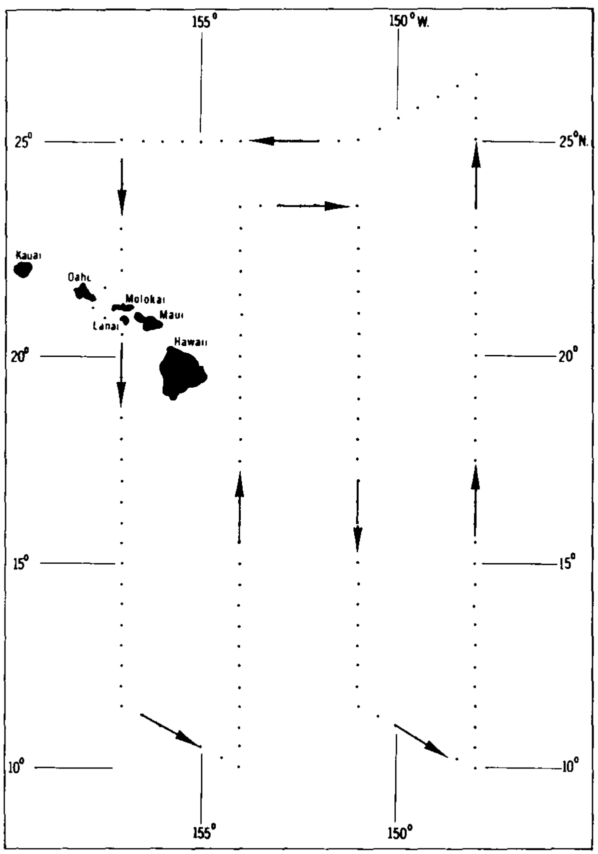


Figure 1.--Replicate track in central Pacific Ocean followed during monthly cruises of the Townsend Cromwell, March 1964 to June 1965. Dots represent locations of oceanographic stations.

The study of the distribution of sea birds is an indirect but effective method for studying the distribution of fishes, since this study provides oceanographers with a visible biological link between the oceanographic phenomena, planktonic organisms, and the fishes of the sea.

Table 1.--Departure and arrival dates, and extent of observations of sea birds on TWZOP cruises of the Townsend Cromwell

Cruise number	Departure date	Arrival date	Hours of obs.	Miles of obs.
2	3/16/64	4/5/64	236.5	2,245
3	4/12/64	5/4/64	242.7	2,338
4	5/17/64	6/5/64	253.1	2,507
5	6/15/64	7/5/64	256.2	2,457
6	7/13/64	8/1/64	244.8	2,468
8	9/1/64	9/20/64	231.5	2,318
9	10/1/64	10/20/64	222.1	2,169
10	11/4/64	11/24/64	216.6	2,114
11	12/1/64	12/20/64	210.0	2,063
12	1/5/65	1/24/65	214.4	2,105
13	2/8/65	2/27/65	222.7	2,139
14	3/8/65	3/28/65	231.8	2,172
15	4/11/65	4/30/65	244.0	2,419
16	5/12/65	5/31/65	250.8	2,431
17	6/10/65	7/2/65	282.2	2,439

Methods of Observation

Observations were maintained continuously from sunrise to sunset, with at least one observer on watch at all times. The watch was held on the wings of the ship's bridge (eye level 7 m. above sea level), which permitted observations covering an arc of 270°. When wind and waves were low or running with the ship, observations were made on the bow from a height of 6 m. Although the arc of observation was wider from the bow, birds could be spotted more readily from the bridge. Bushnell[3] 7 x 35 extra wide angle (11° field) binoculars were used on all cruises. On 12 cruises two POBSP personnel alternated 2-hour watches; on 3 cruises during which only one POBSP observer was present, the ship's crewmember on watch spelled the observer during meal breaks. The POBSP personnel had previous observational experience in the central Pacific ranging from 72 to over 800 hours. Several members of the ship's crew learned to identify birds

[3] Trade names referred to in this publication do not imply endorsement of commercial products.

competently to species' level. Since ship's crewmembers were responsible for maintaining a bird watch of their own for BCF records, two observers were present most of the time.

Although the Townsend Cromwell followed a fixed track which prevented a close approach to most flocks, occasionally birds were collected from the bow with a shotgun.

No systematic nocturnal observations were made. One or two birds flew aboard at night during each cruise, and occasional observations in moonlight of individual birds or flocks indicated at least some nocturnal activity.

Eighteen birds of five species (table 2) were collected; these confirmed many of the sight identifications. Twenty-five birds of four species were banded with USFWS (Fish and Wildlife Service) bands (table 3). With the exception of a Black-footed Albatross banded March 17, 1965 and recovered the following day, none of these birds has been recovered.

Techniques of Data Recording

Because conditions for observation were seldom ideal, many birds were identified only to genus or family.

Observations were entered on a standardized form along with the time of observation to the nearest minute of local time, number of birds of each species in each sighting, the direction the birds were headed, and other information pertinent to each sighting. The information included descriptions when identification was uncertain, behavior, bands or tags on birds, age, sex, presence of molt, color phase, whether or not a bird was collected, food association, unusual weather, and length of time that a bird was in sight. If an actual count was not possible, the estimated limits of accuracy were recorded. Birds that followed the ship were censused about every hour.

A sighting was defined arbitrarily as the observation of a single bird or a group of birds acting as a unit. A time was assigned to each sighting to make it distinct from other sightings. Thus, if different times were given for entries on the log, the entries were separate sightings and the birds in question were not associated. Multiple entries of the same time indicated a sighting composed of more than one bird.

On April 3, 1964 Sooty Shearwaters were encountered in such numbers that counts were recorded in 5-minute totals rather than by sightings.

For analysis, a flock was defined arbitrarily as a group of five or more birds.

Table 2.--Bird specimens collected on BCF Townsend Cromwell TWZOP cruises, March 1964 to May 1965

Date	Time	USNM[1] number	Species	Sex	Location Lat. N.	Location Long. W.
3/29/64	0015	494233	Leach's Storm Petrel	M	11°30'	147°59'
6/18/64	0500	494193	Wedge-tailed Shearwater	F	11°53'	157°00'
7/4/64	1700	[2]494194	do	F	22°52'	157°00'
7/4/64	1700	494926	Sooty Tern	F	22°52'	157°00'
7/4/64	1700	494937	Great Frigatebird	M	22°52'	157°00'
7/21/64	1335	493608	Juan Fernandez Petrel	M	22°06'	151°00'
7/22/64	1040	493610	do	M	18°51'	150°59'
7/22/64	1045	493611	do	M	18°50'	151°00'
7/22/64	1145	493612	do	F	18°40'	151°00'
7/22/64	1450	493609	do	F	18°05'	151°00'
7/22/64	1555	495247	do	F	17°53'	151°00'
11/19/64	1415	494234	Leach's Storm Petrel	M	21°27'	147°59'
11/22/64	2000	494242	do	M	24°58'	155°27'
12/6/64	0045	494235	do	?	13°30'	154°00'
1/6/65	2115	494236	do	M	17°30'	157°00'
4/17/65	1610	494237	do	M	19°48'	154°00'
4/19/65	1105	494238	do	F	22°22'	151°00'
5/24/65	1715	494228	Juan Fernandez Petrel	M	11°55'	148°00'

[1]U.S. National Museum, Smithsonian Institution.

[2]Banded USFWS No. 615-15018.

The behavior of flocks was always noted, i.e., feeding, traveling, searching, sitting, dispersing.

The coordinates of each sighting were determined to the nearest minute on the basis of interpolations of preceding and succeeding ship's fixes or dead-reckoned positions.

The time and the location of the ship were recorded at sunrise and sunset, and the distance traveled during each day was measured on the ship's charts. These data were essential for calculation of relative density figures in terms of birds per nautical mile and birds per hour.

BCF scientists gathered environmental data concurrently with the observations of sea birds. They made bathythermograph casts every 30 miles (55.6 km.) along the cruise track and took water samples at various depths to 1,500 m. every 90 miles (166.8 km.). Climatological data were recorded at each bathythermograph cast. A more thorough standard marine weather report was made every 6 hours. Data included surface sea temperature, surface salinity, sea temperature at 10 m., wind speed, wind direction, barometric pressure, general weather description, state of seas, swell direction and period, visibility, wet and dry bulb air temperature, cloud type, and amount of cloud cover. A 25-minute surface plankton haul with a 1-m. net with 0.308-mm. terminal mesh was made every evening beginning at 2000 hours.

Storage and Analysis of Data

An ADP (automatic data processing) system was designed to store and analyze the data. Included in the system were the data pertaining to each sighting, the environmental data (both oceanographic and atmospheric) taken every 30 miles along the cruise track, and the data on the ship's positions and the duration of observations. The ADP system was described by King, Watson, and Gould (1967).

AVIFAUNA OF THE STUDY AREA

The avifauna of the area will be discussed on a general level with respect to the families of birds represented and then more specifically, first in terms of the numbers of species that were recorded seasonally, then in terms of distribution and abundance of the species in

Table 3.--Birds banded on BCF Townsend Cromwell TWZOP cruises, March 1964 to June 1965

USFWS band number	Species	Age	Location		Date
			Lat. N.	Long. W.	
757-60901	Black-footed Albatross	Adult	21°30'	157°15'	4/12/64
757-60902	do	do	21°30'	157°15'	4/12/64
757-60903	do	do	25°00'	157°00'	5/3/64
757-60904	do	do	23°30'	157°00'	6/4/64
757-60905	do	do	25°00'	154°00'	11/22/64
757-60906	do	do	25°00'	154°00'	11/22/64
757-60907	do	do	26°30'	148°00'	1/21/65
757-60908	do	do	26°30'	148°00'	1/21/65
757-60909	do	do	26°30'	148°00'	1/21/65
757-60910	do	do	19°00'	151°00'	3/17/65
757-60911	do	do	19°00'	151°00'	3/17/65
757-60912	do	do	19°00'	151°00'	3/17/65
757-60913	do	do	19°00'	151°00'	3/17/65
757-60914	do	do	19°00'	151°00'	3/17/65
757-60915	do	do	19°00'	151°00'	3/17/65
757-60916	do	do	16°00'	151°00'	3/18/65
757-60917	do	do	25°00'	151°00'	3/25/65
757-60918	do	do	25°00'	151°00'	3/25/65
757-60919	do	do	25°00'	151°00'	3/25/65
757-60920	do	do	25°00'	154°00'	3/26/65
757-60921	do	do	23°30'	157°00'	3/27/65
757-60922	Laysan Albatross	do	23°30'	157°00'	3/27/65
757-60942	Red-footed Booby	Immature	18°19'	157°00'	4/12/65
757-60943	Black-footed Albatross	Adult	23°30'	154°00'	4/18/65
757-60944	Blue-faced Booby	Subadult	13°00'	157°00'	6/13/65

relation to their breeding cycles. A monthly summary gives the temporal sequence of changes in abundance and distribution of the most important components of the avifauna.

Family Summary

Species from 12 families, the first 3 from the order Procellariiformes, the next 3 from Pelecaniformes, the next 5 from Charadriiformes, and the last 1 from Columbiformes, were recorded in the study area. All but the last are normally considered sea birds or shore birds; the last is a land-based group and the occurrence of a bird of this order at sea was accidental.

1. Diomedeidae
The albatrosses were represented by three species, Black-footed and Laysan Albatross, both of which breed during the winter on the leeward Hawaiian chain, and the Black-browed Albatross, a South Pacific breeder from south of New Zealand, which was tentatively identified for the first time in the area. The albatrosses were conspicuous members of the avifauna in the study area during the winter breeding season when they followed the ship readily. Although almost always restricted to the northern half of the cruise area, birds occasionally followed the ship south of lat. 18° N., and on one occasion south of lat. 11° N.

2. Procellariidae
The shearwaters and gadfly petrels were represented by 21 species or field-recognizable subspecies. One is a rare straggler from the North Pacific, six breed on the Hawaiian Islands and are absent in the nonbreeding season, seven breed in the South Pacific and winter in the study area, and seven migrate through the study area between their South Pacific breeding areas and wintering grounds north of the study area. All members of this family recorded are characterized by long migrations and by periods of abundance followed by periods of scarcity or absence. Although the shearwaters and gadfly petrels are less conspicuous than the albatrosses because they are smaller and usually do not follow ships, the family ranked second in total numbers seen and in some months ranked first.

3. Hydrobatidae
Only two species of storm petrels were identified with certainty. Leach's Storm Petrel, the most abundant, migrates south in the winter in large numbers from North Pacific breeding stations. Fork-tailed Petrel is a rare winter straggler from the North Pacific. Two others probably occur in the area, but, because of the possibility of confusion with other species, they must be considered hypothetical.

4. Phaethontidae
Tropicbirds were represented by two species, both of which were observed commonly in all months. They are attracted frequently to ships. Because of the even distribution of Red-tailed Tropicbirds, their islands of origin are in doubt. The White-tailed Tropicbirds probably all came from the main Hawaiian islands.

5. Sulidae
The distribution of two of the three species of boobies in the study area was limited essentially to the area within 50 miles (92.7 km.) of the main Hawaiian islands. The third species occurred primarily in the southern half of the study area--a circumstance which indicates it was probably from the Line or Phoenix Islands.

6. Fregatidae
Great Frigatebirds, the only frigatebirds observed, were seen in all months, mainly within 300 miles (556 km.) of the Hawaiian Islands.

7. Charadriidae
One member of this family, the Golden Plover, was common in the fall during migration to Pacific islands from Siberia or Alaska.

8. Scolopacidae
Although all four sandpiper species observed were common on nearby Pacific islands, each was seen at sea only once.

9. Phalaropodidae
One phalarope species, probably the Red Phalarope, was seen commonly in the spring migrating north to the Arctic.

10. Stercorariidae

Two species of jaegers and one skua were recorded. The jaegers breed in the Arctic and migrate south, the skua breeds in the South Pacific and migrates north. Only the Pomarine Jaeger was observed regularly.

11. Laridae

Two or possibly three species of gulls and seven species of terns were recorded. The gulls were all stragglers from the North Pacific. One tern was a migrant on its way north to the Arctic in the spring. The islands of origin of the three species of tropical terns are in doubt, but the three species of noddy terns were observed almost entirely within 100 miles of the Hawaiian Islands. The tropical terns evidently migrate seasonally, but the noddies remain resident all year. The Sooty Tern was the most abundant species in the study area.

12. Columbidae

One Rock Dove was observed 10 miles (18.5 km.) from Oahu where the species breeds abundantly.

Diversity of Species

Forty-nine species and two field-recognizable subspecies were observed in the study area. The number recorded per month ranged from 32 (April 1965) to 17 (July 1964). The monthly average was 24.2 species. The number of species observed on any day ranged from 2 to 15 (mean 7.7). Numbers were usually highest within 50 miles (92.7 km.) of Oahu and lowest in the northeast corner of the area. Accidentals and stragglers caused the species-per-month figures to be higher, and more erratic, than the species-per-day figures.

Only a weak positive correlation existed between numbers of species and total numbers of birds per month. During migration months (April and May, October and November), when total numbers were highest, species diversity was also high (fig. 2). Species diversity was lowest during the summer (June-September), owing to the low frequency of migrants and accidentals, although numbers of birds were fairly high. The high diversity of species during the winter (December-February) compared with total numbers of birds can be accounted for by the higher incidence of accidentals at that time of year.

Species Accounts

Fifty-one species or field-recognizable subspecies were observed in the study area, and accounts have been prepared for each. The species accounts give first a general statement of the status of each species and stress the time of year that status changes occurred. The species accounts also give a tabulation of the numbers recorded on each cruise. All birds

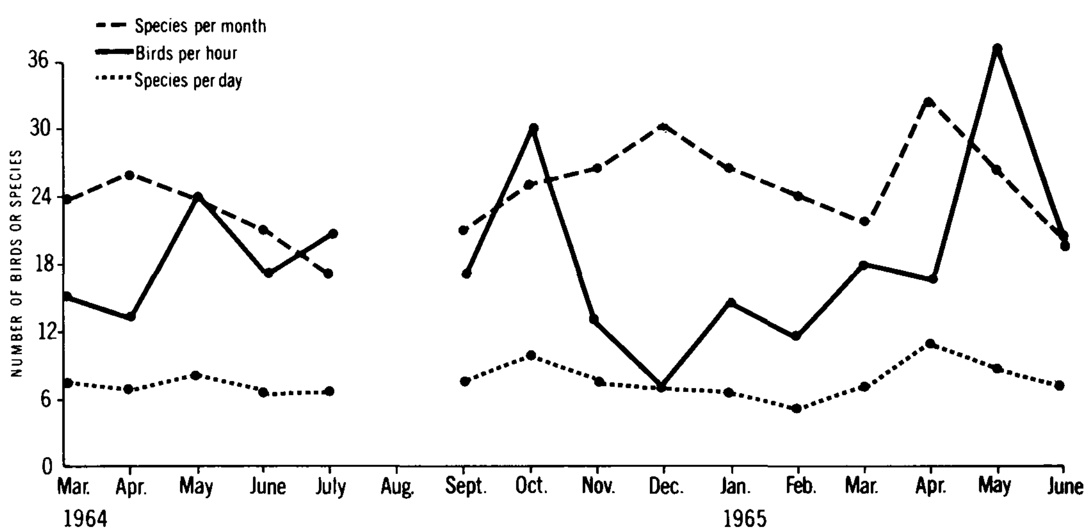


Figure 2.--Numbers of species observed per day and per month and numbers of birds per hour in the study area, March 1964 to June 1965.

from a cruise were tallied under the month in which the cruise mainly took place, even though some may have been seen the first few days of the succeeding month. In the species accounts, and wherever else feasible, the numbers were tallied by hand from the raw data.

The totals in appendix table 2 came from the ADP system and the tables of the section "Components of abundance and distribution" are derived from the latter. There are discrepancies between these totals and the hand-tallied totals, but they are small and, I feel, do not detract appreciably from the accuracy of the text. A dash indicates no observations made; an x indicates that the species (or subspecies) was not distinguished from very similar forms during that cruise.

Relative monthly abundance is discussed in terms of known breeding locations and phenology.

A final section in the species account deals with the distribution of the species through space and time, again in relation to breeding locations and phenology. Included in this section are comments on behavior that might influence distribution, or at least the distribution of our sightings of the species.

From cruise to cruise the variation in the time of day that the ship was within 50 miles of Oahu led to fluctuations in the observed abundance of those species that occur mainly near Oahu (e.g., Red-footed Booby, Brown Noddy). Such fluctuations bore only a chance resemblance to actual fluctuations in the abundance of the species.

The following terms were used to describe relative abundance:

abundant - seen several times daily or in large numbers on a few days;

common - seen once or twice daily or in moderate numbers on a few days;

uncommon - seen regularly several times monthly;

rare - seen irregularly once or twice monthly;

accidental - seen once or twice during the study.

The following terms were used to describe status:

resident - present all year or during the breeding season, breeds in main Hawaiian group;

visitor - present during the nonbreeding season, does not breed in main Hawaiian group;

migrant - present only during passage to land masses or to oceanic areas distant from the study area;

hypothetical - occurrence in study area unconfirmed.

Black-footed Albatross
Diomedea nigripes Audubon

Status: Common visitor November-May, rare or absent June-October

Months	Year	
	1964	1965
January	-	82
February	-	92
March	66	76
April	37	26
May	20	3
June	1	2
July	0	-
August	-	-
September	0	-
October	0	-
November	40	-
December	55	-

This species, which ranges the entire North Pacific during its nonbreeding season, appeared in the *Townsend Cromwell* area on November 11, about 2 weeks after the arrival of the first birds on the leeward Hawaiian chain, the breeding grounds of the species. Numbers increased through February, when eggs were hatching on the Leewards. Thereafter, numbers declined until June, when all adults had left their breeding grounds. The last bird was seen June 12 in 1964 and June 29 in 1965. None was reported from June 30 to November 10.

Maximum numbers were seen on April 5, 1964 when 40 birds were gathered around the ship's stern about 100 miles (185.3 km.) north of Oahu, at the end of the March 1964 cruise. (These are included in the total for March 1964 above.)

Distribution: This species was most abundant at the northern end of the area. In November, it was not seen south of lat. 23° N. Thereafter its range extended southward each month until February when birds were seen as far south as lat. 10°49' N. (fig. 3a). Northward contraction

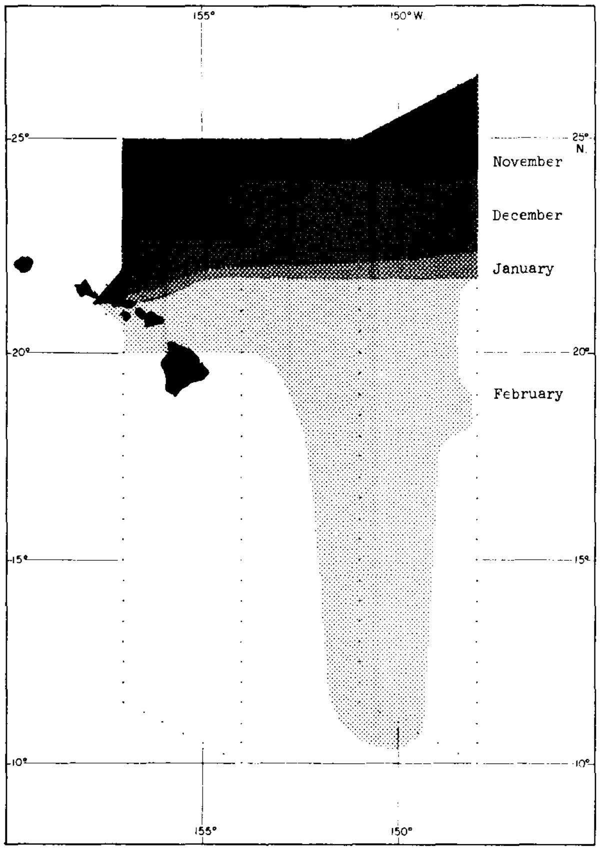


Figure 3a.--Expansion of the range of the Black-footed Albatross in the study area. Birds were recorded at the northern end of the area all winter.

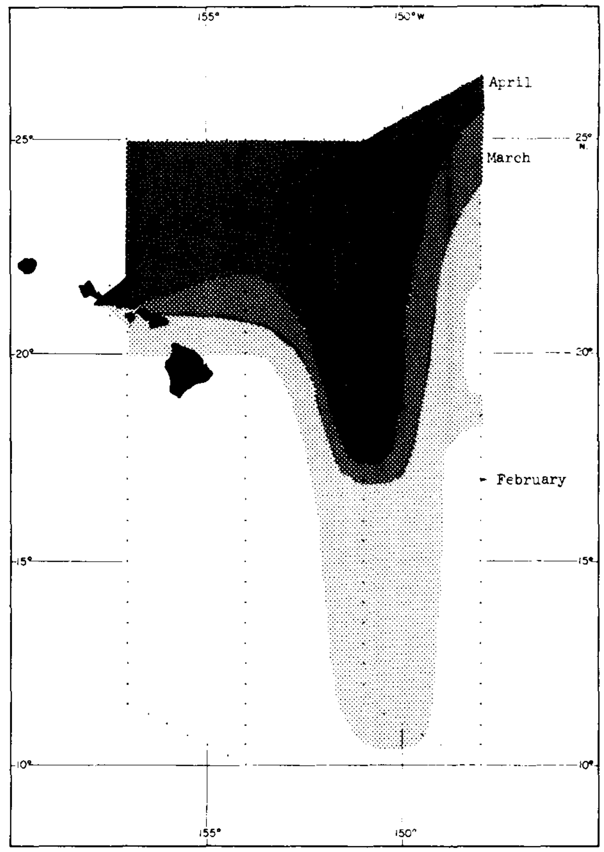


Figure 3b.--Contraction of the range of the Black-footed Albatross in the study area. Birds were recorded at the northern end of the area all spring.

of the range began in March and continued through April and May (fig. 3b). In June only a few stragglers were left in the area.

The area covered by the species each month varied directly with the total numbers seen that month.

Birds were repeatedly seen farthest south on the third (long. 151° W.) leg of the cruise. These sightings may be explained only in part by the attraction of the ship, since birds were seldom attracted south of Oahu on the first (long. 157° W.) leg.

On only about one-half of the days in which Black-footed Albatrosses were seen was the maximum number seen at the end of the day. Generally the maximum number was seen at hydrographic stations, where the ship remained stationary for an hour. Birds that had dropped behind the ship evidently caught up with it at this time.

Because this species is attracted to ships, numbers are probably more accurate for the area and monthly fluctuations in numbers probably are due less to chance than for those species that ignore or avoid the ship.

Total numbers given at the beginning of the species account are the totals of the highest numbers seen at any one time in a day. These figures are obviously lower than the actual numbers seen, since birds were certainly dropping behind and being replaced by others, but the possibility of counting any bird more than once in a day was avoided. Exceptions were made if distinction was possible on the basis of plumage differences or anatomical aberrations.

Miller (1942) recorded a marked Black-footed Albatross that followed his ship 60 miles (111.2 km.), the longest distance a Northern Hemisphere albatross has been known to follow a ship.

A bird that was banded at 1800 hours on

March 17, 1965 was recaptured at 1200 hours on March 18, 1965; it had followed the ship 18 hours and 180 miles (see table 2).

Laysan Albatross
Diomedea immutabilis Rothschild

Status: Uncommon visitor February-April, rare or absent May-January.

Months	Year	
	1964	1965
January	-	0
February	-	4
March	10	11
April	3	3
May	0	0
June	0	0
July	0	-
August	-	-
September	0	-
October	0	-
November	1	-
December	0	-

Although one bird was seen on November 23, the species was not recorded regularly until after February 25, when adults on the breeding islands along the leeward Hawaiian chain were beginning to leave their chicks unattended most of the time. Numbers reached a peak in March and declined in April. The last birds of the season were seen on May 2, 1964 (at the end of the April 1964 cruise) and April 27, 1965. Adults were on the breeding islands as late as June, however.

Maximum number seen at one time was three on April 4, 1964, the last day of the March 1964 cruise.

Distribution: This species was found most frequently at the northern end of the area. As its numbers increased, its range extended southward, although greatest density was still in the north. On March 27, 1964 one bird was seen at lat. 11°30' N. and long. 151° W. Thompson (1951) recorded a Laysan Albatross from lat. 8°30' N., long. 163°35' W., 180 miles (333.5 km.) south of our record.

In April the reduction in numbers was accompanied by a contraction of range to the northern end of the study area. No bird was seen south of lat. 22° N. in April.

The general distribution was similar to that of the Black-footed Albatross, although the smaller numbers seen each month prevent as detailed an analysis. The area of greatest density, the northern edge of the study area, coincided with that of the Black-footed Albatross (fig. 4).

This species follows ships less frequently than does the Black-footed Albatross. On April 4, 1964, however, two Laysan Albatrosses followed the ship for over 11 hours, and on several occasions others followed for shorter periods. Birds that did not follow were attracted close to the ship as they passed by. Thus, the disparity between monthly totals of this species and of the Black-footed Albatross in the study area is probably real, although the former outnumbers the latter on their breeding grounds by 5 to 1 (Palmer, 1962). A breeding distribution closer to the breeding islands or north of the study area, rather than indifference to or repulsion from the ship, may explain the discrepancies in numbers.

DIOMEDEA IMMUTABILIS MARCH 1964 to APRIL 1965

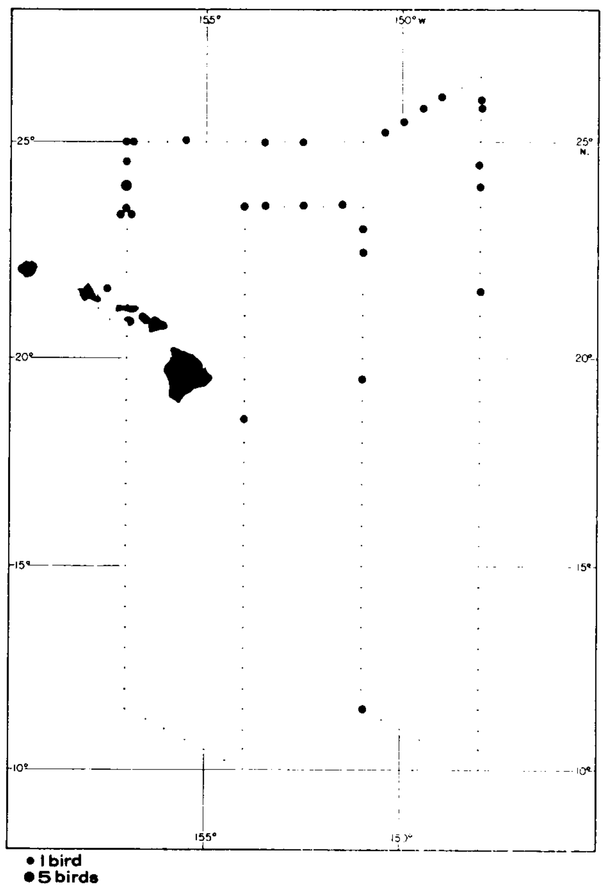


Figure 4.--Distribution of Laysan Albatross.

Black-browed Albatross
Diomedea melanophris Temminck

Status: Hypothetical, based on one sight record.

On January 23, 1965 an albatross, closely resembling a Laysan Albatross, but with a larger, yellow bill, was seen at close range at lat. 25° N., long. 156° W. by Patrick J. Gould. This species had not been previously recorded from the central Pacific Ocean, although several records exist for latitudes even farther north in the Atlantic Ocean (Palmer, 1962).

Fulmar Fulmarus glacialis (Linnaeus)

Status: Accidental.

One dark-phase Fulmar was observed at very close range for 1/2 hour on February 23, 1965 at lat. 23°30' N., long. 148° W.

Specimens of this species have been collected on several islands of the Hawaiian group (Clapp and Woodward, 1968).

Dark-rumped Petrel
Pterodroma phaeopygia (Salvin)

Status: Rare, but possibly regular resident. Distinction was made between this species and P. externa only after October 1964.

Months	Year 1964	1965
January	-	0
February	-	0
March	x	1
April	x	3
May	x	9
June	x	6
July	x	-
August	-	-
September	x	-
October	3	-
November	4	-
December	0	-

Although numbers seen in the study area were very low, a peak in May was suggested. This peak would coincide with egg dates on the breeding grounds on Maui and Hawaii (Richardson and Woodside, 1954). No birds were seen between December and February.

Scarce at sea, this species is also scarce on its known breeding grounds.

Distribution: The distribution map for the species for 9 months indicates a density center in the northwestern corner of the study area near lat. 25° N., long. 157° W. (fig. 5). Inclusion of about 10 less certain sightings does not appreciably alter the distribution picture. No indication of population movement or of marked habitat preference on a monthly basis can be inferred from this small total sample. Individuals were seen as far south as lat. 11° N., as far east as long. 148° W., and as far north as lat. 25° N. The range doubtless extends beyond the edges of the study area in all directions.

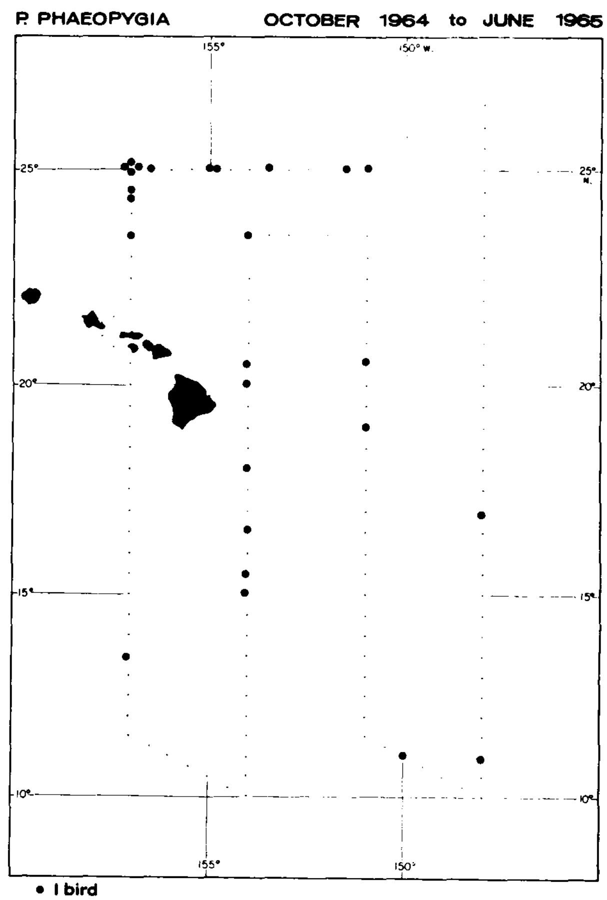


Figure 5.--Distribution of Dark-rumped Petrel.

Juan Fernandez Petrel Pterodroma externa externa (Salvin)

and

White-necked Petrel Pterodroma externa cervicalis (Salvin)

Status: P. e. externa was an abundant visitor during its nonbreeding season, May-December, common or uncommon, January-April. P. e. cervicalis was probably an uncommon or rare visitor all year. No attempt was made to distinguish between these similar forms until October 1964.

P. externa total

Months	Year	
	1964	1965
January	-	51
February	-	2
March	18	40
April	20	21
May	160	277
June	210	699
July	647	-
August	-	-
September	611	-
October	1,206	-
November	301	-
December	169	-

P. e. cervicalis only

Months	Year	
	1964	1965
January	-	8
February	-	1
March	x	2
April	x	0
May	x	14
June	x	12
July	x	-
August	-	-
September	x	-
October	4	-
November	4	-
December	13	-

Both subspecies of Pterodroma externa were found in the study area. Even when the presence of both subspecies in the central Pacific was confirmed by the collection of specimens, it was possible to distinguish between them only under conditions favorable for observation. Frequently no assignment to subspecies was possible. Only 2 percent of all P. externa observed were assigned to cervicalis subspecies (largest proportion 16 percent in January 1965). The seven specimens collected in the study area were all P. e. externa.

Monthly fluctuation of numbers: Monthly totals from March 1964 through September 1964 included records of P. e. cervicalis. It is probable that a small percentage of P. externa, identified at a distance as P. e. externa (which come from Mas Afuera in the Juan Fernandez group, 500 miles west of the Chilean coast), were in reality P. e. cervicalis from the Kermadec Islands, 600 miles northeast of New Zealand, and, to a lesser extent, vice versa.

In February the species was represented only by a straggler or two. Numbers increased slightly in March and April, and rapidly in May. A nonbreeding season plateau was reached in July and maintained until October, when numbers reached their peak. Thereafter numbers declined rapidly each succeeding month as the birds migrated out of the study area back to the breeding grounds. The low point was reached at the same time that eggs were beginning to hatch on the breeding grounds.

Distribution: The species' distribution in the study area reflected its breeding phenology. In the months in which the species breeds in the Southern Hemisphere, P. externa was found mainly in the southeastern corner of the area (figs. 6a, 6b). During these months (February-April) not only was the range of the species in the area the most limited but numbers were also lowest. From May onward the limit of the range was pushed northwestward until September and October, when the species was found throughout the area. Its range contracted progressively in November and December. The distribution in January did not follow the same pattern: although numbers were greatly reduced from the previous month, birds were found throughout most of the area. Since the breeding season was already underway, these birds were probably nonbreeders spending at least a portion of the breeding season in their "wintering" area. January was the only month that lacked a defined center of density. In all other months greatest densities were in the southeastern portion of the area.

P. e. cervicalis numbers and distribution: Although data on this subspecies were incomplete, their numbers tended to parallel those of the species in general. February, March, and April were the low months for both subspecies. Owing to the small sample size, as well as the likelihood of confusion in distinguishing between the two forms of P. externa in the field, distributional differences cannot be determined. In general, P. e. cervicalis seemed to have a more northerly distribution only in December and January. In all other months the distribution of the two forms was apparently coincident.

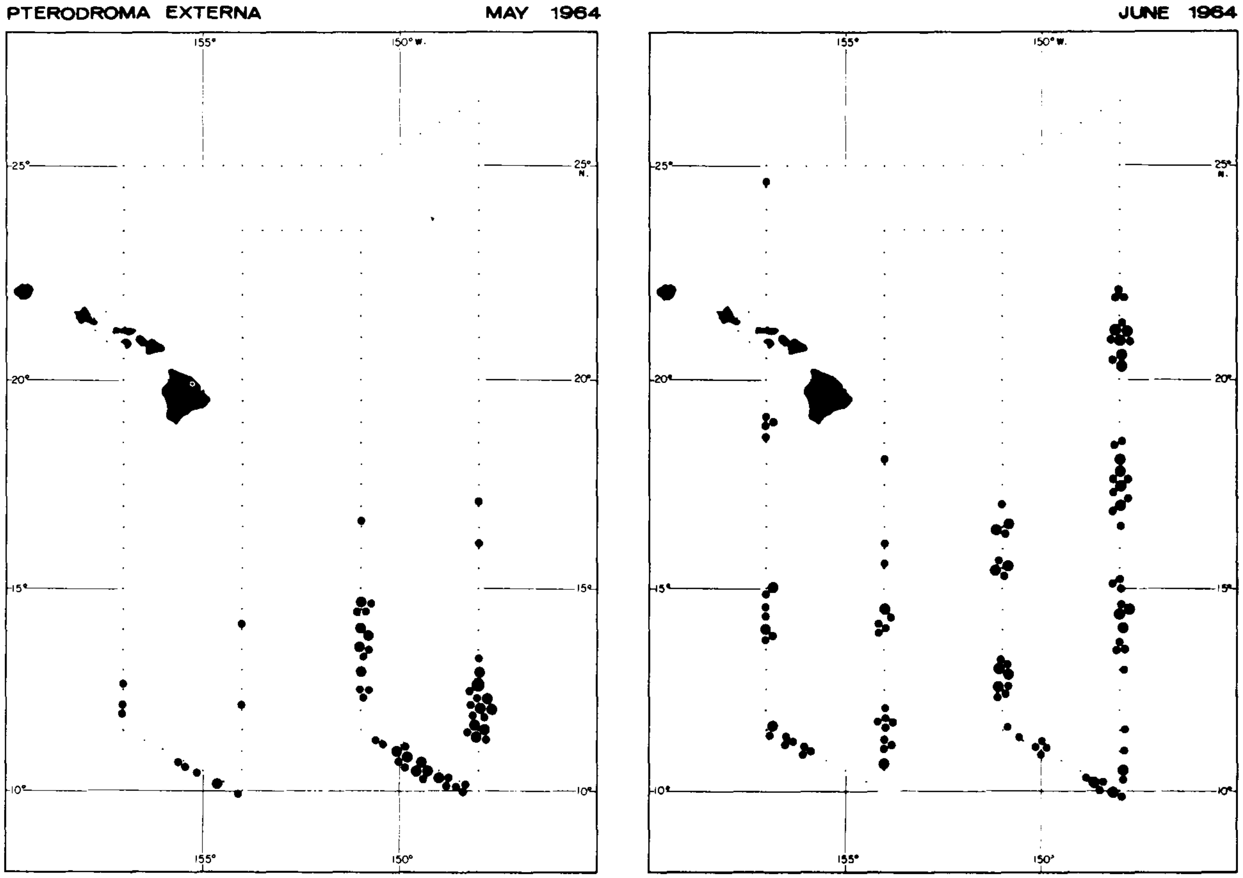


Figure 6a.--Distribution of Juan Fernandez and White-necked Petrels, May-September 1964.

Solander's Petrel
Pterodroma solandri (Gould)

Status: Hypothetical, based on several sight records.

Nine birds thought to be this species were seen in the study area: one in April 1964, seven in October 1964, and one in November 1964. The seven seen in October were all heading south, possibly migrating. The observers' lack of familiarity with the field characteristics of this species makes all identifications tentative. This species has not previously been reported from the central Pacific Ocean. Specimen records exist from the western Pacific near Japan (Kuroda, 1955), the only records at any great distance from its breeding grounds on Lord Howe Island (between Australia and New Zealand).

Tahiti Petrel or Pterodroma rostrata (Peale)
Phoenix Petrel Pterodroma alba (Gmelin)

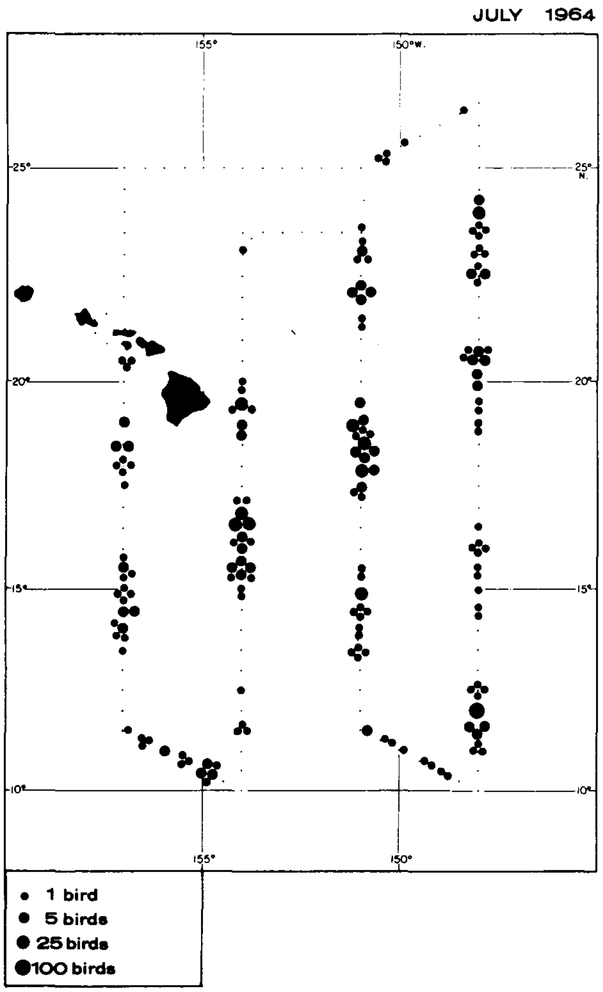
Status: Rare visitor.

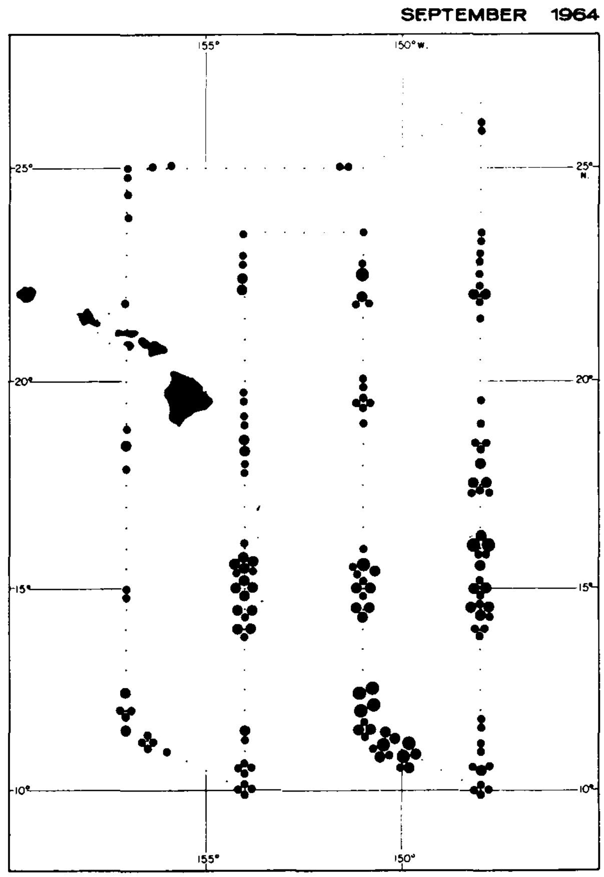
Twelve sight records were made of either or both of these similar species; four in November 1964, one in December 1964, one in January 1965, two in March 1965, and four in June 1965.

Although no specimens of either species were taken in the study area, POBSP personnel have collected both species at comparable latitudes elsewhere in the central Pacific (Gould and King, 1967).

No particular distribution pattern was indicated by the records. Birds were seen from lat. 10° to 23° N. and from long. 148° to 157° W.

Either species could be expected to occur in the study area, but neither occurs regularly or in abundance.





Mottled Petrel
Pterodroma inexpectata (Forster)

Status: Common spring and fall migrant.

Months	Year	
	1964	1965
January	-	0
February	-	0
March	0	0
April	0	10
May	0	1
June	0	0
July	0	-
August	-	-
September	0	-
October	50	-
November	2	-
December	2	-

The Mottled Petrel first appeared on October 13, 1964. Peak numbers--22 birds--were seen on October 18, 1964. Only two were seen in November and two in December. All of these records were of birds heading south, flying in a manner that clearly suggested a direct migration. Several birds were in the company of migrating Sooty Shearwaters.

The return migration from New Zealand, where the species breeds during the Southern Hemisphere summer, was not as strong. Only 11 birds were seen, 10 in April 1965. The species was probably overlooked in 1964. POBSP has several specimen records for the central Pacific.

The distribution showed no particular pattern in the study area. Birds were seen from lat. 11° to 25° N. and from long. 148° to 157° W., indicating that they migrated along a broad front.

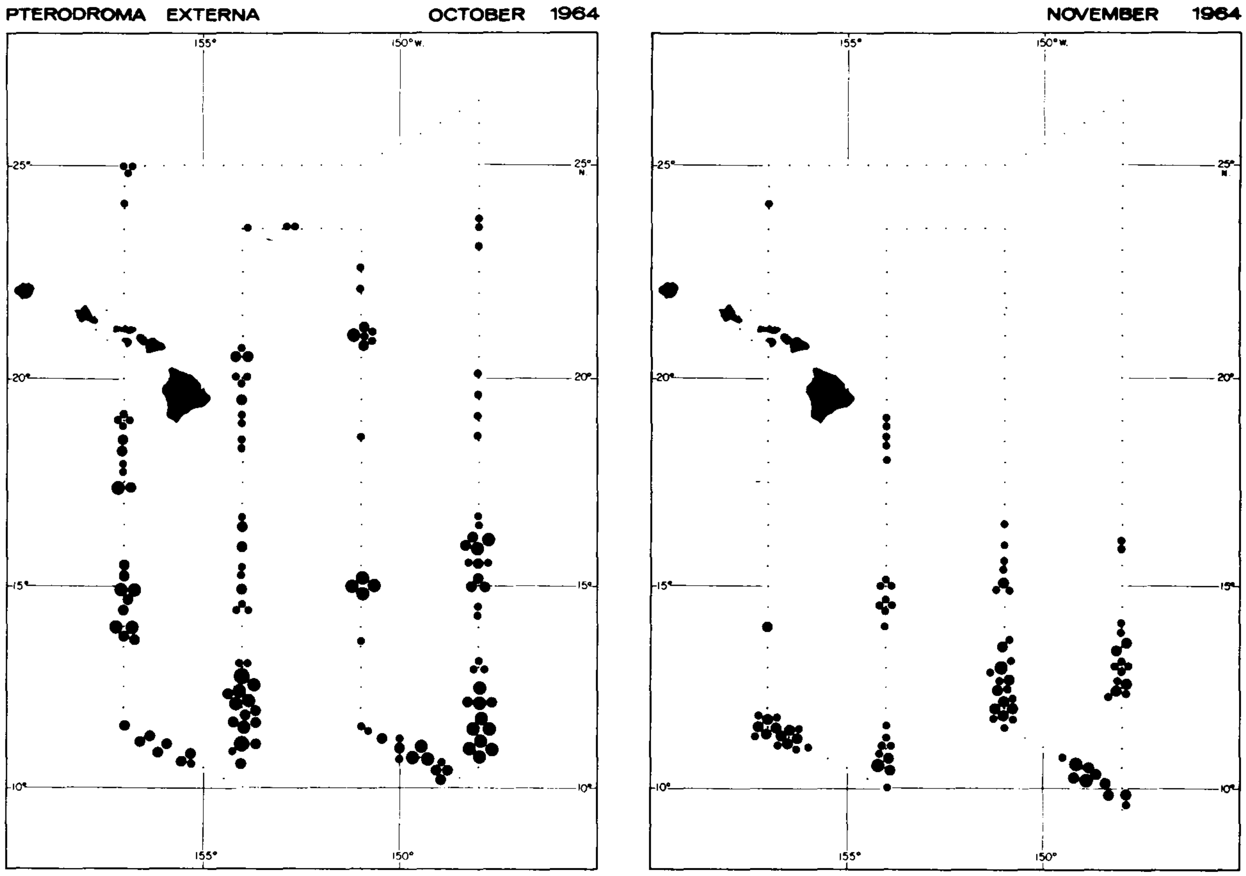


Figure 6b.--Distribution of Juan Fernandez and White-necked Petrels, October 1964 to January 1965.

Usually only one bird was seen at a time, and never more than two together.

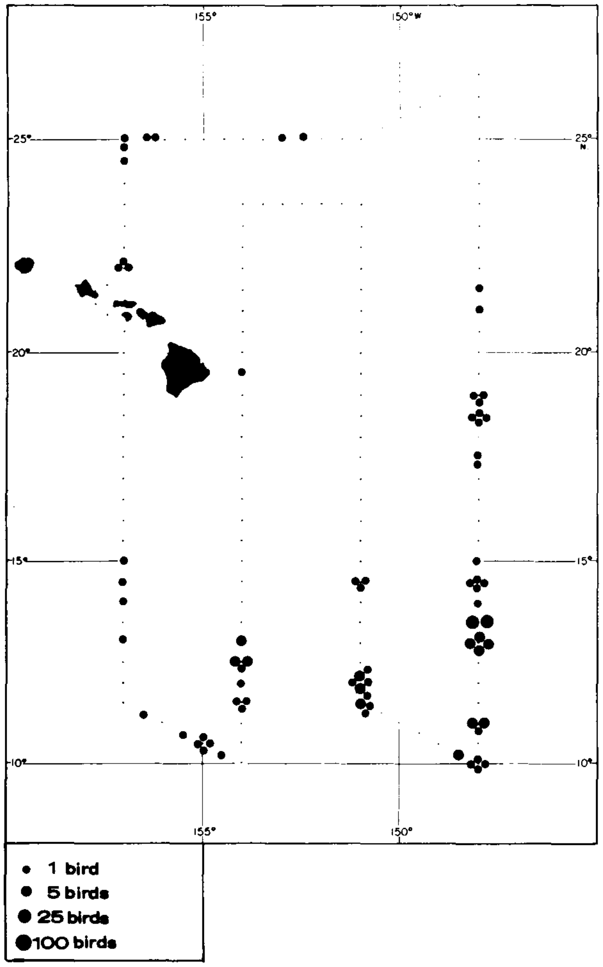
The migration peaks for this species were similar to those of the Sooty Shearwater which also breeds in New Zealand.

Bonin Petrel
Pterodroma hypoleuca hypoleuca (Salvin)

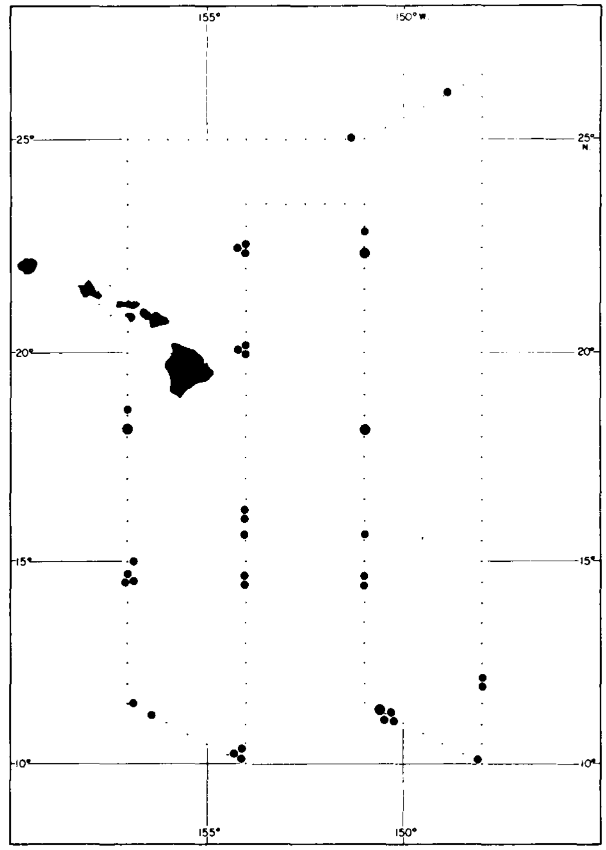
Status: Rare visitor.

Months	Year	
	1964	1965
January	-	3
February	-	0
March	x	0
April	x	1
May	x	1
June	x	0
July	x	-
August	-	-
September	x	-
October	3	-
November	2	-
December	3	-

DECEMBER 1964



JANUARY 1965



Bonin Petrels were recorded from October through January and in April and May. No more than three were seen in any month. No attempt was made to separate this form from the abundant Black-winged Petrel until October 1964, and most identifications thereafter were only tentative.

The number of sightings was too small to allow an analysis of distribution, although the months in which the species was seen are those in which large numbers were on their breeding grounds in the leeward Hawaiian chain.

Most sightings were in the northwestern corner of the study area, although one tentative identification was made at lat. 14° N., long. 148° W. POBSP personnel collected a specimen at a comparable latitude (15° N.) west of the study area.

In view of the abundance of Bonin Petrels along the leeward Hawaiian chain just a few hundred miles west of the study area, it is surprising that very few individuals were seen. So little is known about the pelagic habitat requirements of this bird that theories about its distribution are speculative at best. Its pelagic range during the breeding season seems restricted to waters fairly close to its breeding grounds; its nonbreeding range is unknown. The low numbers suggest that it was merely a straggler.

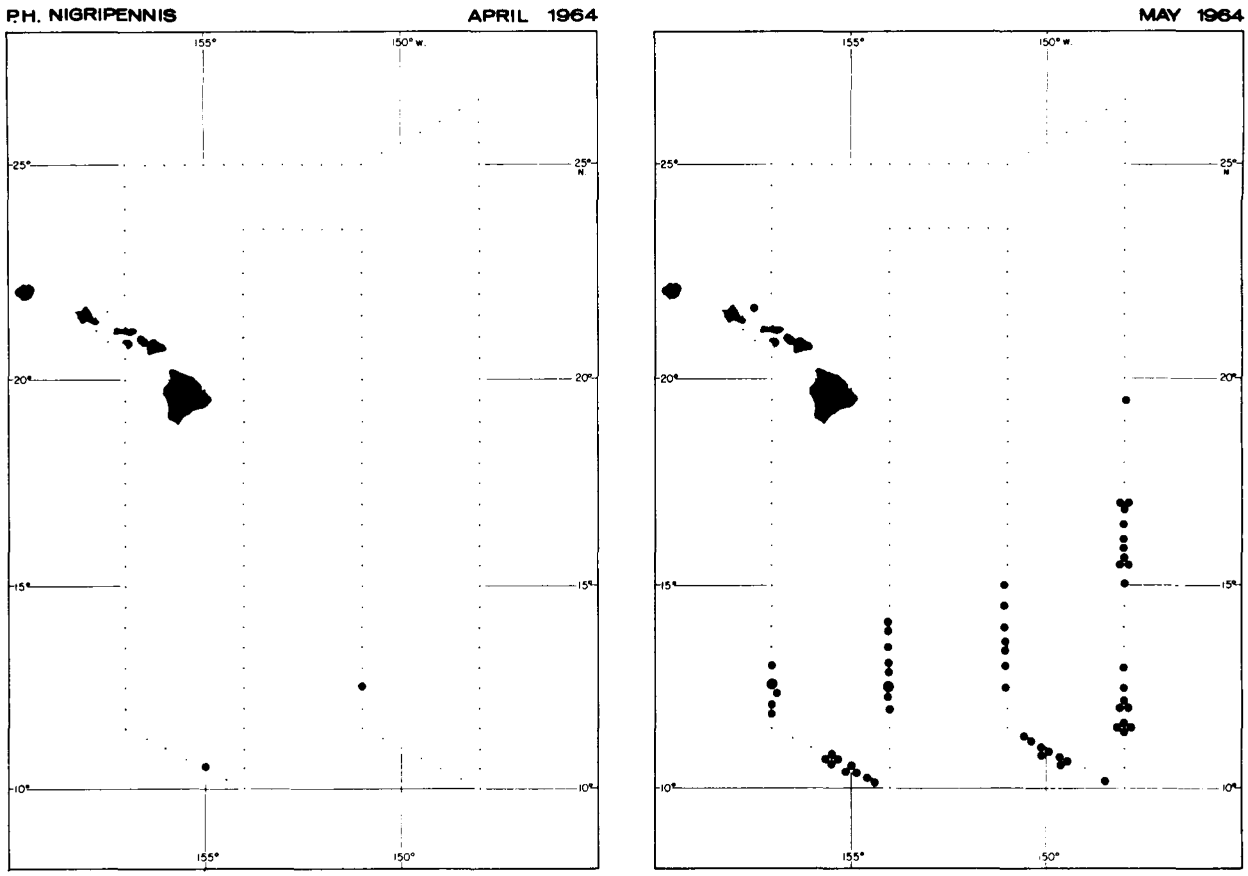


Figure 7a.--Distribution of Black-winged Petrel, April-July 1964.

Black-winged Petrel
Pterodroma hypoleuca nigripennis (Rothschild)

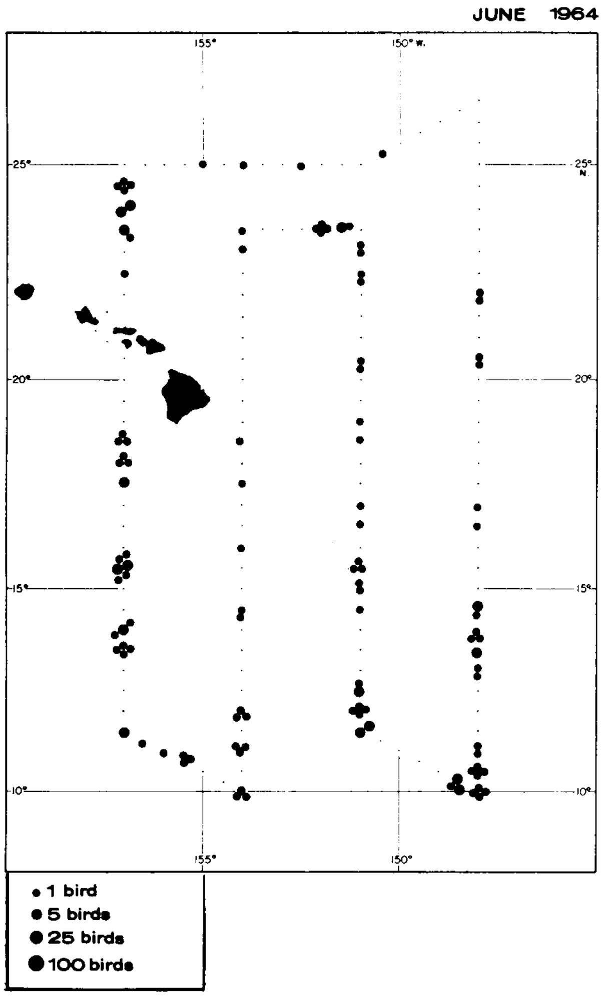
Status: Abundant visitor during nonbreeding season, May-November; uncommon or rare December-April.

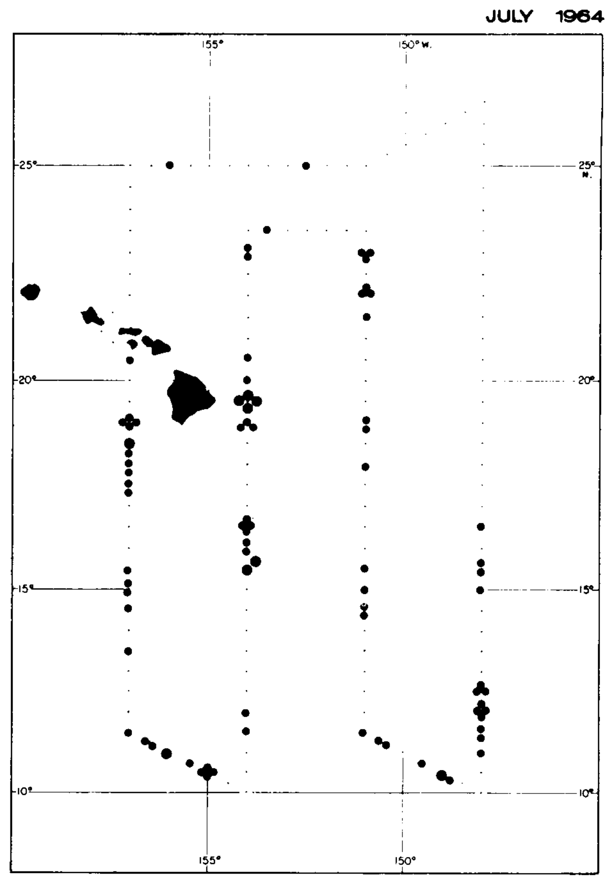
Months	Year	
	1964	1965
January	-	4
February	-	0
March	4	0
April	2	1
May	69	147
June	176	130
July	116	-
August	-	-
September	92	-
October	1,033	-
November	268	-
December	19	-

Black-winged Petrel was first observed in the study area on March 17, 1964. Only an occasional bird was seen until May when numbers began to increase. Numbers were fairly stable from May through September but rose sharply in October. A decrease in November to a level somewhat higher than the May-September level was followed by a sharp reduction in December and January. No birds were seen in the 1965 season until April 24.

This bird attained its greatest density in October shortly before, or concurrent with, its reappearance on its breeding grounds on the Kermadec Islands. By the time eggs were laid (December) numbers in the study area were greatly reduced. No birds were seen in the study area from the time of hatching to fledging.

Distribution: In May birds appeared in the southeast third of the study area (figs. 7a, 7b).





In June, July, and September the entire study area was occupied, although somewhat sparsely in the northeast portion. In October and November the greatest densities were south of lat. 18° N., the southern half of the area, although no part of the area was without a few birds. By December birds left in the area were scattered but had a density center at the southern end of the area.

Data in figures 7a, 7b indicate a possible tendency for birds to enter the study area from the southeast and to exit toward the southwest. Analysis of the direction of movement from field notes bears out this suggestion.

Although no specimens of Black-winged Petrels were collected during the study, specimens taken at comparable latitudes west of the area, as well as one subsequently collected from the study area, make identifications of this bird fairly certain. Very small numbers of White-winged Petrels (see next species account), Bonin Petrels, and possibly Cook's Petrels Pterodroma cookii (Gray), may have been present, but they would have had little bearing on the numbers of Black-winged Petrels observed. Without doubt this form was by far the most abundant of the small Pterodroma in the study area.

White-winged Petrel
Pterodroma leucoptera (Gould)

Status: Possibly uncommon visitor or migrant during nonbreeding season.

This species is included in the species account on the basis of the identification of at least three birds in June 1965 in the study area and the collection of specimens by POBSP personnel from comparable latitudes to the west of

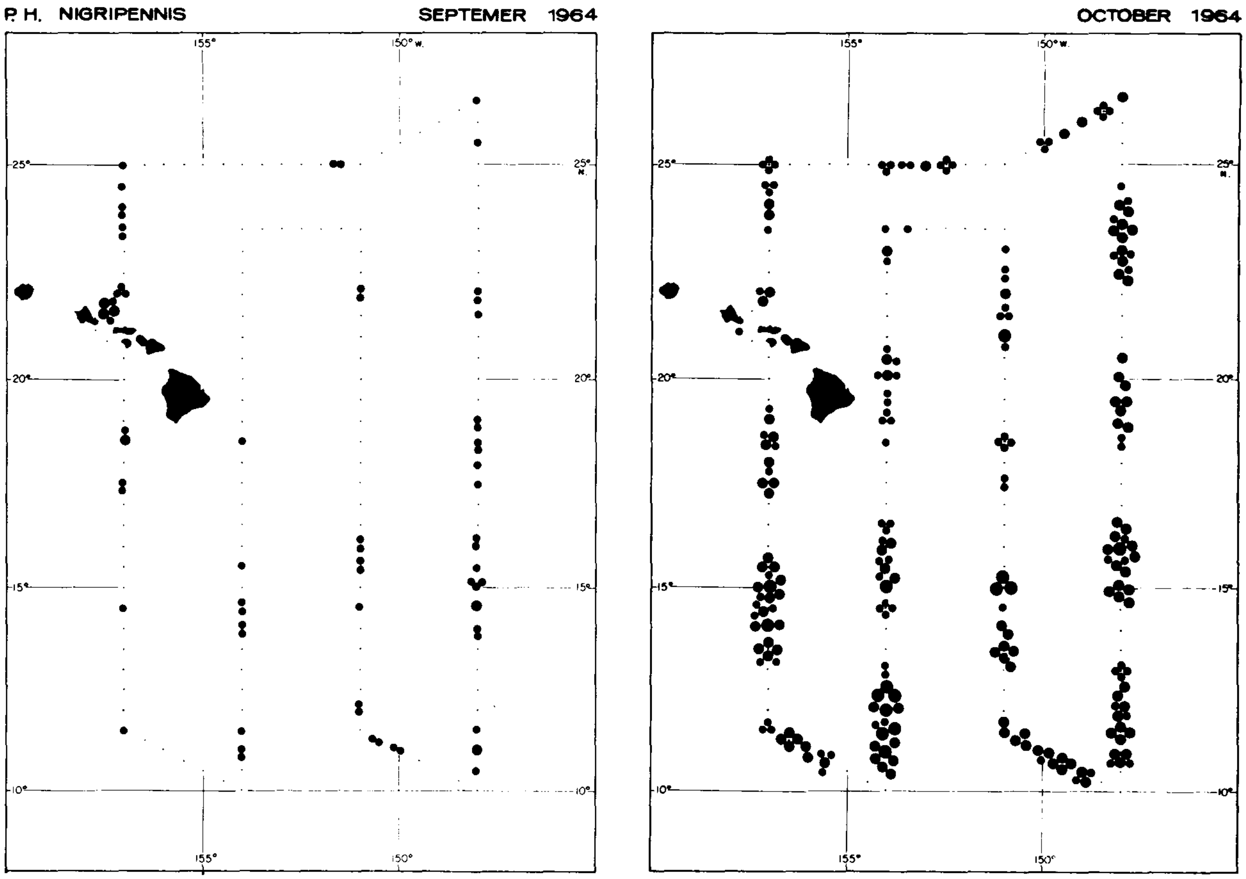
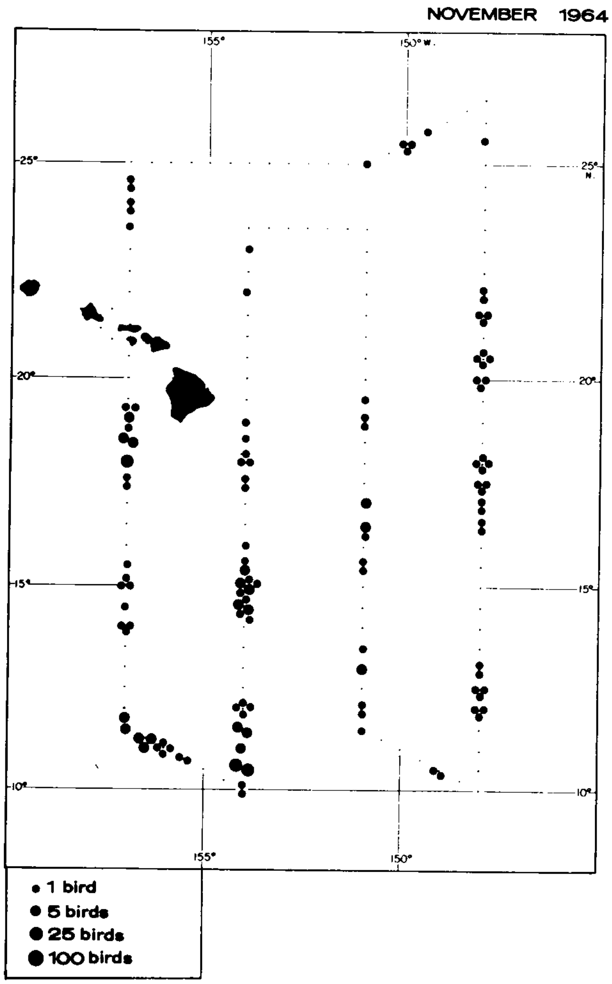
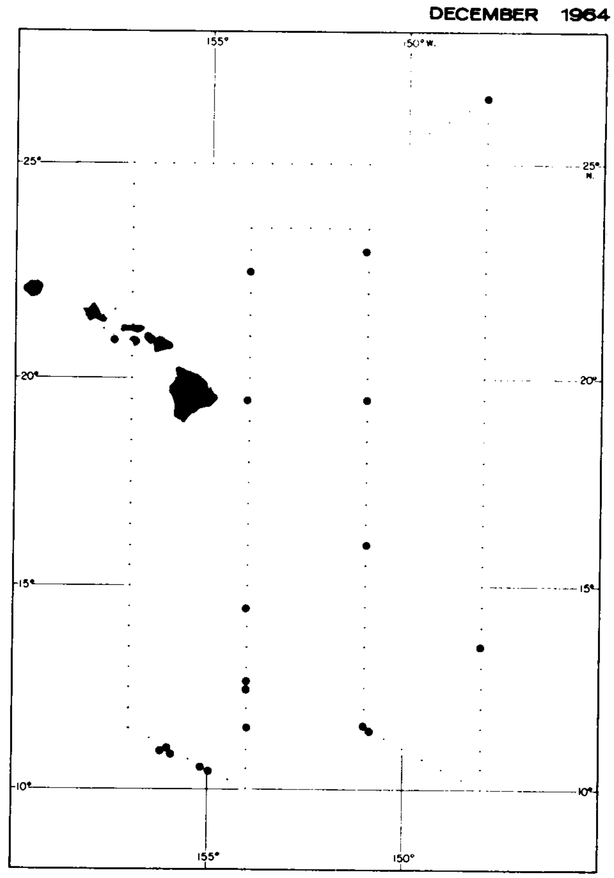


Figure 7b.--Distribution of Black-winged Petrel, September-December 1964.

the study area. Owing to the similarity of this species to Pterodroma hypoleuca, it was probably overlooked in other months. If it migrates through the area it would probably be expected in October, November, May, and June on its way to and from its breeding grounds in the Southern Hemisphere.


NOVEMBER 1964
155°
150° W.
25°
25° N.
20°
15°
10°
155°
150°
1 bird
5 birds
25 birds
100 birds


DECEMBER 1964
155°
150° W.
25°
25° N.
20°
15°
10°
155°
150°

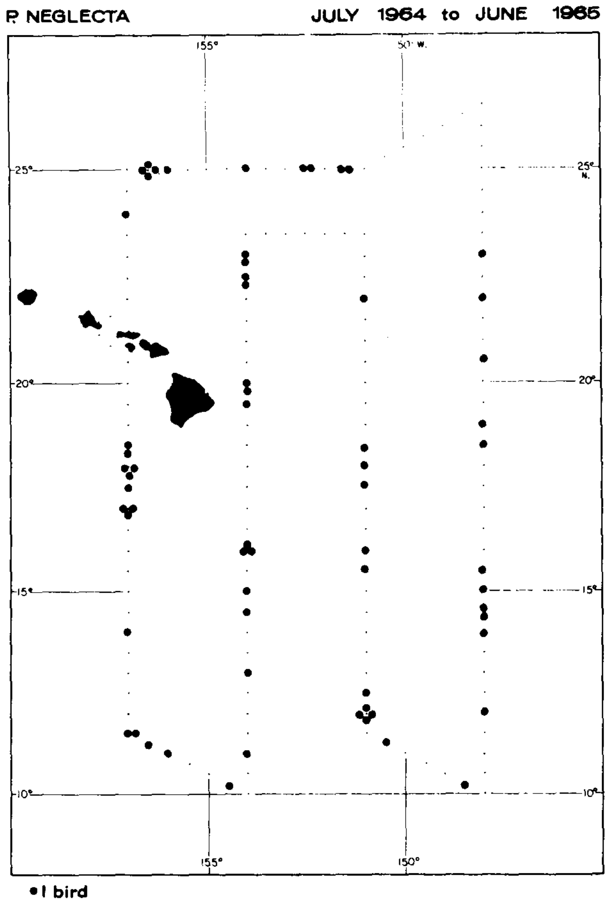


Figure 8.--Distribution of Kermadec Petrel.

Kermadec Petrel
Pterodroma neglecta (Schlegel)

Status: Rare or uncommon visitor.

Months	Year	
	1964	1965
January	-	16
February	-	1
March	0	0
April	0	1
May	0	3
June	0	8
July	4	-
August	-	-
September	11	-
October	4	-
November	9	-
December	9	-

This species occurred regularly but in low numbers. It was observed in all months except March, although it was least common from February through May. Light-phase birds were more plentiful than intermediate and dark-phase birds during most months. Its distribution appeared random throughout the study area (fig. 8). Several specimen records exist from comparable latitudes west of the study area (Gould and King, 1967).

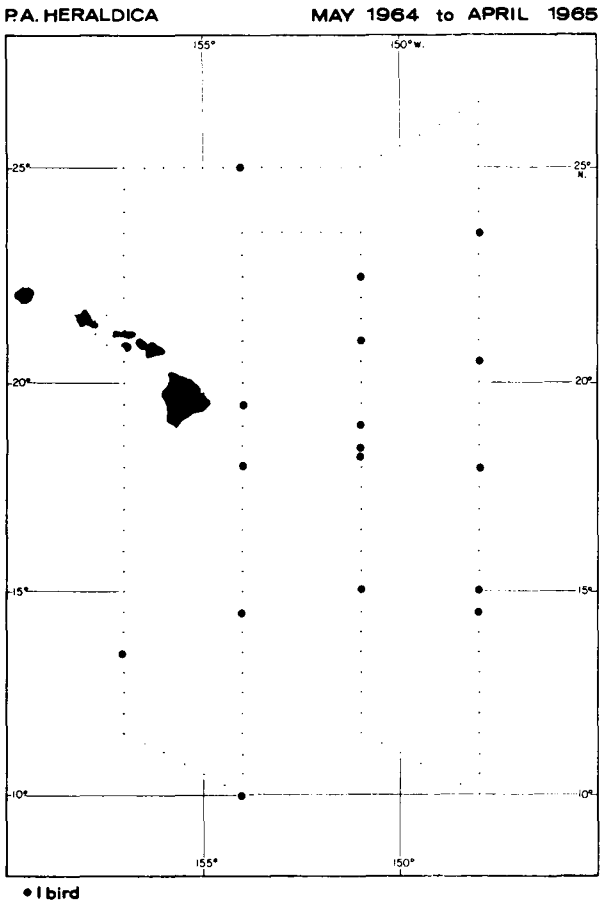


Figure 9.--Distribution of Herald Petrel.

Herald Petrel
Pterodroma arminjoniana heraldica (Salvin)

Status: Rare visitor.

Months	Year	
	1964	1965
January	-	2
February	-	1
March	0	0
April	0	1
May	2	0
June	0	0
July	0	-
August	-	-
September	0	-
October	4	-
November	3	-
December	6	-

This species occurred fairly regularly but never in large numbers. It was seen most consistently between October and February--peak numbers were in December. Its distribution appeared to be random (fig. 9). Birds were seen from lat. 10° to 25° N. and from long. 148° to 157° W. No density center was indicated.

Owing to possible confusion in identification between this species and the similar Kermadec Petrel, Phoenix Petrel, and Tahiti Petrel, most identifications were tentative.

POBSP personnel have collected specimens from comparable latitudes west of the study area (Gould and King, 1967).

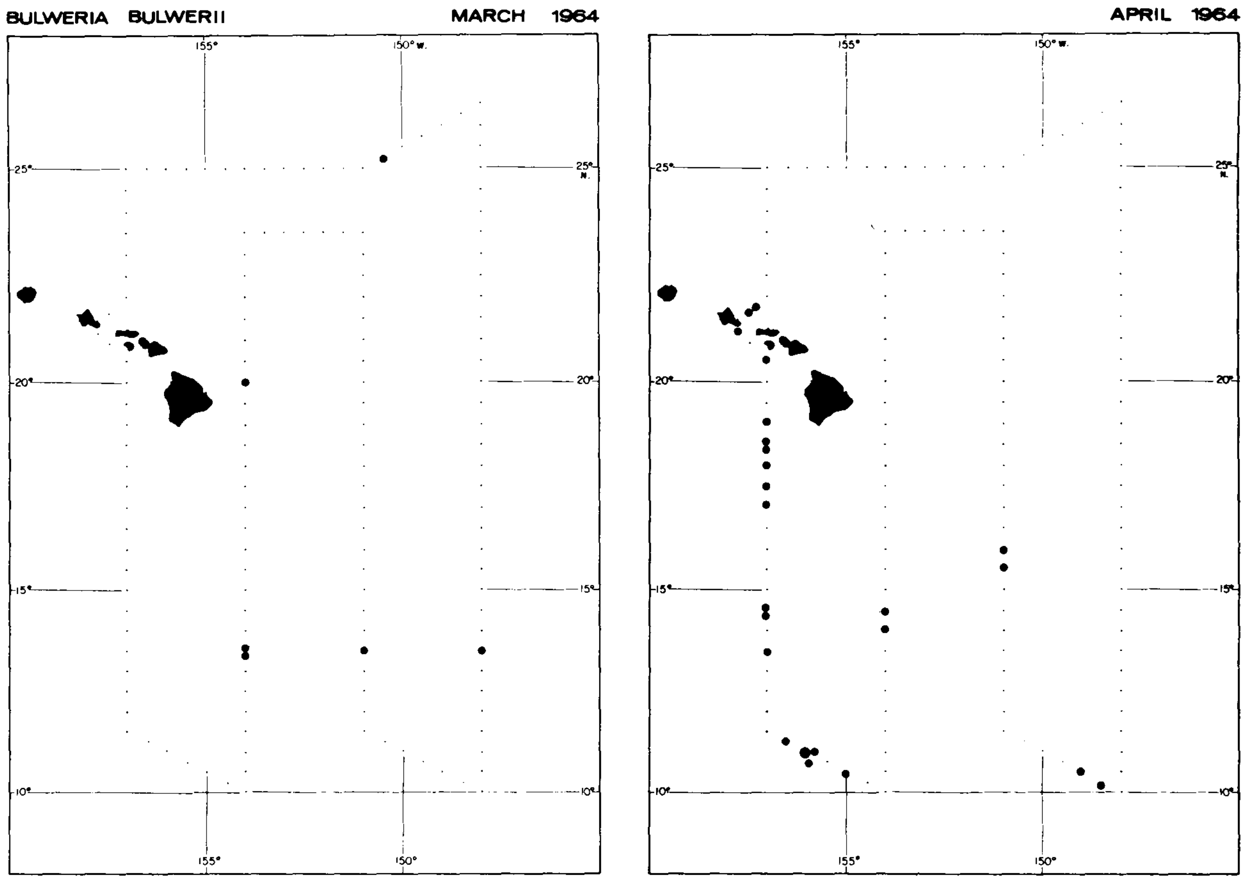


Figure 10a.--Distribution of Bulwer's Petrel, March-June 1964.

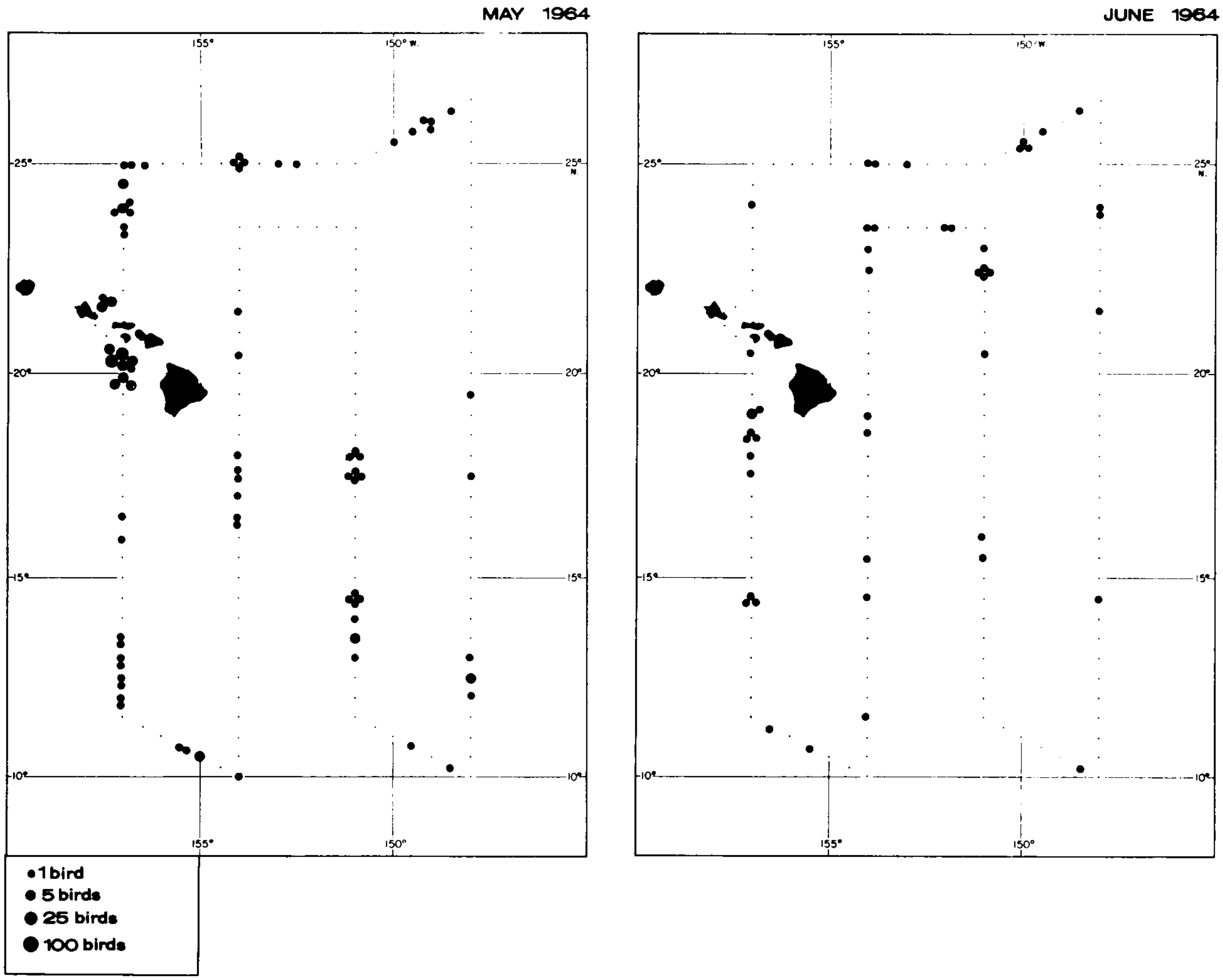
Bulwer's Petrel
Bulweria bulwerii (Jardine and Selby)

Status: Abundant resident during breeding season, April-September; rare or absent October-March.

Months	Year	
	1964	1965
January	-	1
February	-	1
March	6	0
April	28	96
May	178	97
June	50	94
July	58	-
August	-	-
September	11	-
October	4	-
November	4	-
December	0	-

Birds were first seen in March, but in small numbers. Numbers built to a peak in May concurrent with the beginning of egg laying along the leeward Hawaiian chain and on islets around the main Hawaiian islands. By September, when most adults and chicks were leaving the breeding grounds, pelagic numbers already had dropped considerably. After October no birds were seen in the area, with the exception of stragglers in January and February, until the beginning of the breeding season in April when numbers were large once again.

Distribution: The density center for Bulwer's Petrel in the study area was within 50 miles of the Hawaiian Islands (figs. 10a, 10b). Greatest numbers were usually seen just south of Lanai. In general the birds favored the western side of the study area.



The species entered the area from the southeast, and remained concentrated near the Hawaiian Islands during the breeding season, although it tended to extend its range during the period of peak numbers. It later withdrew from the area, again toward the southeast.

POBSP personnel have collected numerous specimens from comparable latitudes west of the study area.

Pale-footed Shearwater
Puffinus carneipes Gould

Status: Uncommon spring and fall migrant.

Seven Pale-footed Shearwaters were identified in the study area: four in October 1964, one in December 1964, and two in April 1965. Probably others were overlooked, especially in the spring of 1964, before we realized that the species occurred in the area. The birds appeared to be migrating, usually in the company of Sooty Shearwaters. Only one of the seven sightings was made in a nonmigration month. Three of the four October birds were heading south, and both April birds were heading north. POBSP personnel have collected several specimens at comparable latitudes west of the study area.

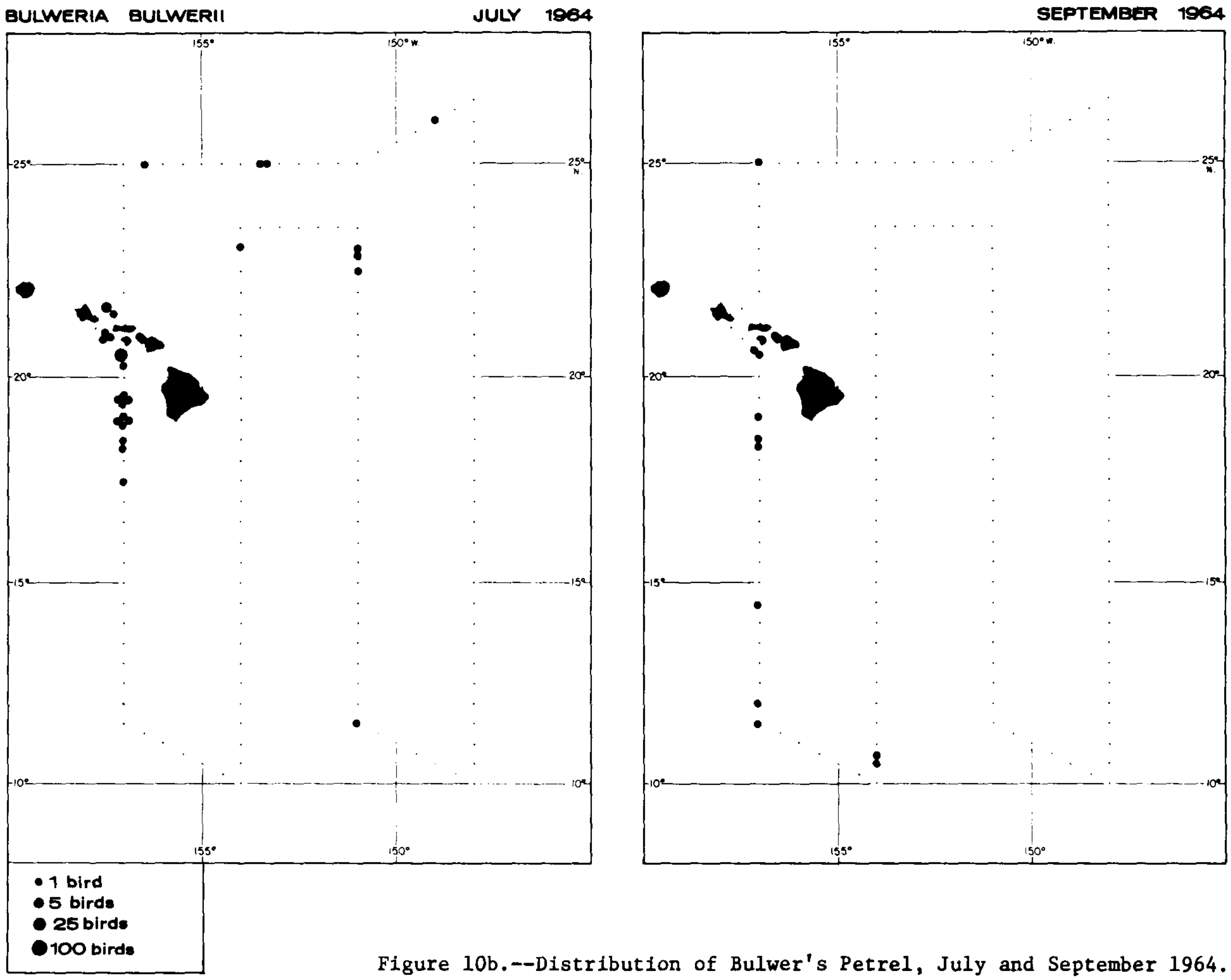


Figure 10b.--Distribution of Bulwer's Petrel, July and September 1964.

Pink-footed Shearwater
Puffinus creatopus Coues

Status: Accidental.

Two birds seen at close range on December 6, 1964 and one on January 16, 1965 were in all likelihood this species. The Pink-footed Shearwater may have occurred more frequently in the study area than records indicate, since its similarity to the Wedge-tailed Shearwater may have caused it to be overlooked. POBSP personnel collected one specimen just south of the study area (lat. 7° N., long. 152° W.).

Wedge-tailed Shearwater
Puffinus pacificus (Gmelin)

Status: Abundant resident during breeding season, March-November; common or uncommon December-February.

Total birds

Months	Year	
	1964	1965
January	-	51
February	-	7
March	104	438
April	352	519
May	1,637	958
June	985	1,054
July	807	-
August	-	-
September	1,308	-
October	208	-
November	199	-
December	106	-

Dark-phase only

Months	Year	
	1964	1965
January	-	3
February	-	0
March	18	3
April	134	101
May	444	53
June	239	164
July	236	-
August	-	-
September	42	-
October	9	-
November	5	-
December	0	-

Wedge-tailed Shearwaters were in the study area all year but were scarce in winter. From the yearly low in February, numbers increased to a peak in May and June, roughly coincident with egg laying on the breeding grounds on islets of the main Hawaiian Islands, and along the leeward Hawaiian chain. Numbers remained high through September (the total for September in the above table was inflated by one sighting of 700 birds a few miles from Oahu) but began to drop off in October, somewhat before chicks fledged on the breeding grounds. By February only a few stragglers remained.

At least two populations were represented in the study area; in most months a fairly sharp line of division existed between the light-phase birds of the Hawaiian group and the dark-phase birds from the southern islands (figs. 11a-d).

Distribution: A recurring density center of light-phase birds was located within 50 miles of the Hawaiian Islands during the breeding season and somewhat later (April-November). The rest of the study area, excluding the area occupied by dark-phase birds, maintained a fairly homogeneous density, bespeaking a random distribution (exception: May 1964, in which a large secondary density center developed at lat. 14° N., long. 151° W.).

The range of dark-phase birds was confined to the southern end of the area from March to May, shifting north to lat. 15° N. in June and to lat. 20° N. in July. Thereafter the range contracted back toward lat. 10° N. In all months the density center was at the southern end of the study area. The range of dark-phase birds covered the greatest area in July. We collected one dark-phase bird.

The light-phase birds represented a breeding population (one bird collected at sea July 4, 1964 at lat. 23° N., long. 157° W. had been banded in May 1964 on an islet off the coast of Oahu) and were much reduced in numbers during the nonbreeding season; the dark-phase birds represented a wintering population (fig. 12). They were most plentiful in May in the beginning of their nonbreeding season. It is not possible to indicate the island(s) of origin of the dark-phase population since several island groups would qualify if we assume a large-scale migration of dark-phase birds similar to that of light-phase birds, which move at least 500 or 1,000 miles (925 or 1,850 km.) from their breeding islands.

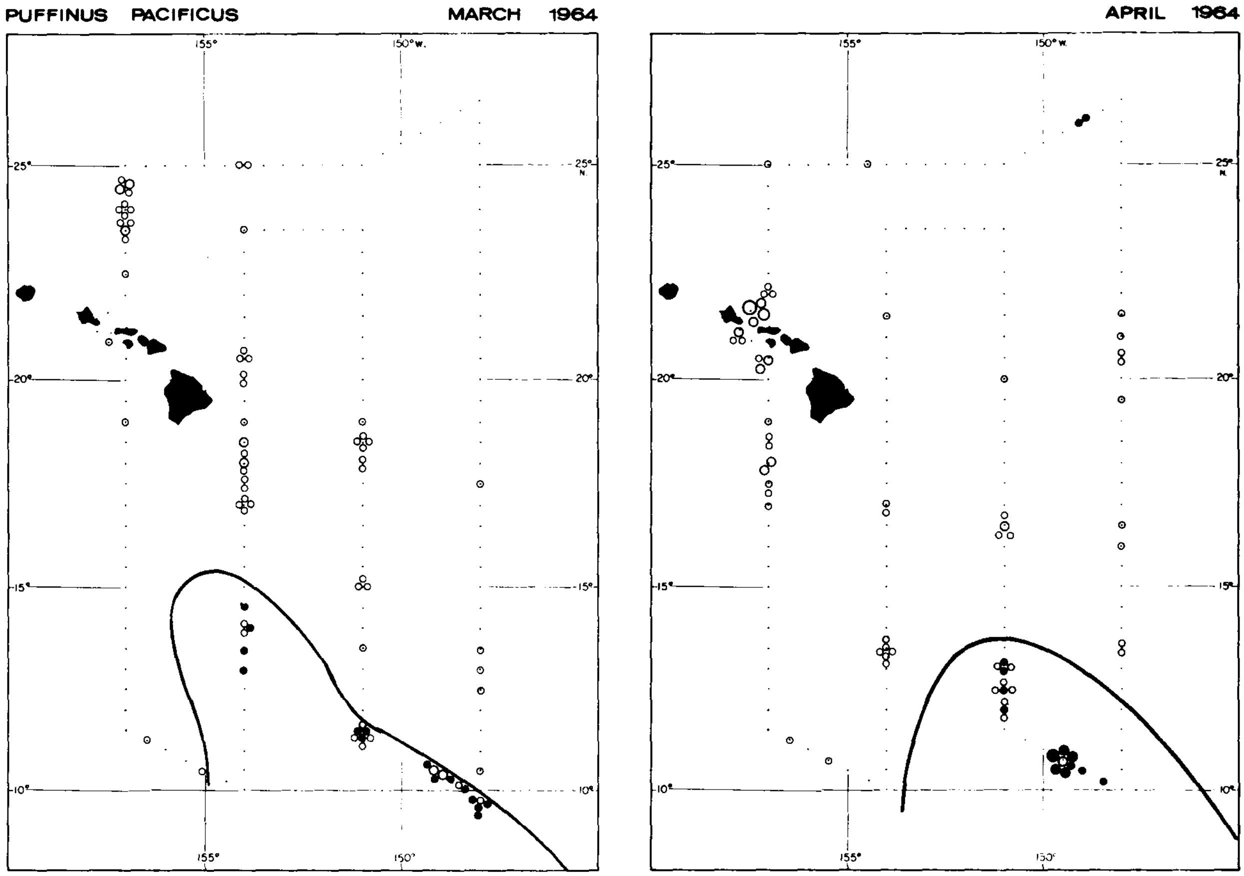
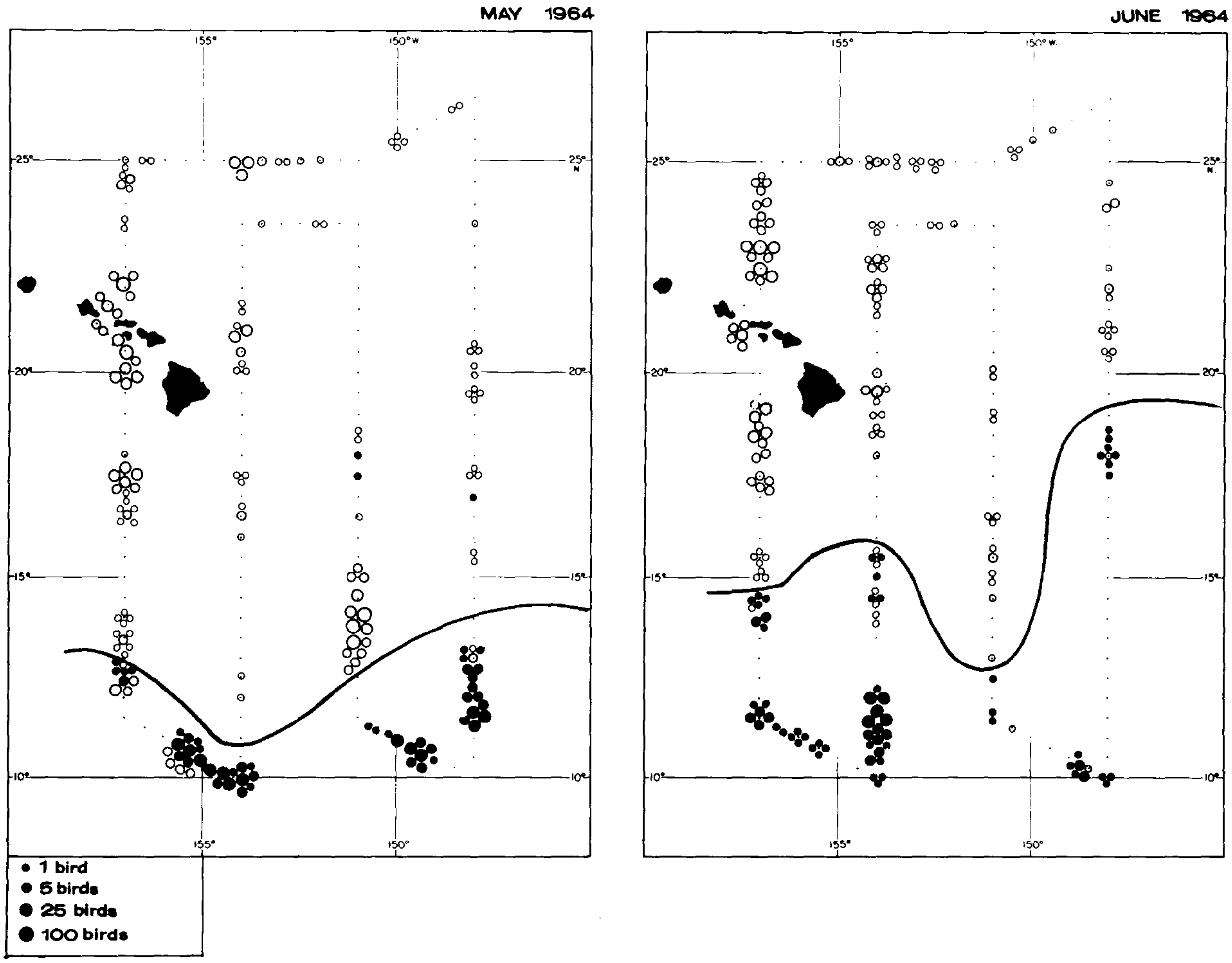


Figure 11a.--Distribution of Wedge-tailed Shearwater, March-June 1964. Lines mark the approximate separation between light-phase (open circle) and dark-phase (solid circle) birds.


MAY 1964
JUNE 1964
155°
150° W.
25°
20°
15°
10°
1 bird
5 birds
25 birds
100 birds

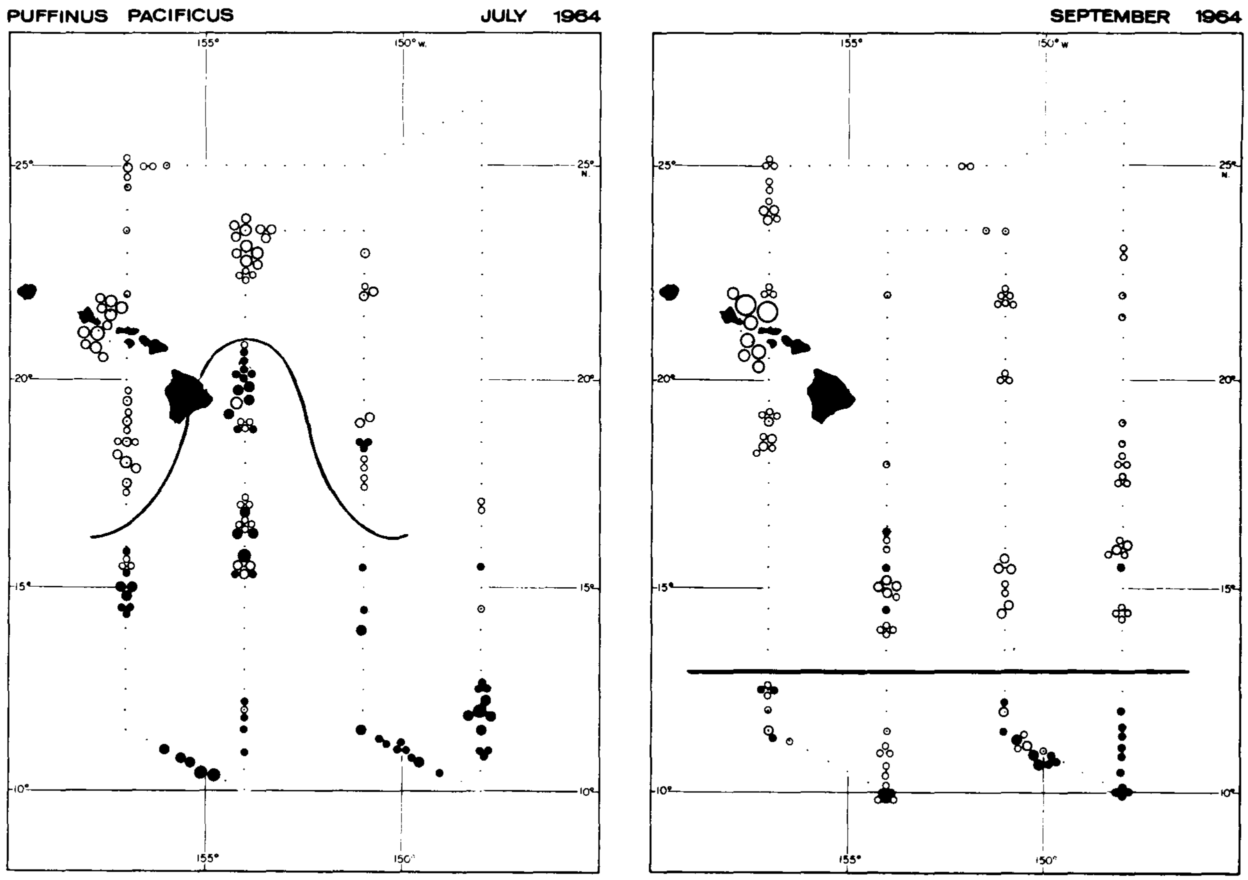
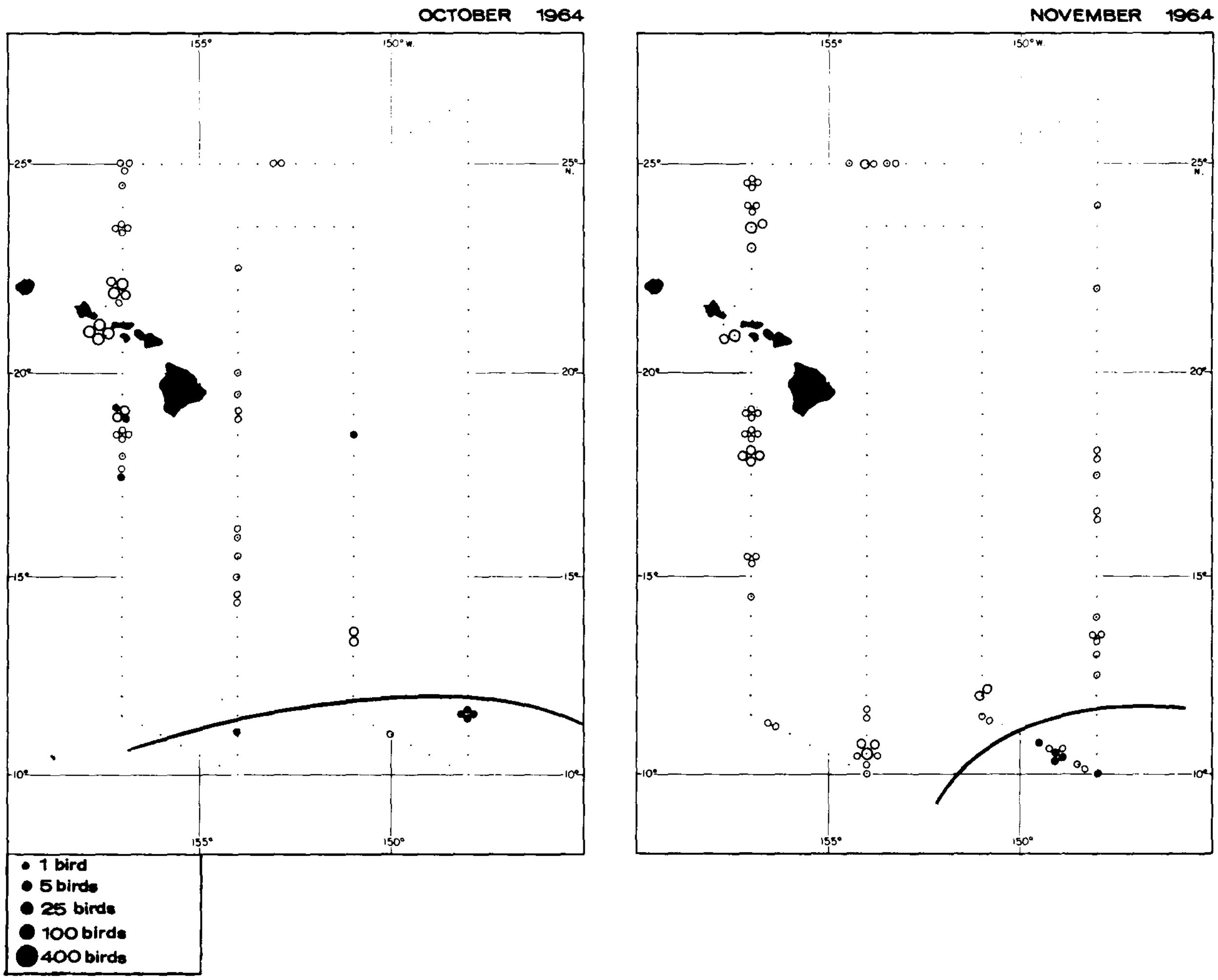


Figure 11b.--Distribution of Wedge-tailed Shearwater, July-November 1964. Lines mark the approximate separation between light-phase (open circle) and dark-phase (solid circle) birds.



OCTOBER 1964
155°
150° W.
25°
25° N.
20°
15°
10°
155°
150°
• 1 bird
• 5 birds
● 25 birds
● 100 birds
● 400 birds
NOVEMBER 1964
155°
150° W.
25°
25° N.
20°
15°
10°
155°
150°

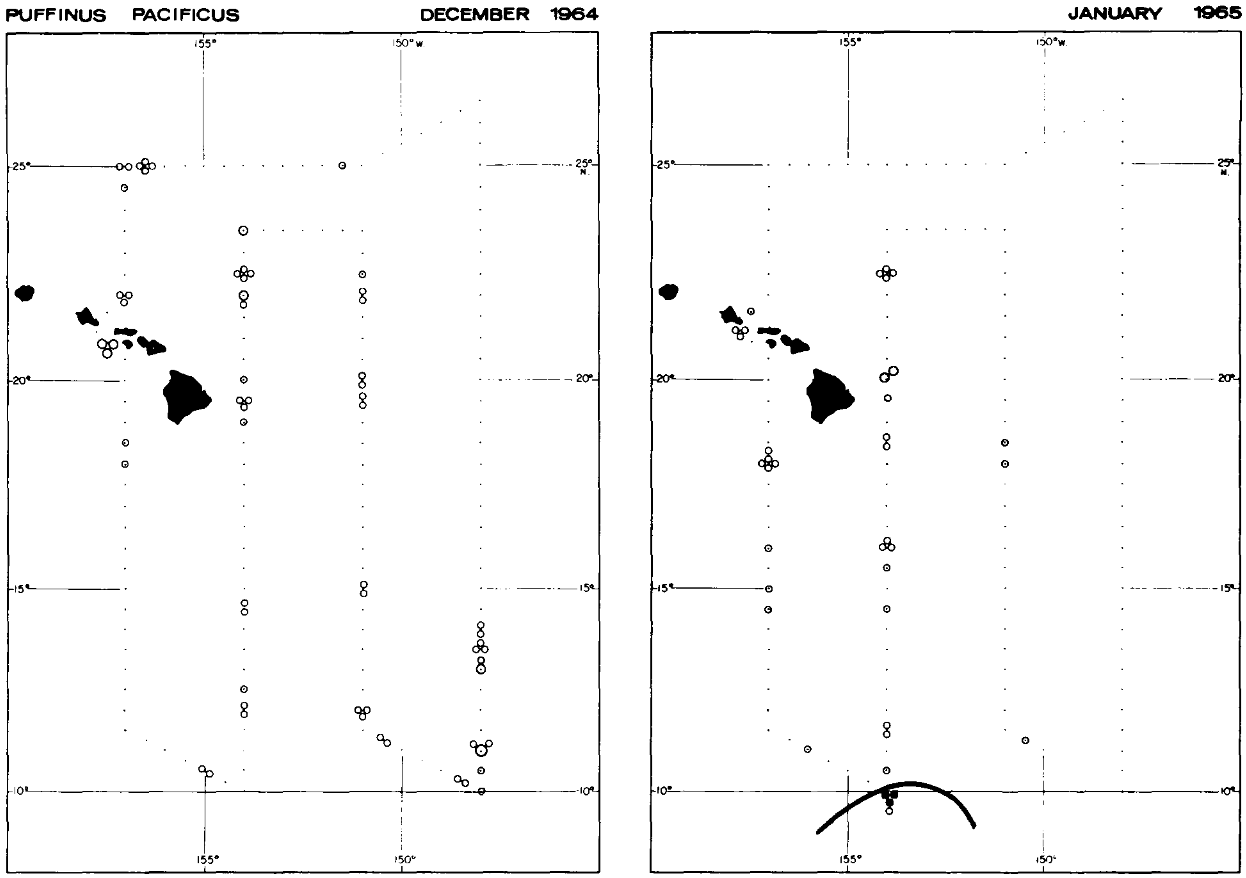
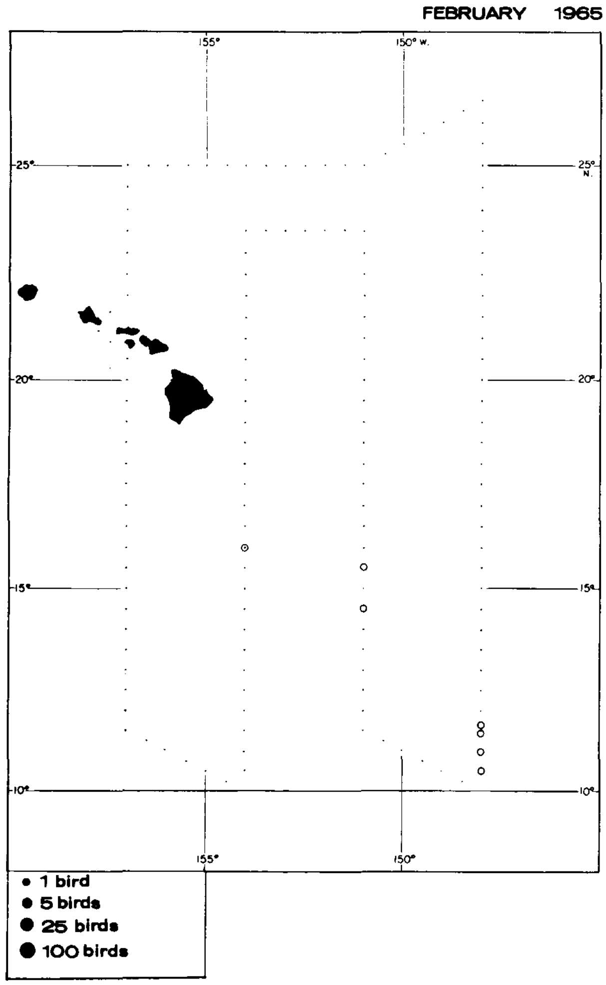
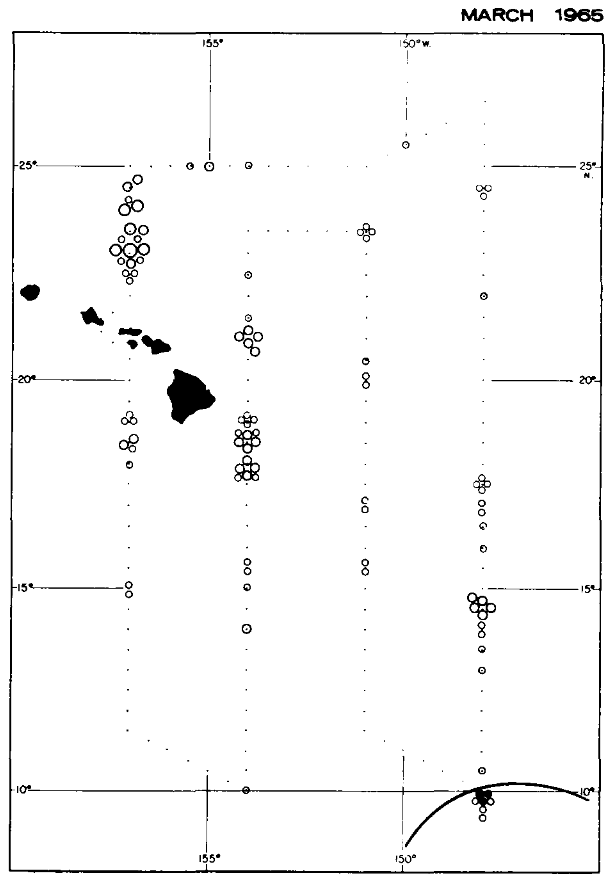


Figure 11c.--Distribution of Wedge-tailed Shearwater, December 1964 to March 1965. Lines mark the approximate separation between light-phase (open circle) and dark-phase (solid circle) birds.


FEBRUARY 1965
155°
150° W.
25°
25° N.
20°
15°
10°
• 1 bird
• 5 birds
• 25 birds
• 100 birds


MARCH 1965
155°
150° W.
25°
25° N.
20°
15°
10°

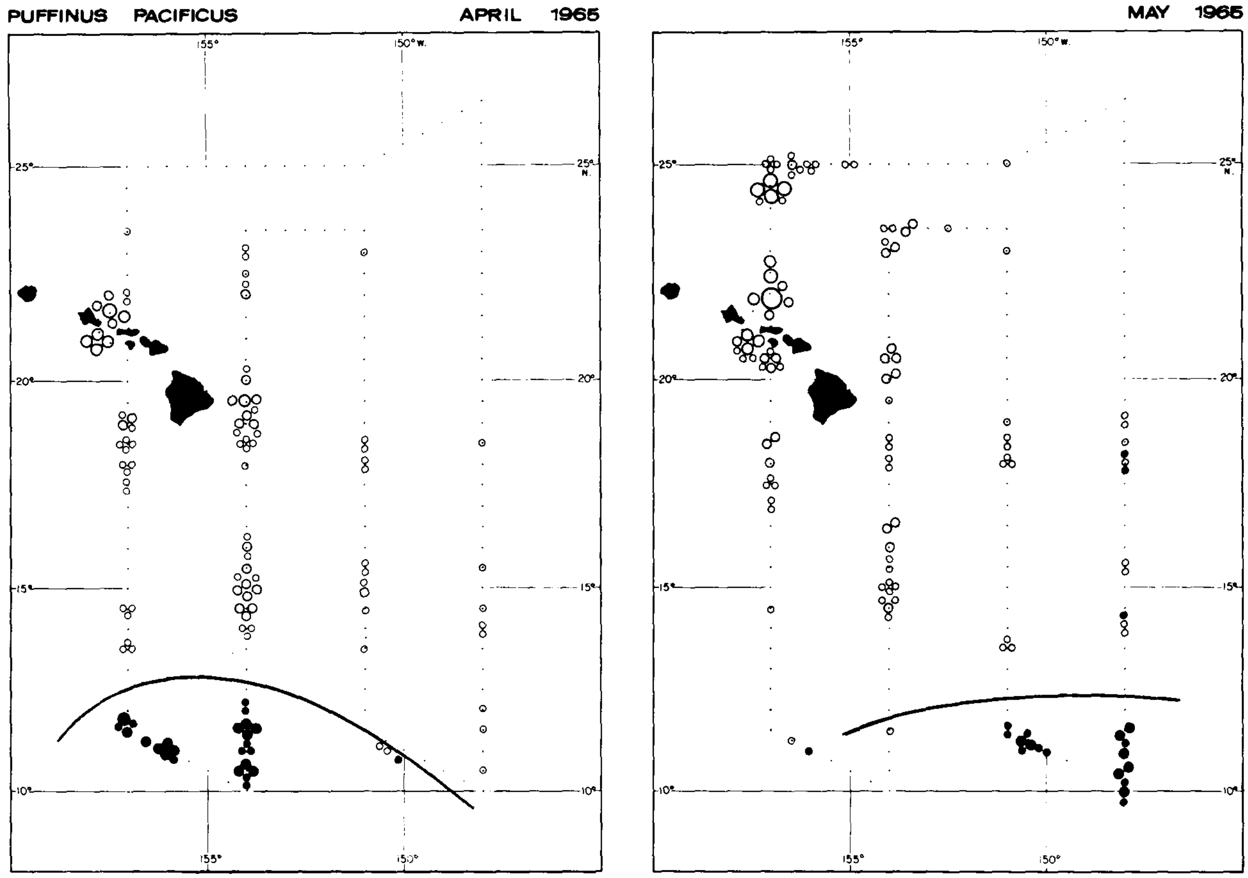
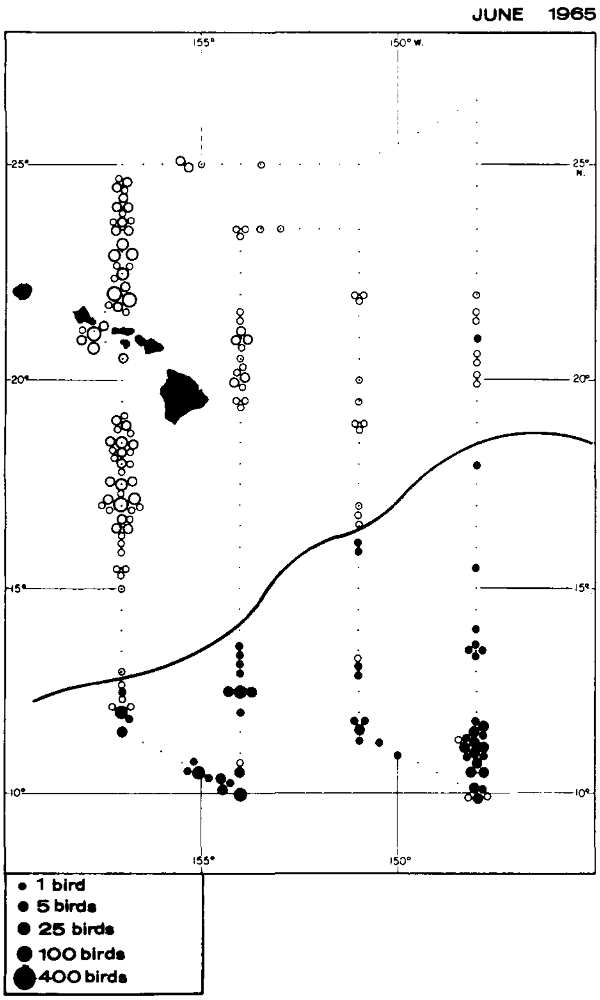


Figure 11d.--Distribution of Wedge-tailed Shearwater, April-June 1965. Lines mark the approximate separation between light-phase (open circle) and dark-phase (solid circle) birds.



New Zealand Shearwater
Puffinus bulleri Salvin

Status: Possibly rare migrant.

This species is included in the species account on the basis of three sight records--one each in March 1964, March 1965, and April 1965--all of which must be considered tentative.

POBSP personnel collected one specimen at a comparable latitude west of the study area.

Sooty Shearwater
Puffinus griseus (Gmelin)

Status: Abundant migrant in spring and fall.

Months	Year	
	1964	1965
January	-	0
February	-	1
March	1,684	382
April	239	507
May	44	222
June	1	0
July	0	-
August	-	-
September	130	-
October	423	-
November	91	-
December	1	-

This species first appeared on March 19, 1964. The peak of the northward migration was toward the end of March. A fairly heavy movement was still underway through April, but by the end of May the species had all but disappeared from the study area. In 1965 the northward migration lasted slightly longer. Fairly large numbers were seen from March 19 through the end of May, although the greatest densities were recorded between March 19 and April 19.

The southward migration started on September 16 and ran sporadically until the end of November. The peak was in the first week of October.

Their behavior was typical of sea birds on migration. Most birds traveled singly and showed little inclination to feed or rest. In spring the most frequently observed direction of flight was northwest. In fall the direction was due south.

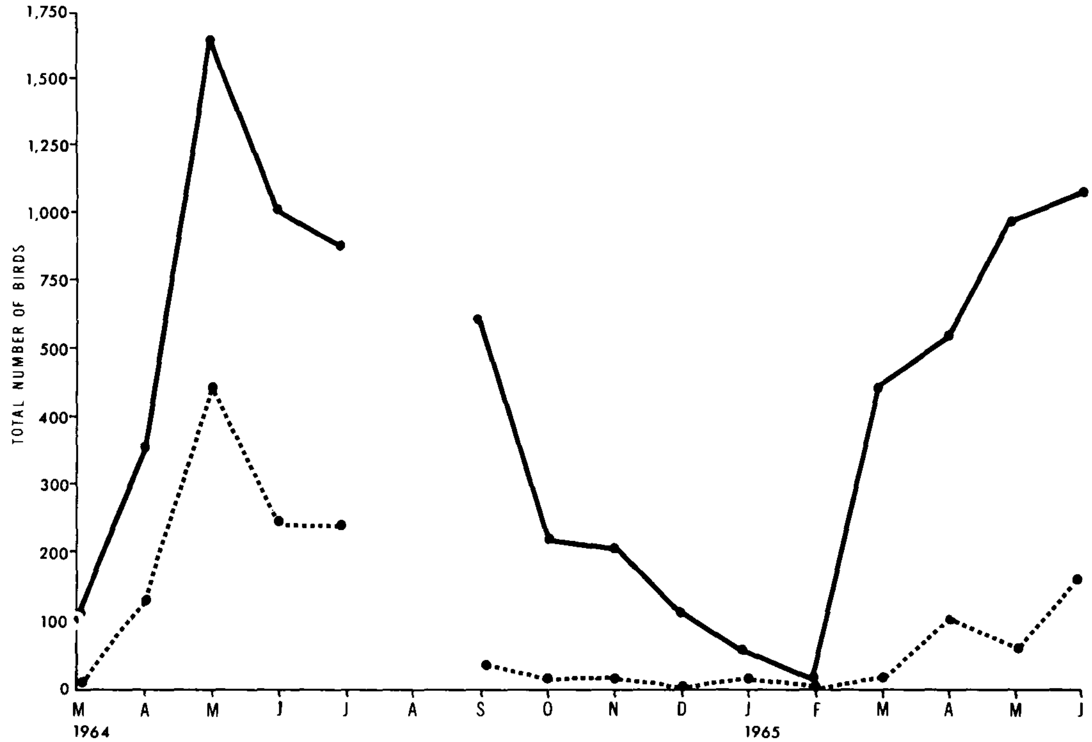


Figure 12.--Monthly abundance of Wedge-tailed Shearwaters: total--solid line; dark-phase--broken line.

Distribution: Individuals were seen from lat. 10° to 26° N. and from long. 148° to 157° W. Birds were observed migrating past Oahu at a distance of 1 mile or less. No distribution pattern was observed within the area.

POBSP personnel have collected specimens west and south of the study area.

Slender-billed Shearwater
Puffinus tenuirostris (Temminck)

Status: Abundant migrant in fall.

Months	Year	
	1964	1965
January	-	3
February	-	0
March	0	1
April	0	0
May	0	0
June	0	0
July	0	-
August	-	-
September	0	-
October	0	-
November	871	-
December	15	-

Slender-billed Shearwaters were first seen on November 9, 1964. They were migrating south, usually in flocks of 5 to 40 birds. The migration peak was short and well-defined; it began on November 9 and was completed on

November 13. Over 96 percent of the birds seen in the area were recorded on these 5 days. Thereafter only stragglers were observed.

This species was difficult to distinguish from the similar Sooty Shearwater when only small numbers of one or both species were present. Thus, although a few of each species may have been identified as the other, the totals in the monthly abundance table for this species would not be altered significantly.

Owing to the short duration of the migration, a distribution analysis would have little meaning. A second migration wave may well have occurred when the ship was in port between cruises.

If a northward migration had taken place through the area in the spring we would have seen more than one bird, even if there had been a peak of migration as sharp as the fall peak.

POBSP personnel have collected specimens at comparable latitudes west of the study area.

Christmas Shearwater
Puffinus nativitatis Streets

Status: Uncommon resident.

Months	Year	
	1964	1965
January	-	0
February	-	2
March	1	1
April	1	4
May	2	0
June	0	0
July	2	-
August	-	-
September	6	-
October	0	-
November	3	-
December	1	-

Christmas Shearwaters were evidently present in the area in most, perhaps all, months of the study. The low numbers observed prevent any precise placement of population peaks.

Distribution: The fact that no Christmas Shearwaters were seen between long. 17° and 21° N. (fig. 13) may be due to chance. It might also be explained by the presence in the study area of two populations of this species--one northern, presumably breeding along the leeward Hawaiian chain, and the other southern, presumably breeding in the Line or Phoenix groups or elsewhere to the south.

No birds were seen in the northern half of the area in January, February, or March, although birds first appear on their breeding grounds in the leeward Hawaiian chain in early March (Richardson, 1957).

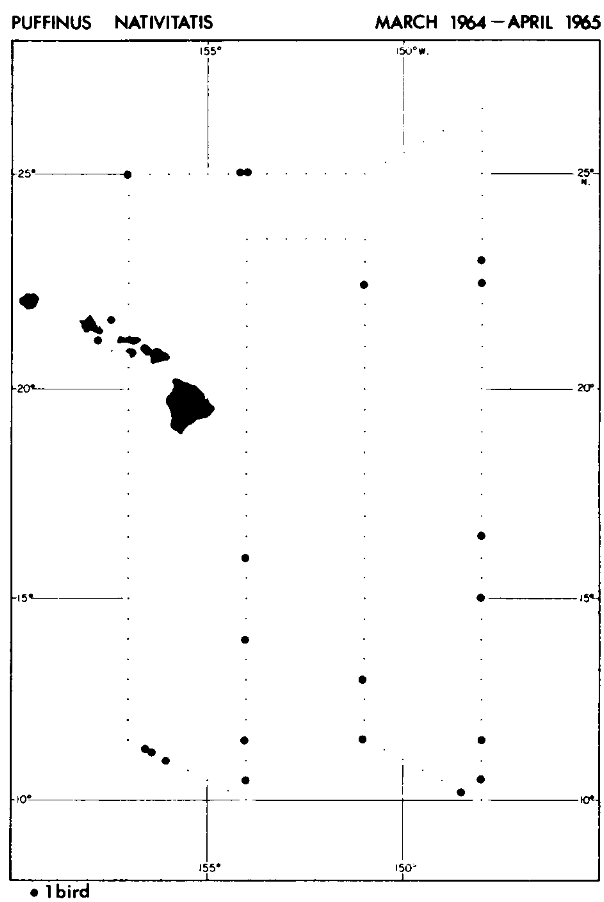


Figure 13.--Distribution of Christmas Shearwater.

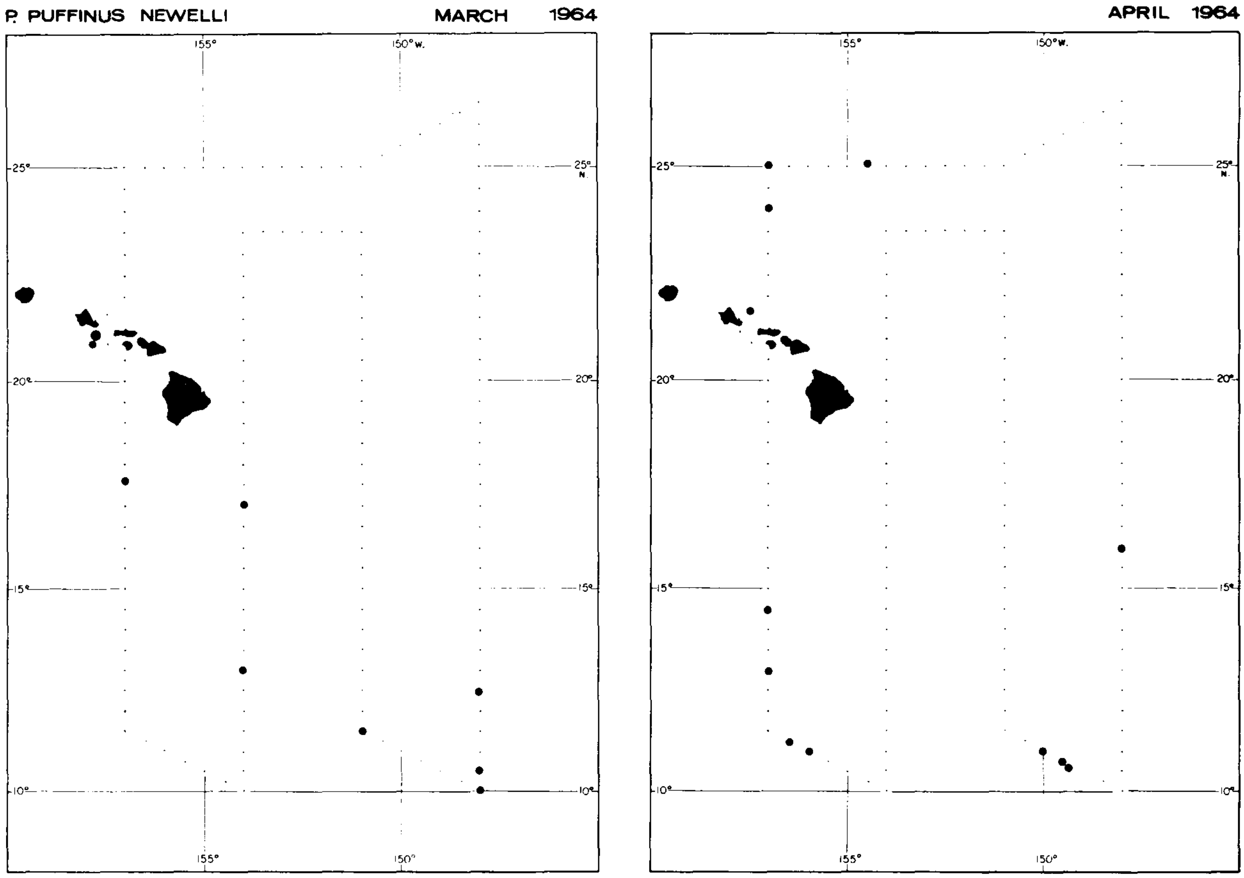


Figure 14a.--Distribution of Newell's Shearwater, March-June 1964.

Newell's Shearwater
Puffinus puffinus newelli Henshaw

Status: Common resident during breeding season in March-September; uncommon October-February.

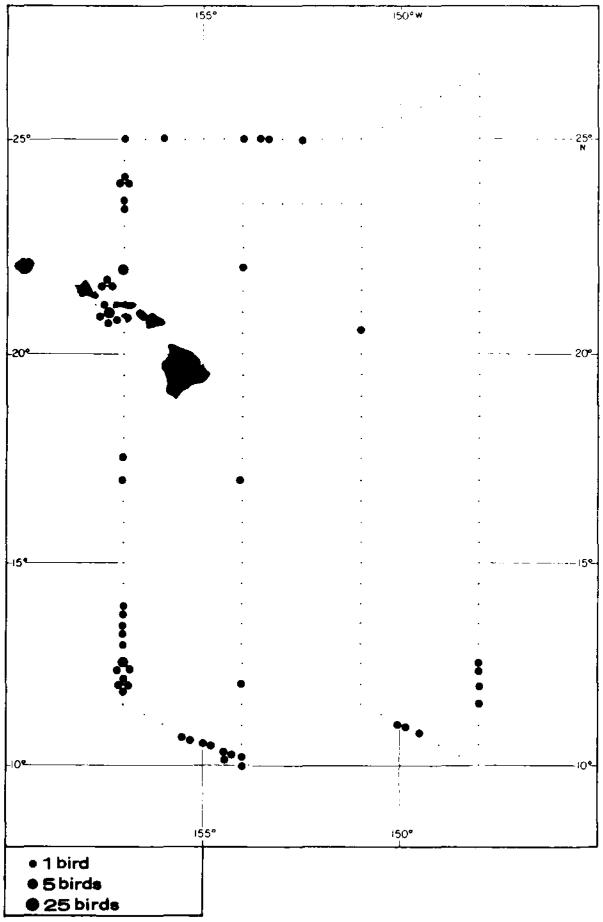
Months	Year	
	1964	1965
January	-	3
February	-	1
March	13	0
April	12	26
May	66	49
June	15	23
July	21	-
August	-	-
September	23	-
October	7	-
November	4	-
December	4	-

Newell's Shearwater was first observed in the study area on March 16, 1964, and was seen regularly each month thereafter except March 1965. Peak numbers were in May of both years. From June through September numbers were lower but nearly constant. A decline that began in October reached a low point in February and the first half of March when the species was nearly absent from the area.

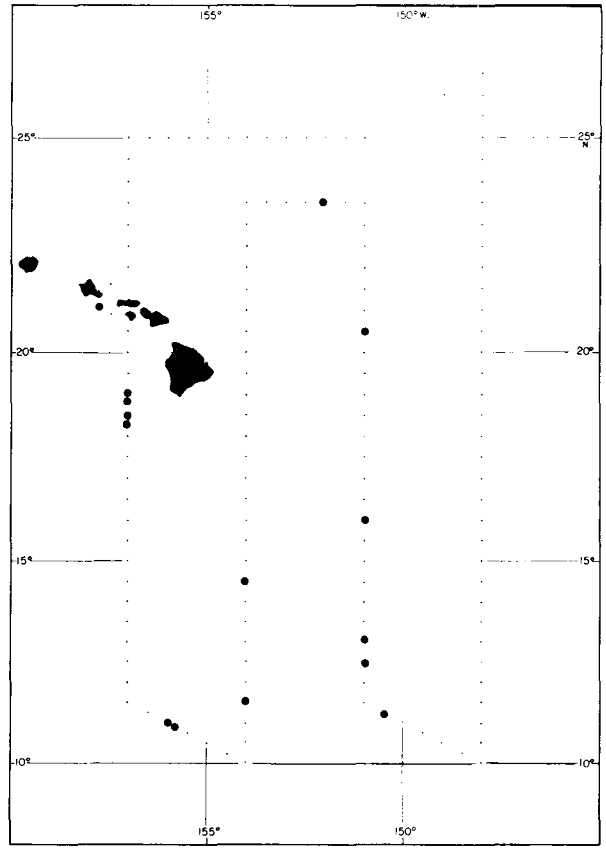
Distribution: Two density centers were noted for this species: one within 200 miles of the Hawaiian Islands, especially north of Oahu, and one at the southern end of the study area below lat. 14° N. (figs. 14a, 14b). Relatively few sightings were made in the area between lat. 14° and 19° N.

In March and April, when the species was evidently heading toward its breeding grounds in the Hawaiian Islands from its wintering area

MAY 1964



JUNE 1964



which is not known, birds were seen in a broad diagonal band from the southeast corner of the study area to the Hawaiian Islands. With the beginning of egg laying in May most birds were either fairly close to the Hawaiian Islands or at the southern end of the area. This distribution pattern prevailed through October, when most chicks were fledged, to January, although after October numbers were greatly reduced.

POBSP personnel have collected specimens south and west of the study area.

Fork-tailed Petrel
Oceanodroma furcata (Gmelin)

Status: Rare winter visitor.

The species account is based on four sight records--three from November 1964 and one from December 1964. All were at the northern end of the study area. This species was previously unrecorded in the central Pacific Ocean.

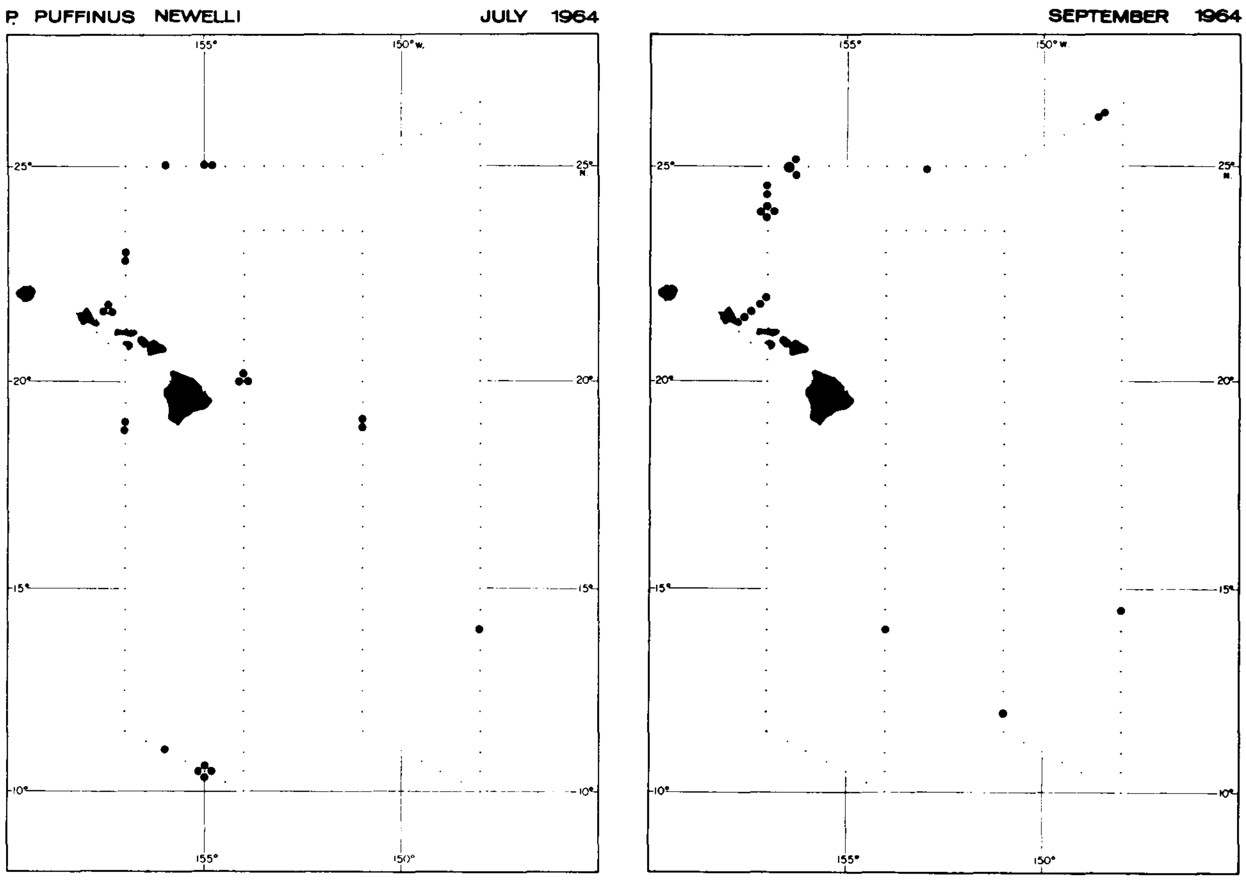
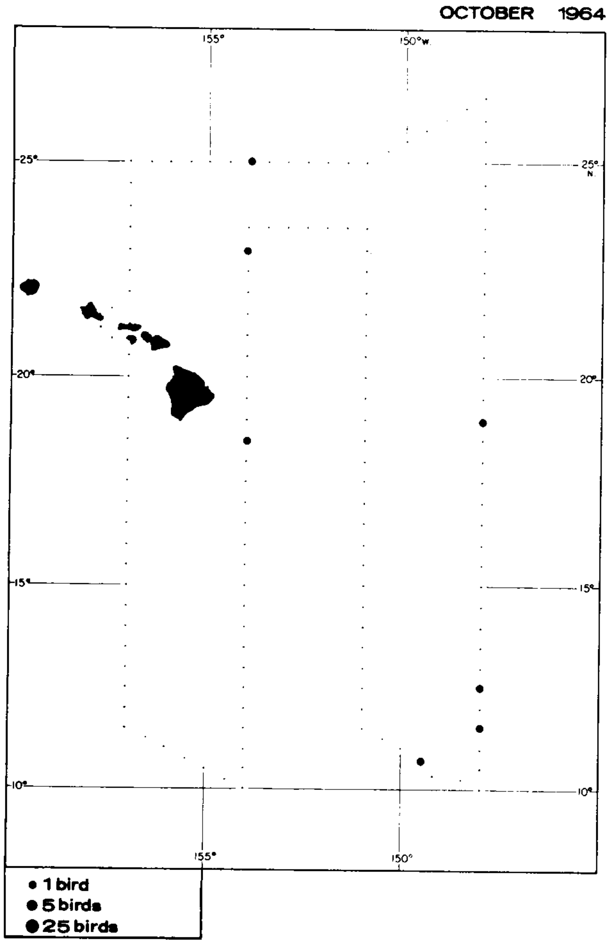
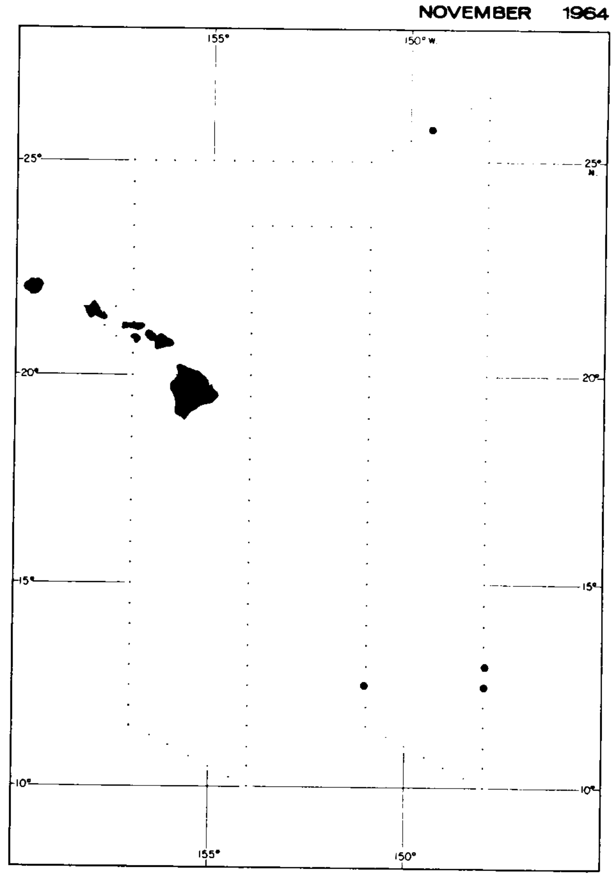


Figure 14b.--Distribution of Newell's Shearwater, July-November 1964.


OCTOBER 1964
155°
150°W.
25°
25° N.
20°
15°
10°
155°
150°
• 1 bird
● 5 birds
● 25 birds


NOVEMBER 1964
155°
150° W.
25°
25° N.
20°
15°
10°
155°
150°

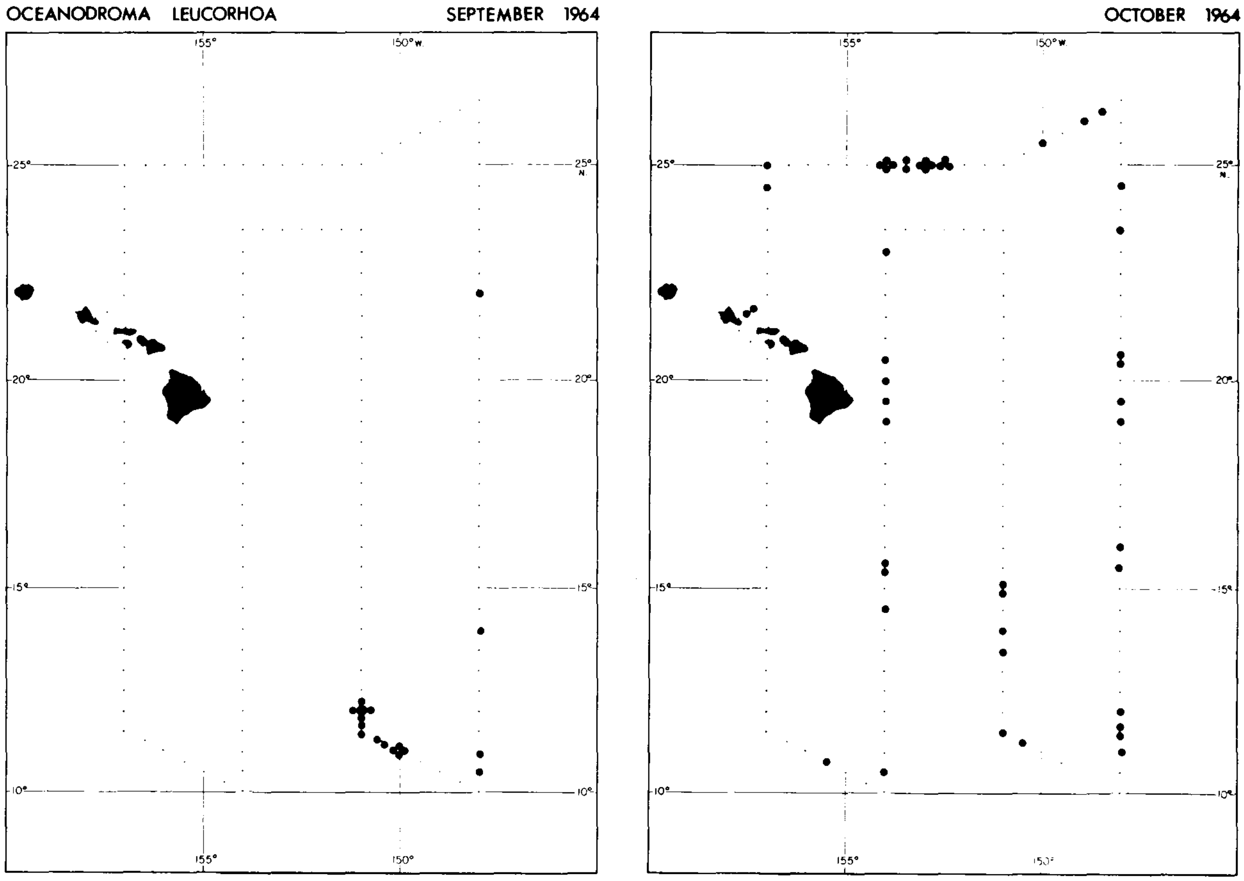


Figure 15a.--Distribution of Leach's Storm Petrel, September 1964 to January 1965.

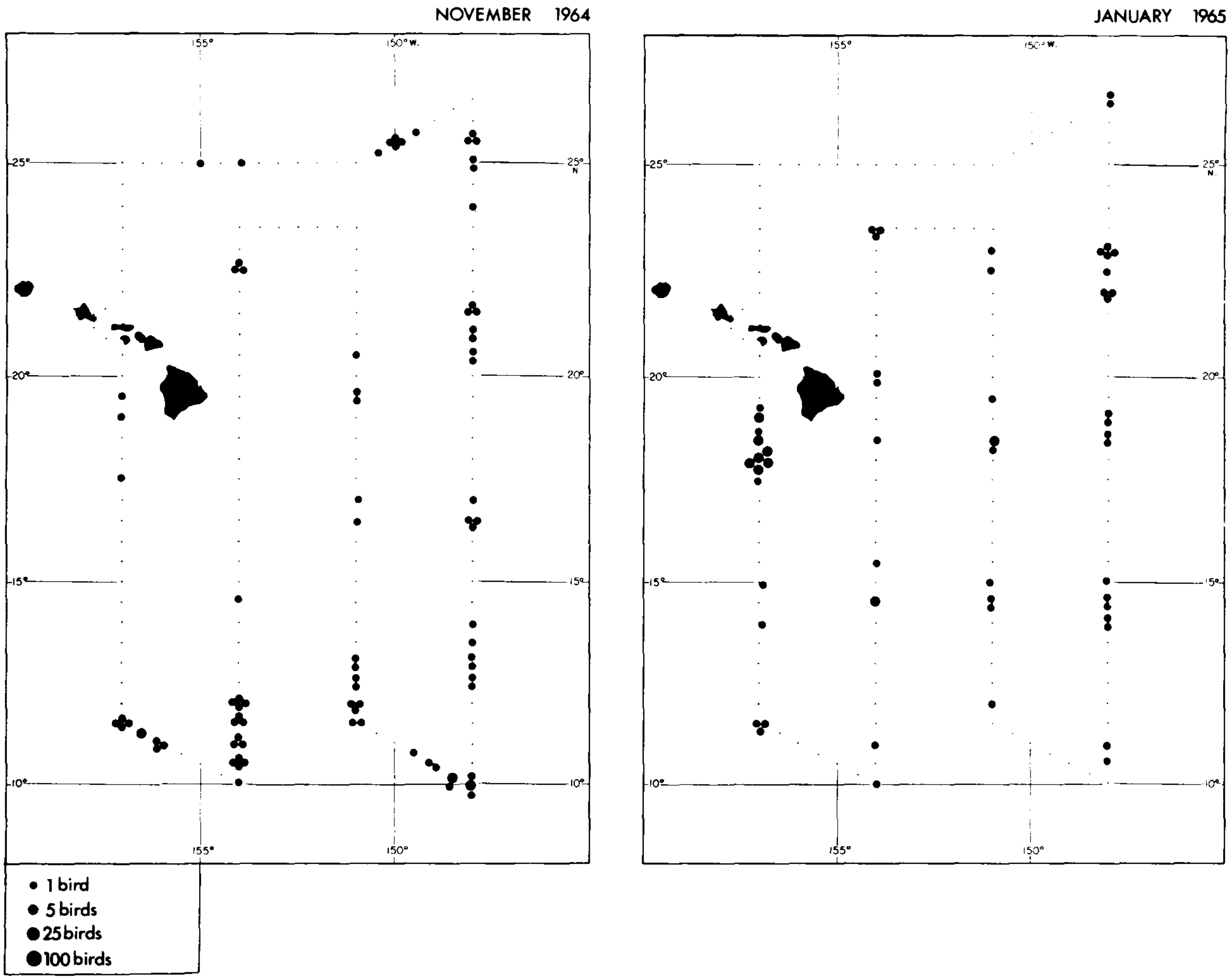
Leach's Storm Petrel
Oceanodroma leucorhoa (Vieillot)

Status: Abundant visitor during nonbreeding season, September-May; uncommon June-July.

Months	Year	
	1964	1965
January	-	81
February	-	83
March	59	81
April	129	297
May	64	32
June	7	1
July	2	-
August	-	-
September	21	-
October	44	-
November	96	-
December	53	-

Upon completion of the breeding season on islands in the North Pacific Ocean in September, Leach's Storm Petrels increased in abundance in the study area. The plateau maintained from November through March indicated that the winter population in the area was nearly constant. Numbers increased in April to a peak as birds began to head north to their breeding grounds. The increase was probably the result of birds entering the study area from the south while local birds were still present. In May numbers decreased, and by June almost all birds had returned to their breeding area.

Distribution: No density centers can be demonstrated for this species (figs. 15a, 15b). We collected seven specimens. POBSP personnel have collected many others south and west of the area. A very small number of the birds



identified as Leach's Storm Petrel or species of storm petrel may actually have been Harcourt's Storm Petrel, which breeds in small numbers in the main Hawaiian islands. POBSP personnel have collected three specimens of the latter species southwest of the study area.

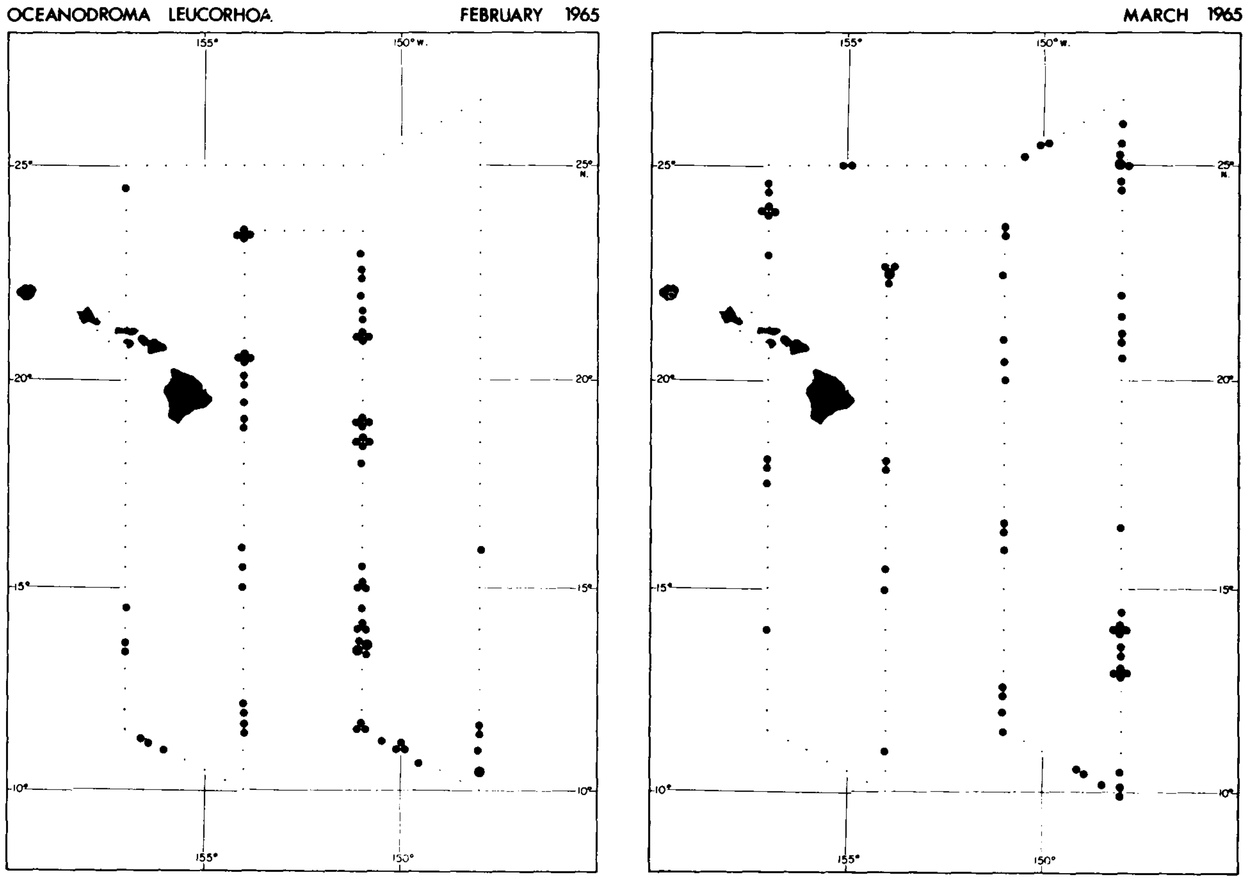
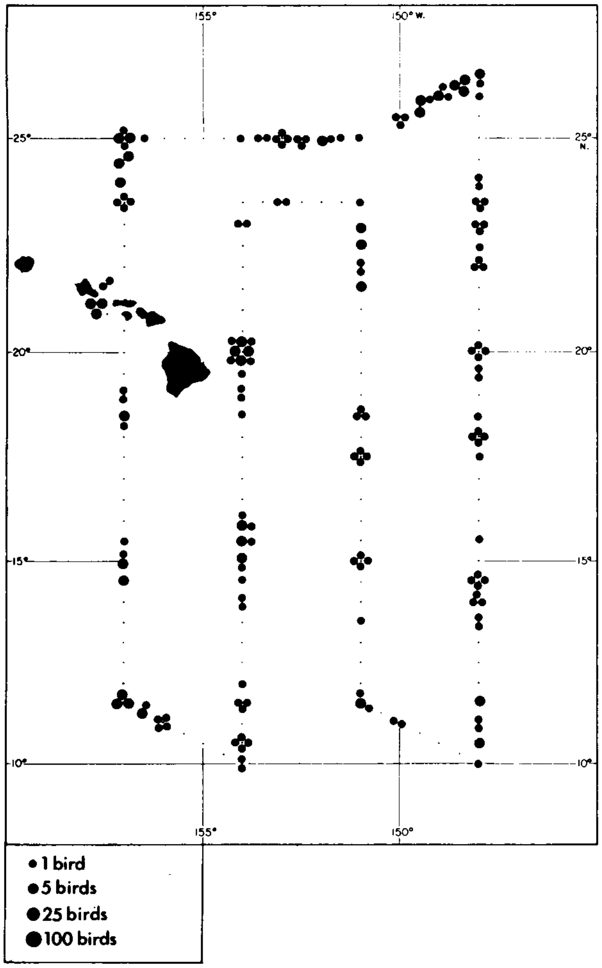
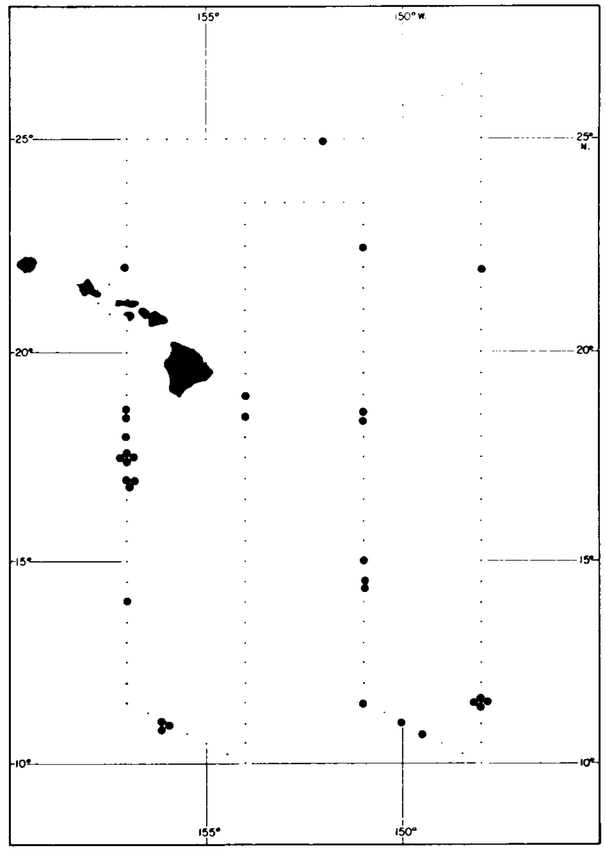


Figure 15b.--Distribution of Leach's Storm Petrel, February-May 1965.

APRIL 1965



MAY 1965



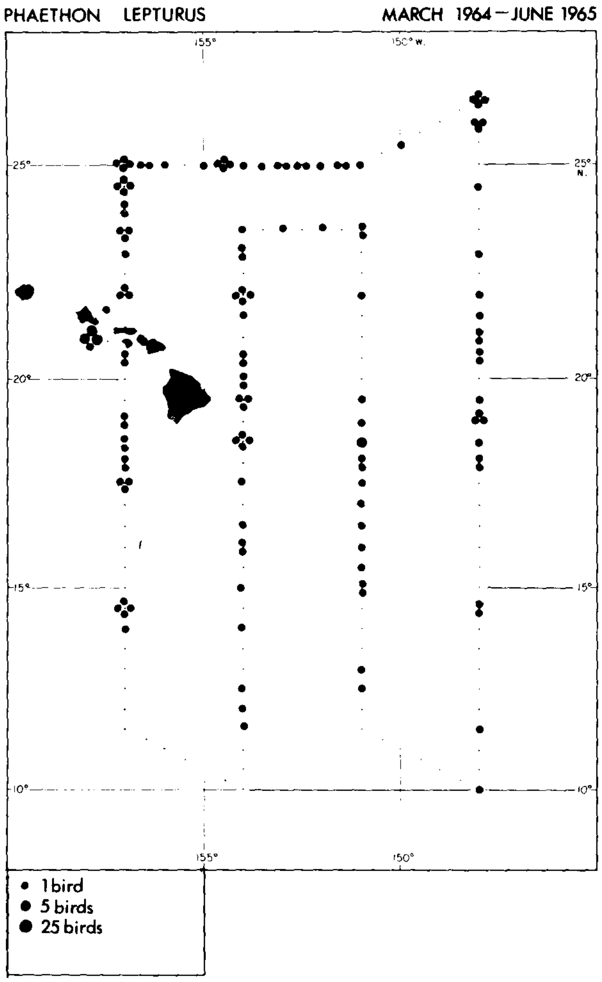


Figure 16.--Distribution of White-tailed Tropicbird.

White-tailed Tropicbird
Phaethon lepturus Daudin

Status: Common resident.

Months	Year	
	1964	1965
January	-	9
February	-	10
March	2	1
April	4	8
May	24	14
June	7	23
July	11	-
August	-	-
September	9	-
October	2	-
November	9	-
December	17	-

This species was present in small numbers every month of the year. A prolonged breeding season, such as that of the birds in the Hawaiian Islands, would account for the relative regularity of sightings.

Distribution: Birds were frequently observed near the main Hawaiian islands (fig. 16). Otherwise, distribution was random throughout the study area north of lat. 15° N. The southern third of the area accounted for only 15 birds (10 percent), even though roughly one-third of the observation time was spent there. All birds recorded south of lat. 15° N. were seen between February and June.

Red-tailed Tropicbird
Phaethon rubricauda Boddaert

Status: Common resident.

Months	Year	
	1964	1965
January	-	8
February	-	3
March	20	13
April	7	19
May	25	13
June	15	34
July	22	-
August	-	-
September	26	-
October	38	-
November	14	-
December	6	-

The numbers of Red-tailed Tropicbirds were nearly constant from March 1964 through November 1964; they decreased in December, and remained low in January and February. Numbers increased again in March 1965 and remained at the higher level until the end of the study.

The breeding season begins in late February, and chicks are fledged by November on both the leeward Hawaiian chain and the Phoenix and Line groups. The population at these breeding sites is smallest December through February. Since fewer birds were seen at sea during these 3 months than during the rest of the year, a postbreeding dispersal out of the study area is indicated.

Distribution: Red-tailed Tropicbirds were distributed evenly throughout the study area in all months (fig. 17).

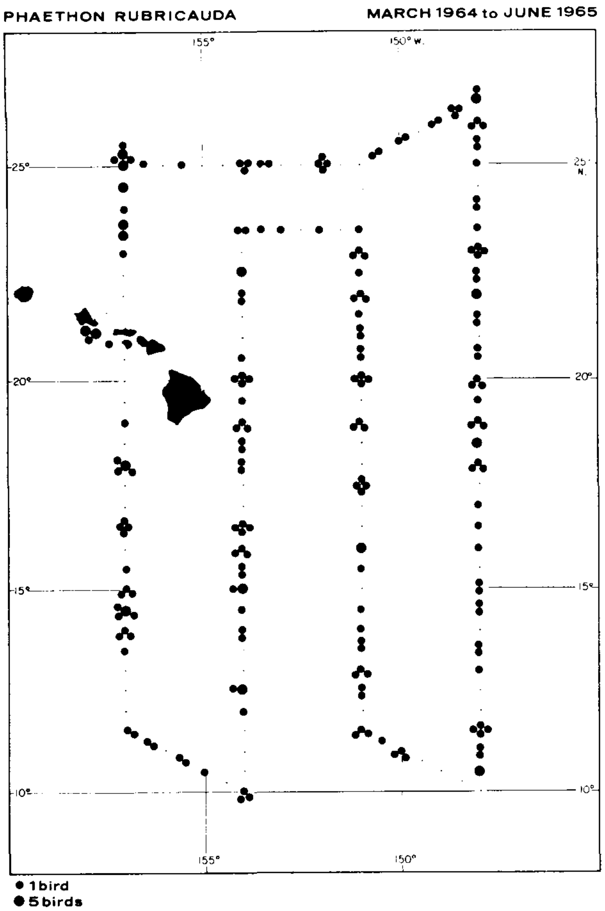


Figure 17.--Distribution of Red-tailed Tropic-bird.

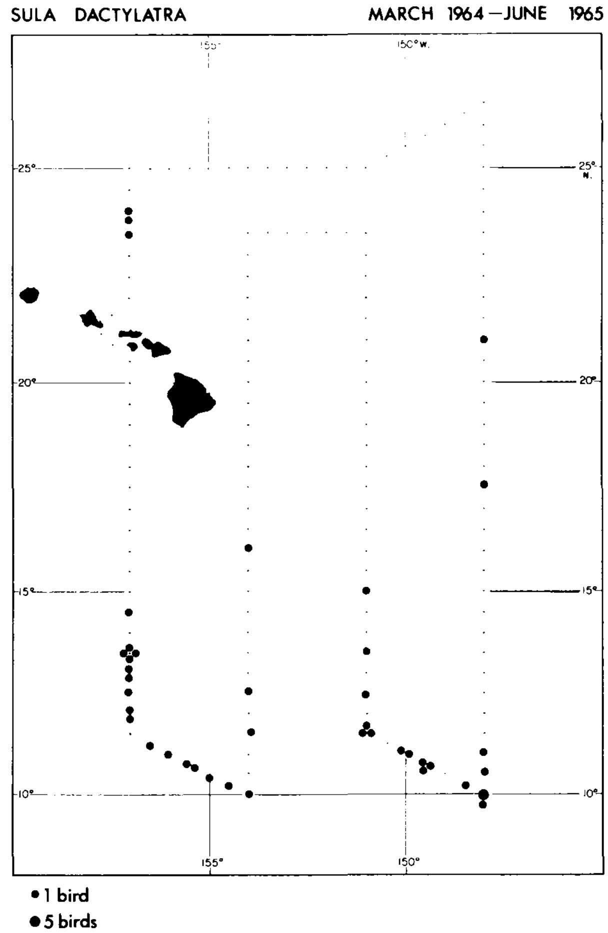


Figure 18.--Distribution of Blue-faced Booby.

Blue-faced Booby
<u>Sula dactylatra</u> Lesson

<u>Status</u>: Uncommon visitor January-June; absent July-December.

Months	Year	
	1964	1965
January	-	3
February	-	4
March	5	3
April	4	5
May	9	5
June	1	6
July	0	-
August	-	-
September	0	-
October	0	-
November	0	-
December	0	-

Blue-faced Boobies were observed in small numbers every month from January through June. The species was apparently absent from the area from July through December. It was not possible to determine a population peak because of the small sample size.

<u>Distribution</u>: Only 6 of 45 Blue-faced Boobies were found north of lat. 15° N. (fig. 18). Probably three seen 200 miles north of Oahu were from the leeward Hawaiian chain and the rest were from the Line Islands.

Every bird observed had immature or subadult plumage except one that appeared to have adult plumage.

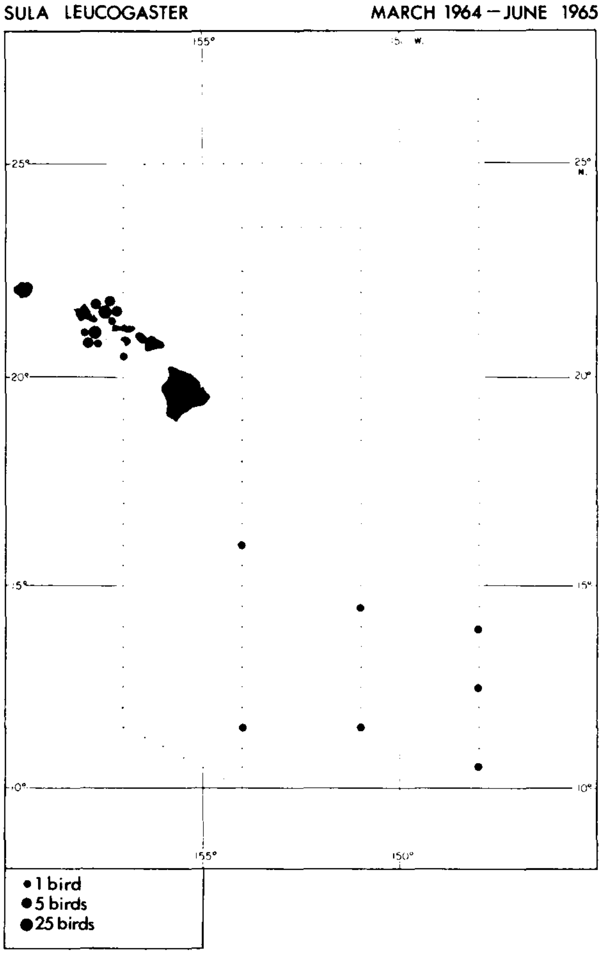


Figure 19.--Distribution of Brown Booby.

Brown Booby
Sula leucogaster Boddaert

Status: Locally common resident.

Months	Year	
	1964	1965
January	-	8
February	-	12
March	0	12
April	4	5
May	2	5
June	1	2
July	2	-
August	-	-
September	8	-
October	18	-
November	1	-
December	1	-

The number of Brown Boobies recorded in any given month depended more on the number of hours of observation within 50 miles of Oahu than on the relative seasonal abundance of the bird. It is present year round on its breeding grounds, the nearest of which to the study area is Moku Manu, offshore Oahu (Richardson and Fisher, 1950); no determination of population peaks in the study area was possible.

Distribution: As can clearly be seen in figure 19, Brown Boobies tended to stay very close to their breeding grounds. Of 81 birds observed, all but 7 were within 50 miles of Oahu. The other seven were scattered throughout the southern third of the area. Birds were seen away from Oahu only in October 1964 and February and March 1965.

Red-footed Booby
Sula sula Linnaeus

Status: Locally abundant resident.

Months	Year	
	1964	1965
January	-	22
February	-	106
March	10	114
April	71	46
May	108	114
June	6	221
July	17	-
August	-	-
September	68	-
October	79	-
November	24	-
December	77	-

Since monthly fluctuations in recorded numbers of Red-footed Boobies in the study area probably reflected the number of hours of daylight, and hence of observations, near Oahu (where the species breeds), rather than actual seasonal increases and decreases, I did not attempt to determine population peaks.

Distribution: Only 22 of 1,082 Red-footed Boobies (1.9 percent) were found more than 50 miles from Oahu (fig. 20). Of these 22, 11 were immatures and 4 were adults (no age data for 7). All four adults were seen north of Oahu. The immature birds were spread at random through the area. Most birds seen near Oahu were adults.

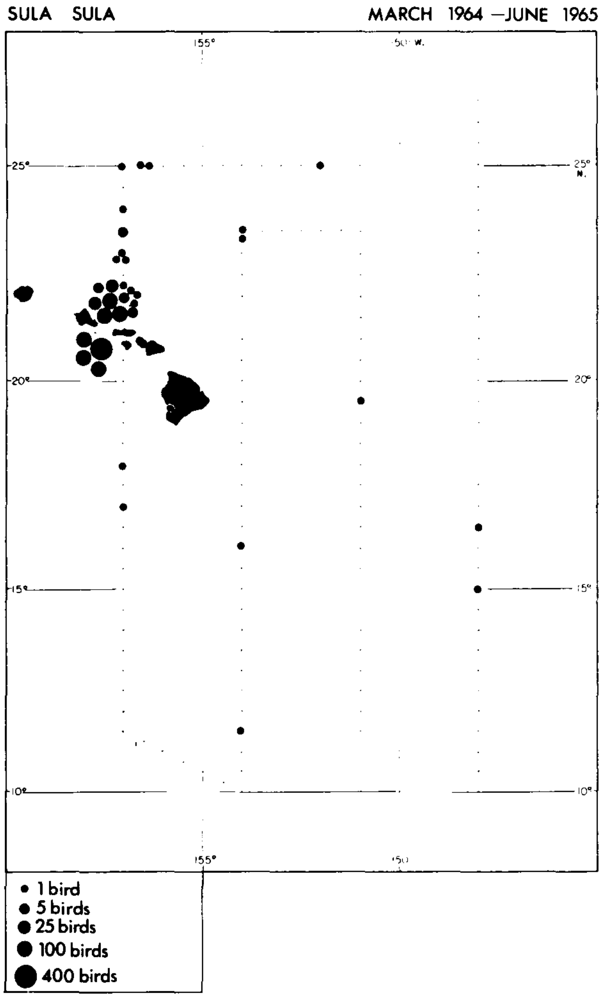


Figure 20.--Distribution of Red-footed Booby.

Great Frigatebird
Fregata minor (Gmelin)

Status: Common resident.

Months	Year	
	1964	1965
January	-	19
February	-	15
March	4	19
April	2	26
May	11	48
June	6	62
July	14	-
August	-	-
September	19	-
October	28	-
November	22	-
December	9	-

No identifiable trends in monthly fluctuations of numbers of this species can be found on the basis of available data. No reason can be given for the apparent increase in numbers from March through June 1965 and the absence of such an increase in the same months of 1964.

Distribution: Densities were greatest within 50 miles from land and decreased gradually in direct relation to distance from land. Individuals were observed up to 700 miles from land.

Although the range of the Great Frigatebird undoubtedly exceeds the limits of the study area in all directions, only 9 of 304 birds (3.0 percent) were seen south of lat. 15° N., and only 47 (15.5 percent) were seen in the southern half of the area (south of lat. 18° N.).

One specimen, an adult male, was collected 75 miles north of Oahu on July 4, 1964.

The Lesser Frigatebird Fregata ariel was not identified in the area but probably occurs there occasionally. POBSP personnel have identified Lesser Frigatebirds at sea as far north as lat. 18° N., just west of the study area.

Golden Plover
Pluvialis dominica (Mueller)

Status: Common fall migrant.

Months	Year	
	1964	1965
January	-	0
February	-	0
March	0	0
April	0	0
May	0	0
June	0	0
July	1	-
August	-	-
September	4	-
October	159	-
November	0	-
December	0	-

Golden Plover was seen abundantly only in October 1964, at the height of its migration south from Siberia to the islands of the central and South Pacific Ocean. Evidence of a return migration in the spring was completely lacking.

Peak numbers were seen a month after the birds became plentiful on the main Hawaiian islands. The species arrives from the north in August and September (Munro, 1960).

Ruddy Turnstone
Arenaria interpres (Linnaeus)

Status: Rare migrant.

Only one Ruddy Turnstone was observed, about 250 miles south of Oahu on October 30, 1964, heading south. Either the ship was in port during a migration wave in the study area or the species is less frequently observed in the study area than it is farther west where it has been noted by POBSP personnel.

Bristle-thighed Curlew
Numenius tahitiensis (Gmelin)

Status: Accidental.

One bird was observed on February 9, 1965 at lat. 17°30' N., long. 156°59' W. It called twice and continued on its southeasterly course.

Wandering Tattler
Heteroscelus incanum (Gmelin)

Status: Accidental.

One bird was observed on May 29, 1965 at lat. 25° N., long. 152°30' W. It circled the ship twice and headed south.

Sanderling
Crocethia alba (Pallas)

Status: Accidental.

On November 8, 1964 at lat. 11°30' N., long. 154° W., a Sanderling circled the ship many times before departing in an undetermined direction.

/Red/ Phalarope
Phalaropus fulicarius (Linnaeus)

Status: Common spring migrant.

Months	Year	
	1964	1965
January	-	0
February	-	8
March	29	53
April	9	4
May	0	0
June	0	0
July	0	-
August	-	-
September	0	-
October	0	-
November	0	-
December	0	-

Phalaropes--presumably Red Phalaropes--reached peak numbers in their northward migration in March of both years, although a few birds were seen in February and April as well.

Distribution: Only 9 of 103 phalaropes (8.7 percent) were observed along the long. 157° W. leg; the other 94 birds were evenly distributed along the other three longitudinal legs.

It is likely that the main spring migration path of this bird lies to the east of the Hawaiian Islands. This contention is supported by the relatively low number of sightings west of the study area by POBSP personnel.

Pomarine Jaeger
Stercorarius pomarinus (Temminck)

Status: Common winter visitor December-April; uncommon to rare May-November.

Months	Year	
	1964	1965
January	-	15
February	-	3
March	22	13
April	14	60
May	2	4
June	2	1
July	0	-
August	-	-
September	3?	-
October	0	-
November	5	-
December	20	-

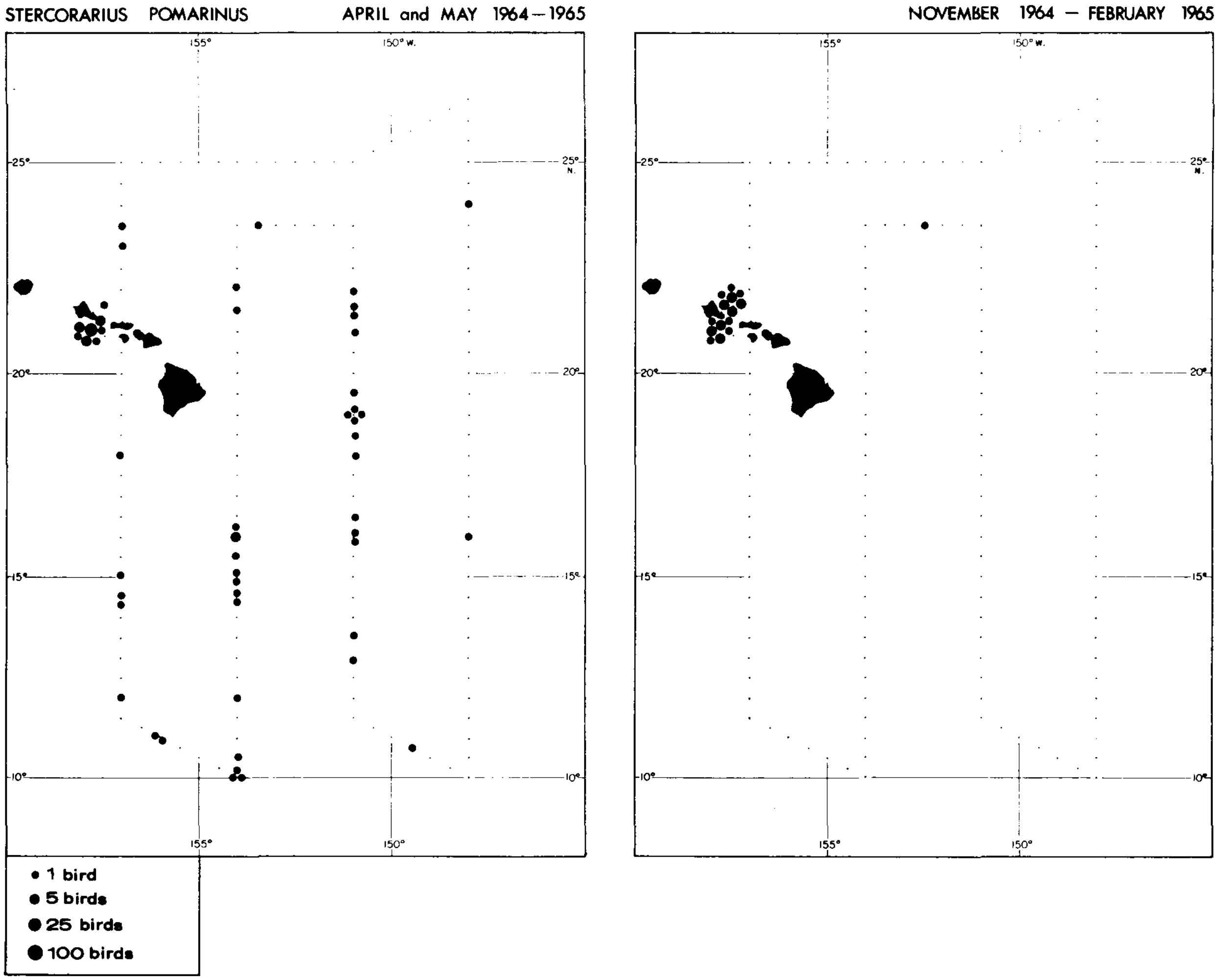


Figure 21.--Distribution of Pomarine Jaeger, spring migration months and winter months.

During the summer and fall (May-October) Pomarine Jaegers were nearly or completely absent from the study area (identification of the three birds recorded in September was not certain). They began to appear in the area in November, after their breeding season in Alaska and Siberia. Numbers increased in December and remained constant until March, except for a possible decline in February. Monthly fluctuations in numbers of this species, especially during the winter (December-March), were as much a reflection of the short period of observation in the bird's area of greatest density (usually 2 half days per month, sometimes less) as of actual increases or decreases in population. The high total for April 1965 was probably the result of the presence in the area of migrants from the south and Hawaiian Islands-based birds at the same time. By May most birds had already begun their northward migration.

Distribution: This species exhibits two distribution patterns (fig. 21). During the winter nearly all the birds (42 of 43) were within 50 miles of the Hawaiian Islands. In the months of northbound migration (April-May) they were still concentrated around the Hawaiian Islands, but slightly more than half (47 of 91) were seen farther than 50 miles from land. Observations on the long. 148° W. leg accounted for fewest of these migrants (only 2 of 47).

Either the birds returned from their breeding areas during the period the ship was in port, or a different route was used.

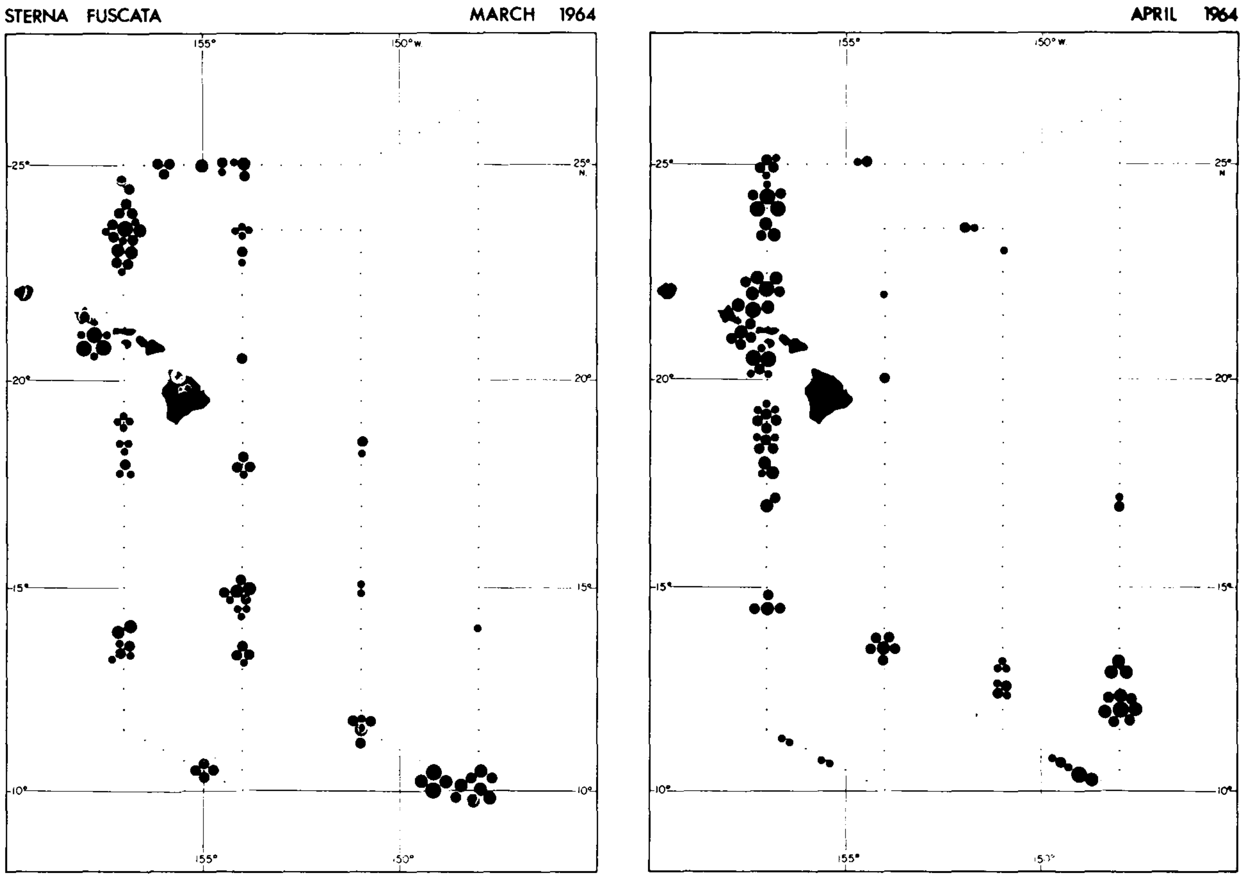


Figure 22a.--Distribution of Sooty Tern, March-June 1964.

/Long-tailed/ Jaeger
Stercorarius longicaudus Vieillot

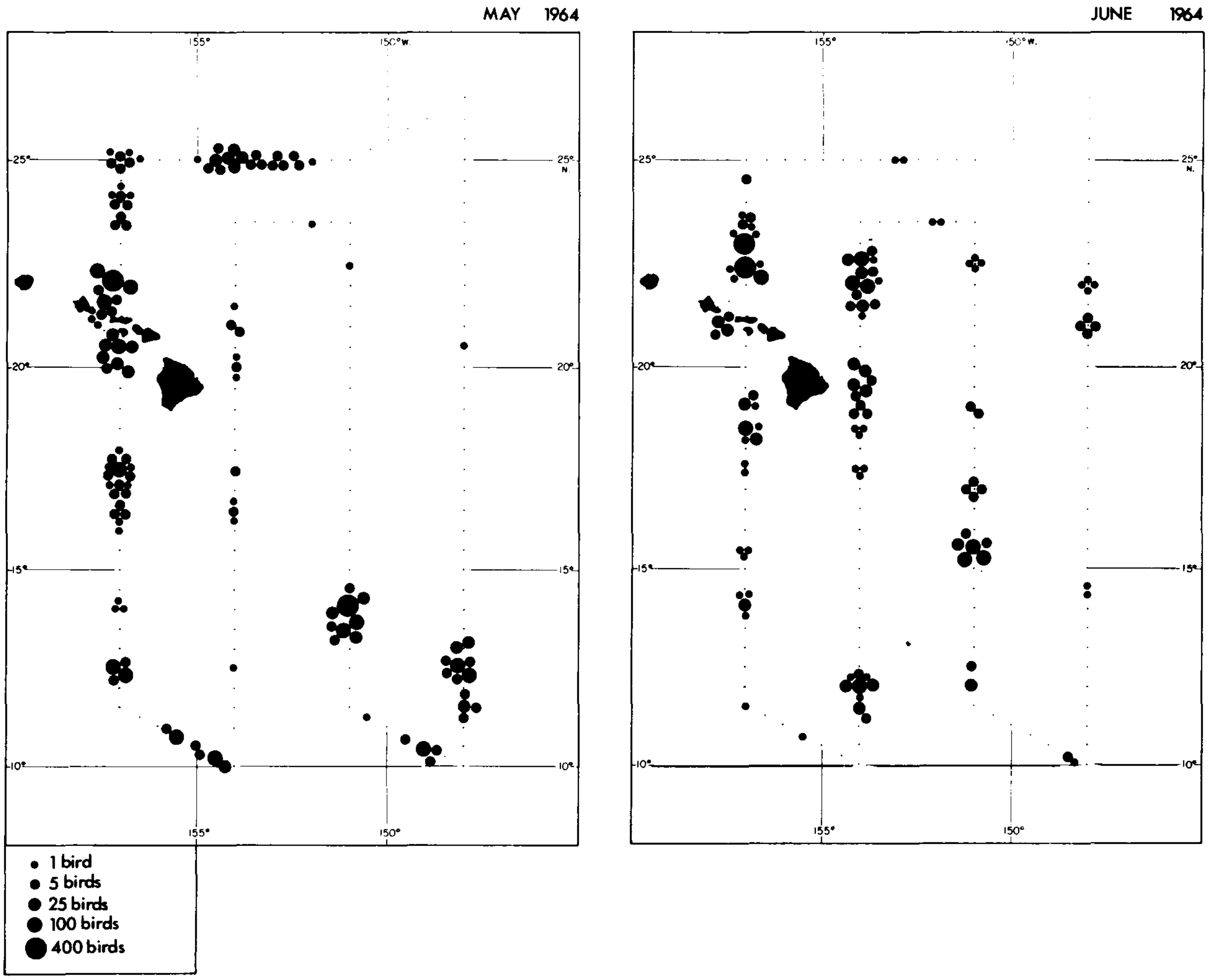
Status: Rare spring and fall migrant.

Four small jaegers, in all likelihood Long-tailed Jaegers, were seen, two each in April and May 1965.

Many of the 15 jaegers observed but not identified to species were probably Long-tailed Jaegers. Ten of these were seen in April 1965, two in September 1964, and three in October 1964.

This species occurs in the study area only as a migrant. The observations from April and May were probably of birds migrating northward through the study area to their breeding grounds in Alaska or Siberia from an unknown wintering area, presumably in the Southern Hemisphere. The observations from September and October may well indicate a return migration through the area.

Although four specimens taken by POBSP personnel south and west of the study area were of this species, some of the observations of small jaegers not identified to species may have been of Parasitic Jaegers. The latter species has not yet been collected in the central Pacific Ocean.



Skua
Catharacta skua Bruennich

Status: Rare visitor or migrant.

Months	Year	
	1964	1965
January	-	0
February	-	0
March	0	0
April	0	0
May	2	1
June	1	0
July	0	-
August	-	-
September	1	-
October	3	-
November	0	-
December	0	-

This species appeared during months when other species were migrating; however, so few were seen that no conclusive evidence of migration can be given.

Presumably the birds recorded in the area were Southern Hemisphere breeders and not North Atlantic breeders that traveled across the continent.

No specimen exists for the central Pacific, although POBSP has one specimen from lat. 45° N., long. 173° E.

Two color phases were noted--one a lighter brown than the other.

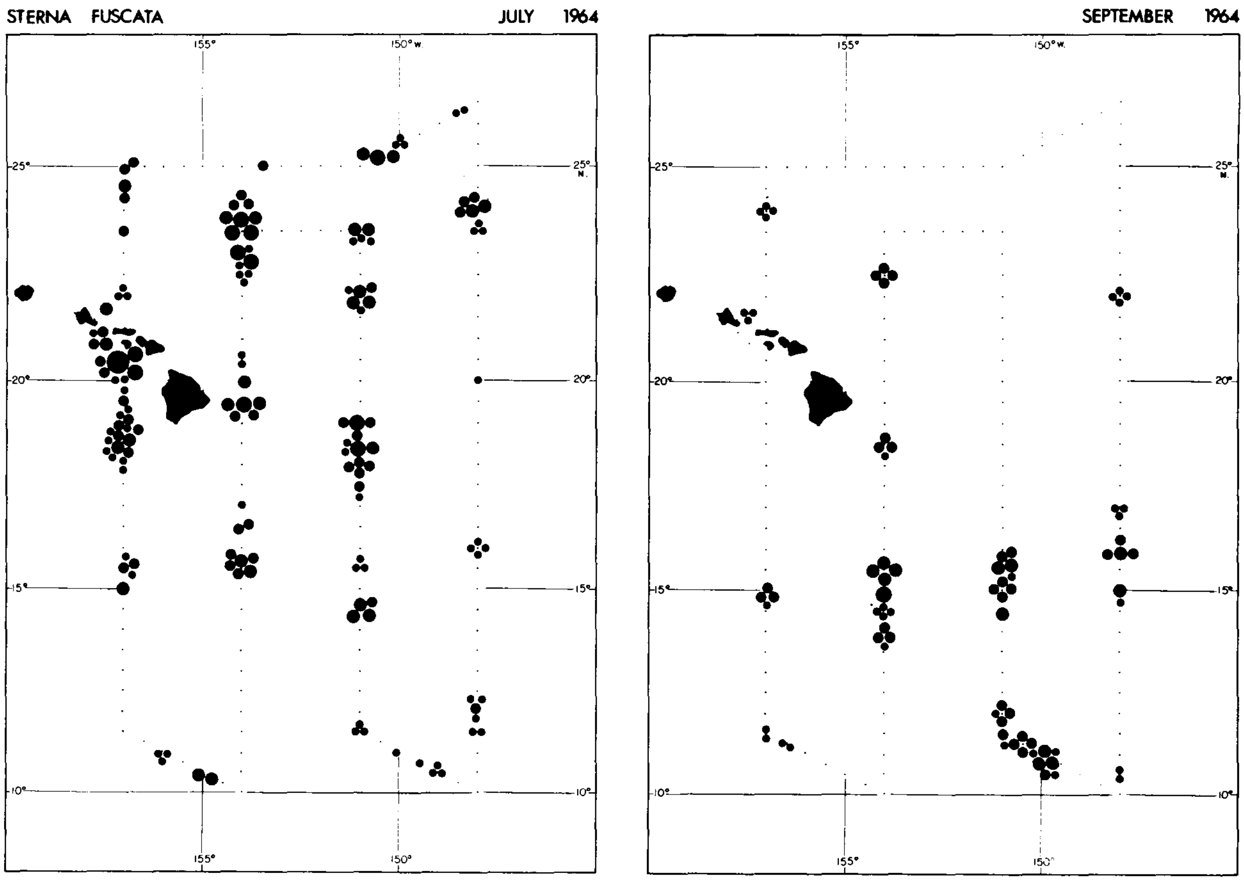


Figure 22b.--Distribution of Sooty Tern, July-November 1964.

[Glaucous-winged] Gull
Larus glaucescens Naumann

Status: Accidental.

One bird thought to be this species was observed on October 19, 1964 at lat. 24°45' N., long. 157° W., about 300 miles north of Oahu.

Three additional gulls of undetermined species were seen as the ship left Oahu on the first day of both the December 1964 and January 1965 cruises. Unidentified gulls were also seen on March 22, 1964 near Hawaii and on April 22, 1965 at the southeastern corner of the area.

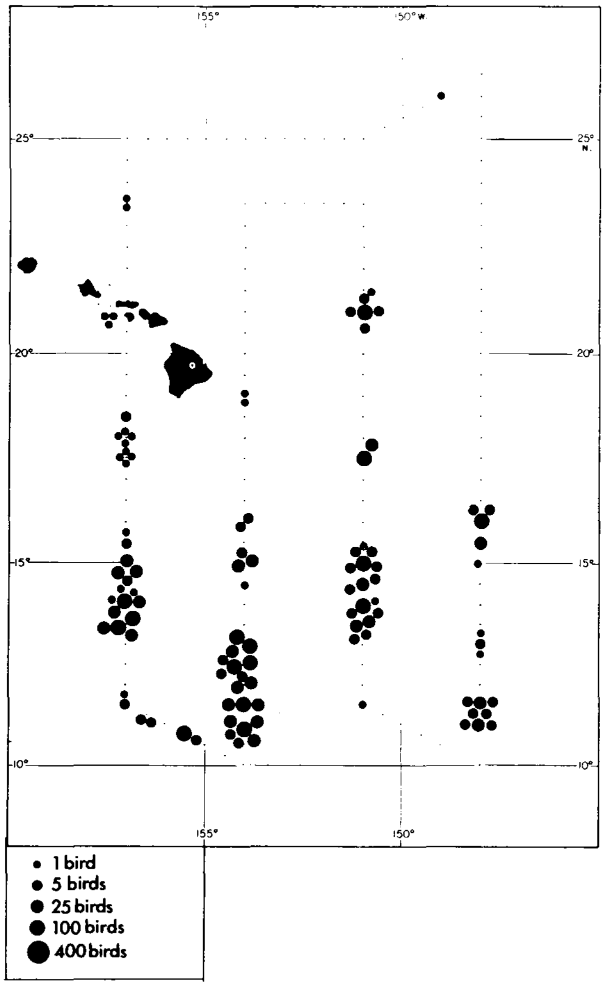
Gulls are evidently least likely to be observed during the summer (April-September).

[Arctic] Tern
Sterna paradisaea Pontoppidan

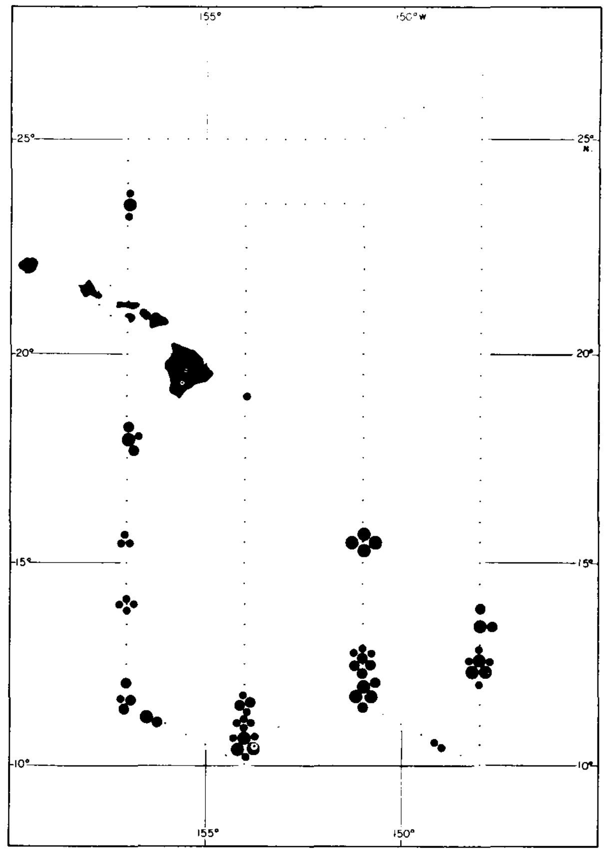
Status: Common spring migrant.

Months	Year	
	1964	1965
January	-	0
February	-	0
March	-	0
April	12	27
May	0	6
June	0	0
July	0	-
August	-	-
September	0	-
October	0	-
November	0	-
December	0	-

OCTOBER 1964



NOVEMBER 1964



Arctic Terns or possibly Common Terns Sterna hirundo Linnaeus were first observed in the study area on April 23, 1964. None was seen after May 2, 1964 until the spring of 1965. The 1965 migration ran from April 21 to May 30, considerably longer than the 1964 migration.

All birds seen in both years were heading north. No return migration was noted.

Although the sighting of as many birds along the 157° W. leg as along the other three indicates a fairly equal migratory movement across the entire width of the study area, the smaller number of sightings of this species west of the area by POBSP personnel indicates that the western margin of the area may define the western limit of its migration route.

POBSP personnel have collected specimens of S. paradisaea west of the area.

Sooty Tern
Sterna fuscata Linnaeus

Status: Abundant resident.

Months	Year	
	1964	1965
January	-	2,354
February	-	1,796
March	1,261	2,395
April	1,633	1,655
May	3,117	5,020
June	2,413	2,557
July	2,555	-
August	-	-
September	589	-
October	2,334	-
November	557	-
December	566	-

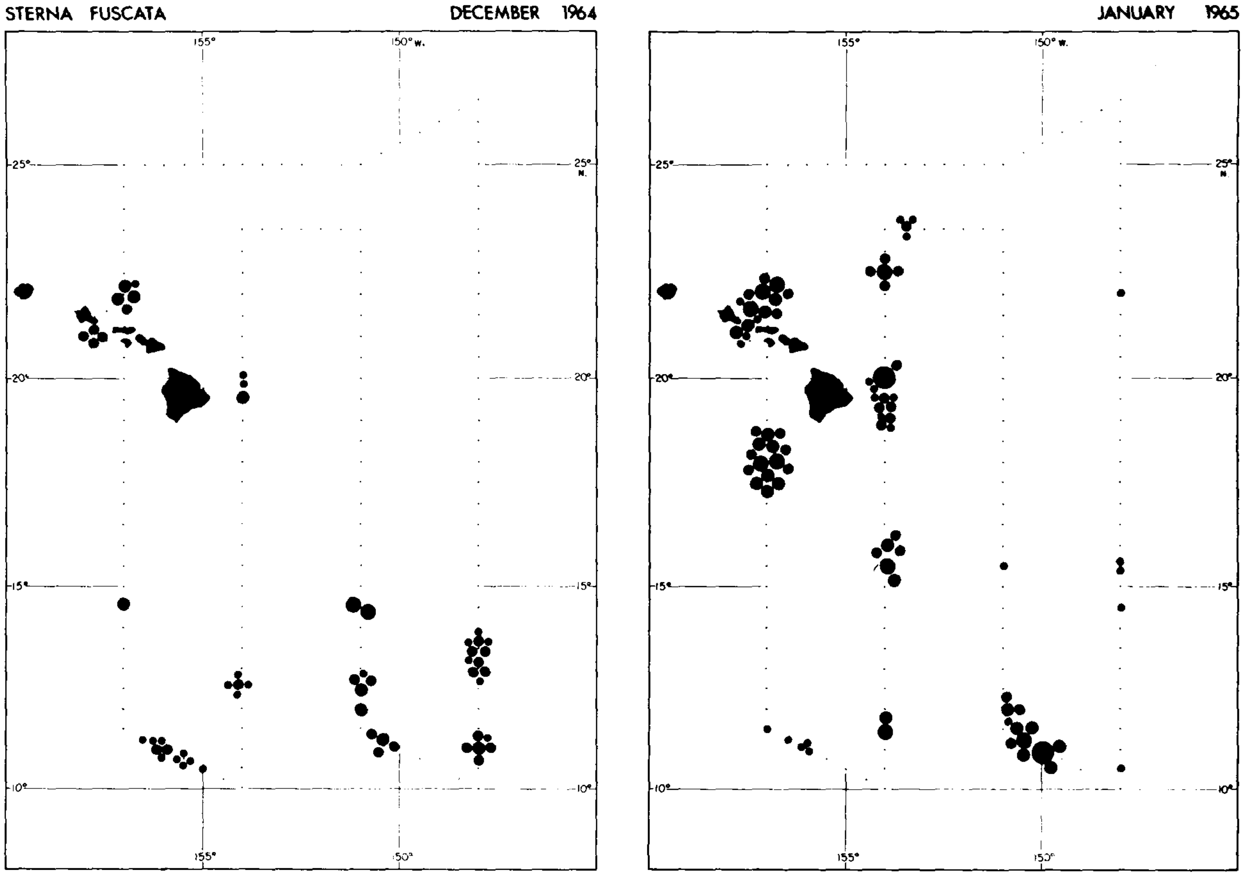


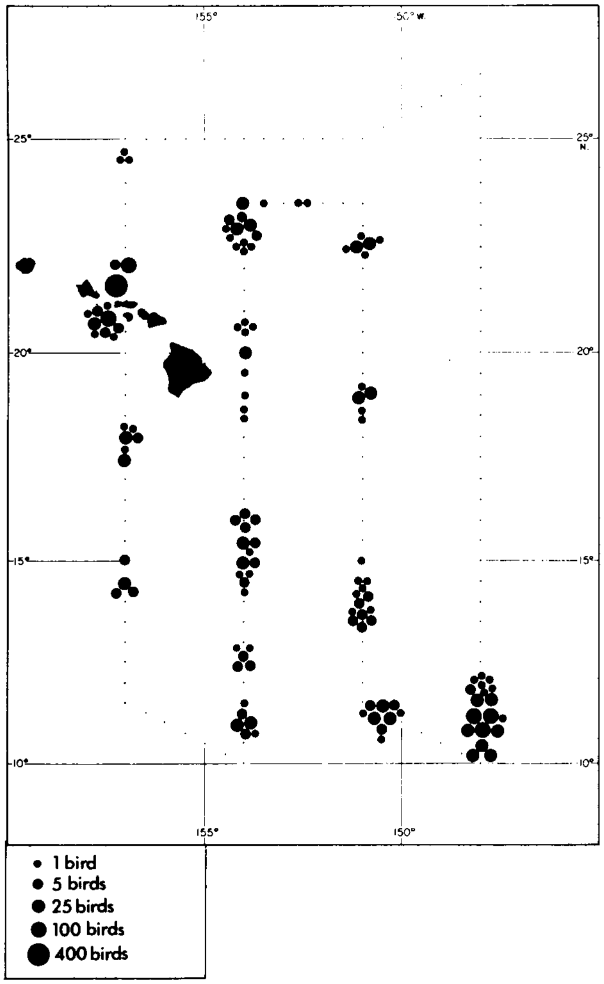
Figure 22c.--Distribution of Sooty Tern, December 1964 to March 1965.

Sooty Terns were present in large numbers every month of the year (figs. 22a-d). The pattern of distribution is somewhat clarified if the birds are divided into two groups, one with a southerly distribution and a density center usually at the southeast corner, and the other with a northerly distribution and a density center within 50 miles of the Hawaiian Islands. If the division is made along lat. 16° N., which roughly corresponds to the line of least density between the two density centers, figure 23 expresses monthly abundance of the two groups. They may be separate populations or different age groups of the same populations. The peaks and declines in abundance of the two groups were clearly out of phase with each other.

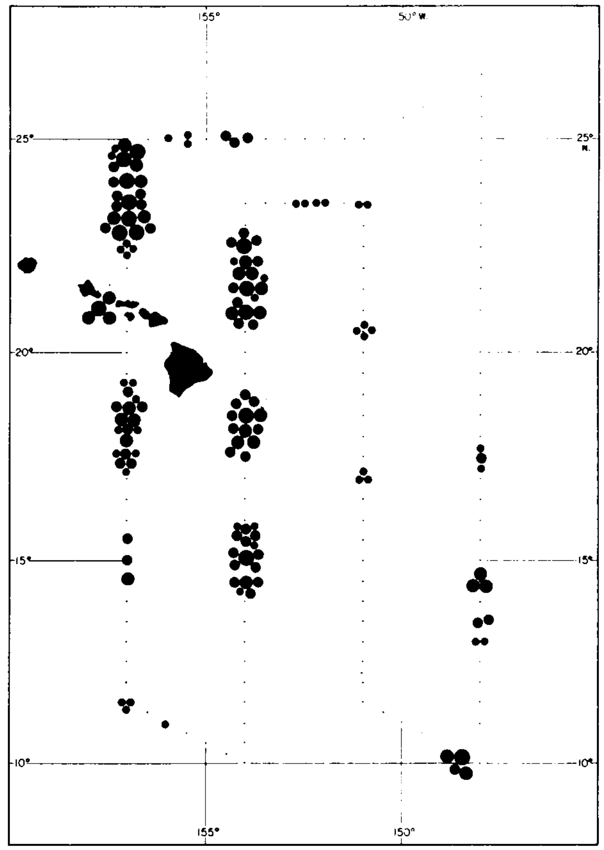
The abundance pattern of the northern population appeared to be directly related to the breeding cycle of the Sooty Terns on islets off Oahu. In general, the northern half of the study area had large numbers when breeding was underway. At the conclusion of the breeding cycle the Sooty Terns left the islets and the pelagic area around them. Numbers remained low from September through December but increased again in January and remained high until June, when the study ended.

The abundance changes in the southern half of the study area were less clear-cut, perhaps because the birds that constitute a large part of the population may come from the Line Islands, where breeding cycles are on a 6-month schedule (Ashmole, 1963). A peak occurred in May 1964, followed 5 months later by one in October. A subsequent decline was followed by two lesser peaks in January and April 1965. In May 1965 numbers in the southern half were at a record low, in contrast to May 1964. Although the data indicate some cycle other than an annual one, it is not possible to ascribe a 6-month cycle to

FEBRUARY 1965



MARCH 1965



the population, since peaks seem to come more frequently.

In general, Sooty Terns preferred the northwestern and southeastern corners of the area. The northeastern corner consistently had the lowest densities. In addition to the primary density centers around Oahu and in the southeastern corner, secondary centers appeared in most months, although not consistently.

Because of the tendency of this species to flock in large numbers, considerable differences in total numbers for any month could result from the oversight of one or two large flocks, and monthly trends in abundance could be altered somewhat.

We collected one specimen on July 4, 1964 about 75 miles north of Oahu.

Gray-backed Tern
Sterna lunata Peale

Status: Rare resident?

On June 5, 1964 two Gray-backed Terns were observed within 10 miles of Oahu. This species breeds in very small numbers on Moku Manu off Oahu (Richardson and Fisher, 1950). The two birds observed were heading for their breeding islets.

This species undoubtedly occurred in very small numbers with fair regularity, usually close to land, but was not observed more frequently because of the small size of the breeding population.

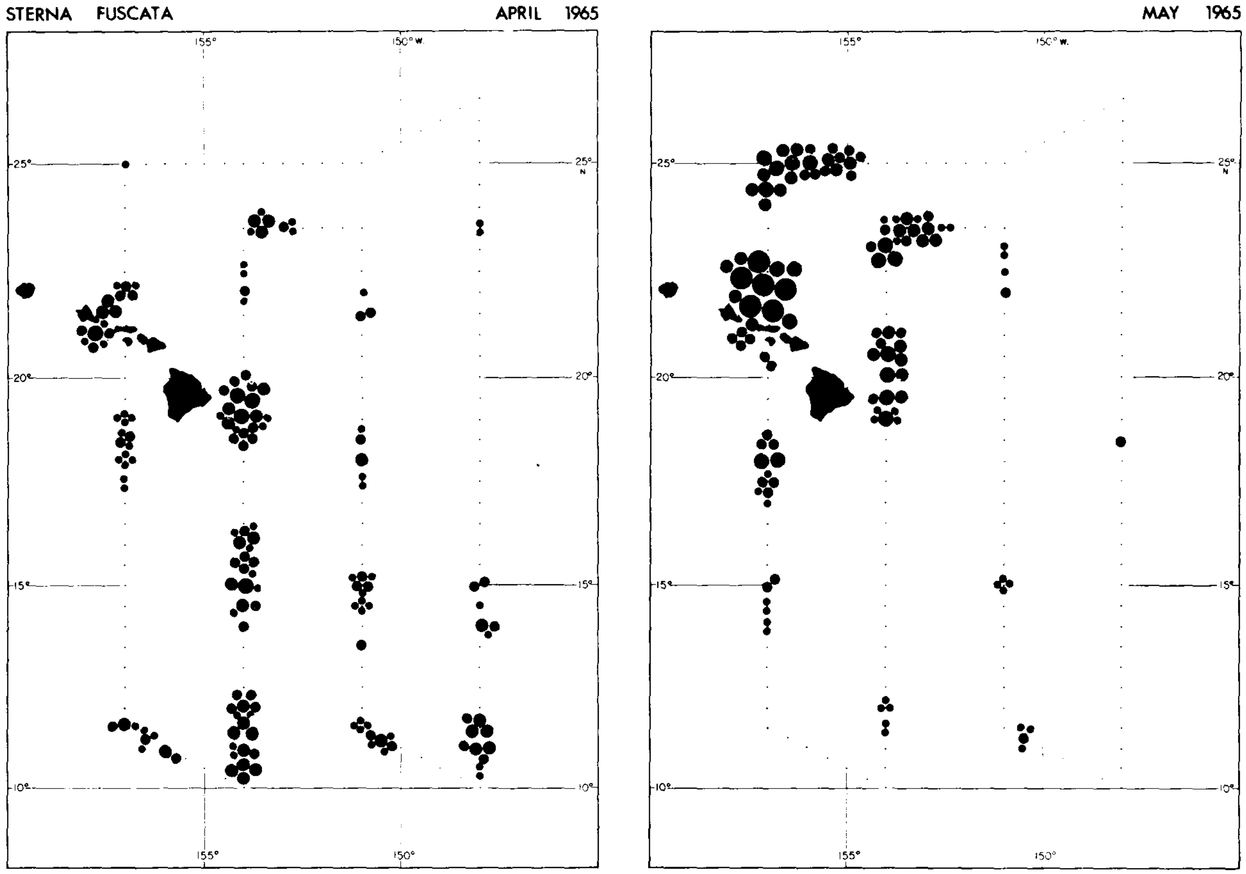


Figure 22d.--Distribution of Sooty Tern, April-June 1965.

Blue-gray Noddy
<u>Procelsterna cerulea</u> (Bennett)

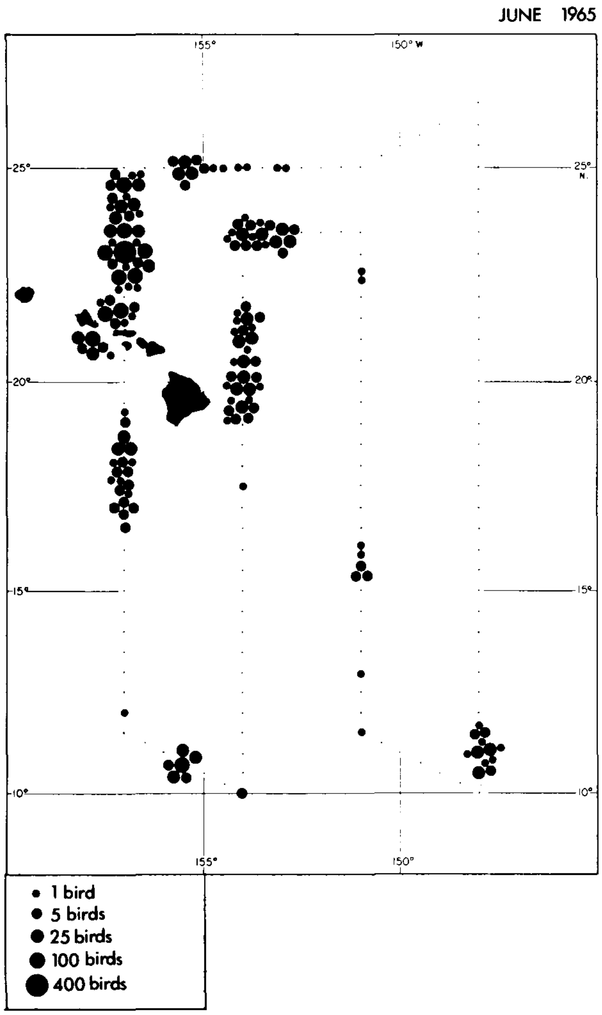
<u>Status</u>: Accidental.

On April 11, 1965 one Blue-gray Noddy and possibly two more were observed just south of Kauai, less than 50 miles from Kaula Rock where the species is presumed to breed (Caum, 1936). The regular occurrence of this species in the study area is considered unlikely; birds may stray there occasionally.

Brown Noddy
<u>Anous stolidus</u> (Linnaeus)

<u>Status</u>: Abundant local resident.

Months	Year	
	1964	1965
January	-	73
February	-	167
March	4	177
April	165	420
May	304	1,516
June	23	55
July	308	-
August	-	-
September	476	-
October	138	-
November	2	-
December	109	-



Sightings varied more with time of day and length of time the ship spent near Oahu, where the species breeds or roosts year round, than with actual variation in the size of population.

The lower numbers observed between October and March may have been the result of a reduction in population in the area during the nonbreeding season.

Distribution: Only 1.7 percent (66 of 3,937) of all Brown Noddies observed were more than 50 miles from land. No bird was seen farther than 300 miles from land.

Black Noddy
Anous tenuirostris (Temminck)

Status: Abundant local resident.

Months	Year	
	1964	1965
January	-	6
February	-	0
March	1	0
April	420	0
May	7	0
June	0	0
July	0	-
August	-	-
September	0	-
October	0	-
November	0	-
December	1	-

The large numbers of Black Noddies recorded in April 1964 were 10 miles from the island of Hawaii, along the precipitous shores of which this species breeds in fair numbers. Only one bird, in December 1964, was found farther than 50 miles from land.

White Tern
Gygis alba (Sparrman)

Status: Common resident.

Months	Year	
	1964	1965
January	-	23
February	-	18
March	7	23
April	0	24
May	7	13
June	18	22
July	23	-
August	-	-
September	2	-
October	23	-
November	16	-
December	8	-

No indication of a population peak can be determined from monthly fluctuations in numbers. The population of White Terns in the area was believed to be nearly constant from month to month. The fact that no bird was seen in April 1964 was probably attributable as much to chance as to an actual population decrease.

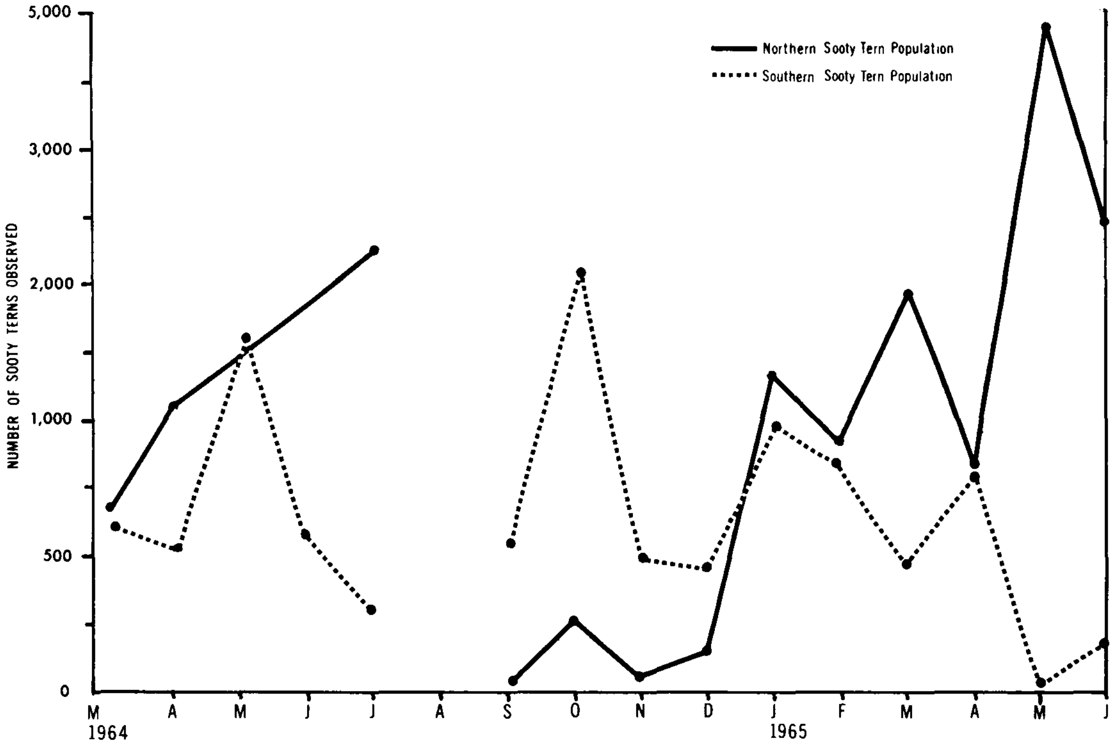


Figure 23.--Monthly abundance of northern and southern populations of Sooty Terns.

Distribution: Although the distribution in any given month appeared to be random, a tendency to favor certain parts of the area and to avoid others became apparent when White Tern sightings on all 15 cruises were plotted together (fig. 24). Density centers were noted between 50 and 100 miles east and southwest of Hawaii. The northeastern portion of the study area was avoided rather consistently.

Rock Dove
Columba livia Gmelin

Status: Accidental.

On May 4, 1964 a lone Rock Dove circled the ship twice 10 miles north of Oahu, where the species is abundant.

Monthly Summary

March 1964

Sooty Shearwaters, migrating north for the summer, were the most numerous species in March. Sooty Terns were the second most abundant, concentrating north of Oahu where their breeding season was getting underway. These two species accounted for 83.1 percent of all birds seen. Wedge-tailed Shearwaters had not yet entered the study area in large numbers. Black-footed Albatrosses were still present in fair numbers near their breeding islands in the leeward Hawaiian chain. Numbers of Leach's Storm Petrels were still at their winter level before the spring buildup.

April 1964

Total density remained relatively unchanged. Migration of Sooty Shearwaters had slowed down considerably although fair numbers were still seen each day. Sooty Terns predominated, especially within 100 miles of their breeding islets off Oahu. Wedge-tailed Shearwaters increased as their breeding season began in the Hawaiian Islands. Leach's Storm Petrels attained peak numbers this month as they began their northward movement to their breeding grounds in the Aleutians. Albatrosses declined, and their range retracted northward.

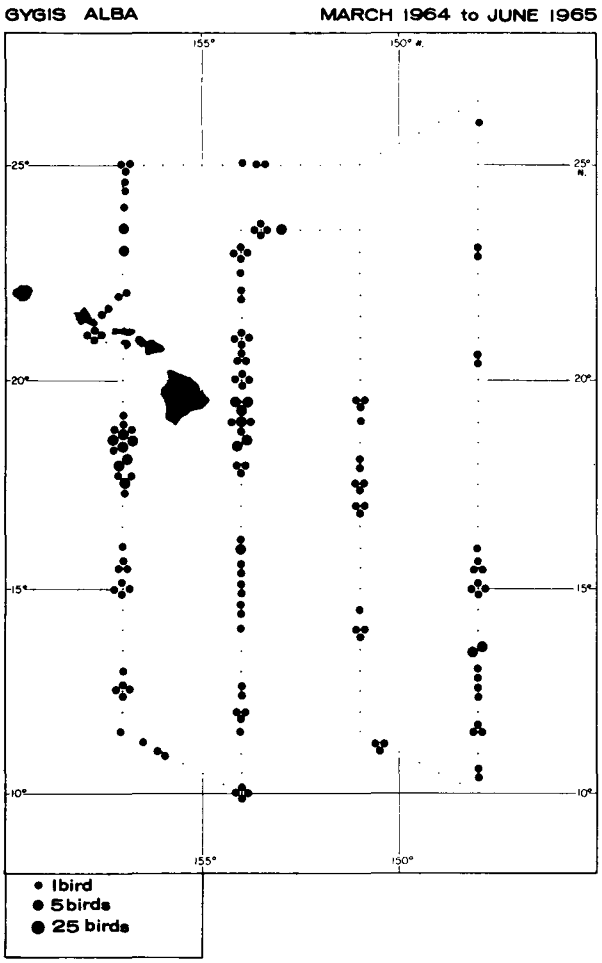


Figure 24.--Distribution of White Tern.

May 1964

Density of birds was high because large numbers of breeding Sooty Terns and Wedge-tailed Shearwaters were in the area. Both were at their annual peak during this month. In addition, Newell's Shearwaters and Bulwer's Petrels were most abundant in May, but albatross numbers declined still further and Leach's Storm Petrels and Sooty Shearwaters had nearly finished their northward movement through the area. Increasing numbers of Juan Fernandez Petrels and Black-winged Petrels began to appear in the area as their breeding seasons drew to a close in the Southern Hemisphere. Two density centers were evident: one within 100 miles of Oahu made up mainly of Sooty Terns and light-phase Wedge-tailed Shearwaters, and one in the southeast corner of the area composed of Sooty Terns, dark-phase Wedge-tailed Shearwaters from areas south of the study area, and the newly appeared Juan Fernandez Petrels and Black-winged Petrels.

June 1964

Sooty Terns and Wedge-tailed Shearwaters predominated as in May, although their numbers decreased somewhat. Migrants were absent entirely, as were albatrosses, but the Southern Hemisphere visitors--Juan Fernandez Petrels and Black-winged Petrels--increased somewhat and moved farther north into the study area. Two density centers prevailed again, the one around Oahu mainly of breeding birds, the southern one of Sooty Terns, dark-phase Wedge-tailed Shearwaters, and the southern petrels.

July 1964

Total density remained unchanged from June. Again, Sooty Terns and Wedge-tailed Shearwaters predominated, the dark-phase birds of the latter attaining their farthest northward range, the southern end of the main Hawaiian islands. Similarly, Juan Fernandez Petrels and Black-winged Petrels moved farther north. The former increased considerably in numbers and was found everywhere except in the northwest corner of the area.

September 1964

Total density was slightly reduced from July. Data are not available for August but I assume that density for that month did not differ appreciably from the months before and after. The Wedge-tailed Shearwater was the most abundant species in September as the birds that bred around Oahu gathered before migrating out of the area. Sooty Terns had already completed their breeding season and were represented by fewer birds, all in the southern half of the study area. Sooty Shearwaters appeared on their southward migration, although not yet in peak numbers. Juan Fernandez Petrels and Black-winged Petrels maintained fairly high numbers and were found throughout the area, although their greatest concentration was still at the southern end.

October 1964

Total density increased in October to a fall peak as several species reached peak numbers. Juan Fernandez Petrels and Black-winged Petrels were both abundant, especially in the southern end of the area, as numbers built up just before the southward migrations to the breeding islands. Sooty Terns were the most abundant species as usual. Few were seen near Oahu this month; almost all were in the southern half of the area. Sooty Shearwaters moved through the area in the highest numbers seen during the fall migration, although these were lower by half than those observed in the spring migration. Small numbers of migrant Mottled Petrels were noted as well. A small population of light-phase Wedge-tailed Shearwaters still remained near Oahu, but the range of the dark-phase birds continued to contract southwards. Only a few of the latter were seen at the southeastern corner.

November 1964

Total density dropped considerably from October, owing mainly to large decreases in Juan Fernandez and Black-winged Petrels (although the northern limits of their ranges remained unchanged). Wedge-tailed Shearwaters remained unchanged in abundance and distribution. Slender-billed Shearwaters appeared for the first time, and their short migration peak accounted for 32.5 percent of the birds seen. Black-footed Albatrosses reappeared, and Leach's Storm Petrels attained their normal winter abundance.

December 1964

December was the month of lowest avian density in the study area. All major species, i.e., Wedge-tailed Shearwater, Juan Fernandez Petrel, Black-winged Petrel, and Sooty Tern, were reduced in numbers. The southward migration of Sooty and Slender-billed Shearwaters had all but ended. Only albatrosses and Leach's Storm Petrel remained in large numbers, but their relatively small populations in the study area played a minor role in determining total density.

January 1965

Total density increased over the low December figure. Sooty Terns accounted for 79.5 percent of the total population in the area, as large flocks were seen once more near Oahu at the beginning of their breeding season there. Wedge-tailed Shearwaters and Juan Fernandez Petrels decreased in abundance. Black-footed Albatrosses and Leach's Storm Petrels maintained their numbers.

February 1965

The total density remained nearly constant. Sooty Terns accounted for the greatest part of the total population (73.5 percent). Large concentrations of this species were found around Oahu and at the southeastern corner of the study area. Wedge-tailed Shearwaters and Juan Fernandez Petrels were rare.

March 1965

The total density of birds increased as Sooty Terns became very abundant around Oahu. They were much less abundant in the southern end of the study area than in previous months. Wedge-tailed Shearwaters reappeared around Oahu. Sooty Shearwaters began their northward migration, although not in peak numbers. Black-footed Albatrosses and Leach's Storm Petrels maintained constant populations.

April 1965

No change occurred in total density. Sooty Terns declined somewhat and were spread more evenly between Oahu and the southeastern corner than in March. The increase in the numbers of Wedge-tailed Shearwaters was mainly the result of the penetration of dark-phase birds into the southern end of the area. Numbers of Black-footed Albatross dropped as its breeding cycle drew to a close. Leach's Storm Petrels rose sharply in abundance before the northward migration to breeding grounds. Sooty Shearwaters rose to maximum migration numbers. The migration peak in 1965 was less pronounced and somewhat later than in 1964. Bulwer's Petrels reappeared in the area after several months' absence.

May 1965

The highest general density of the study was recorded in May 1965--mostly because of the very large numbers of Sooty Terns observed north of Oahu. In addition, numbers of Wedge-tailed Shearwaters increased in the Oahu area. The Sooty Shearwater migration ran its final month. Juan Fernandez Petrels and Black-winged Petrels reappeared in fair numbers at the southern end of the study area. Black-footed Albatrosses and Leach's Storm Petrels declined in numbers in the study area as they headed north for the summer. Several large flocks of Brown Noddies were seen just north of Oahu.

Table 4.--Number of sea birds of different species seen per hour in the Townsend Cromwell TWZOP study area, March 1964 to June 1965

Species	1964									1965					
	Mar.	Apr.	May	June	July	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Black-footed Albatross	1.0	0.5	0.1	0.1	0.0	0.0	0.0	0.4	1.3	2.3	1.8	0.6	0.3	0.1	0.1
Laysan Albatross	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0
Wedge-tailed Shearwater	0.4	1.4	6.4	4.2	3.2	5.6	0.9	0.9	0.5	0.2	0.1	1.8	2.1	3.4	3.7
Sooty Shearwater	7.0	0.9	0.1	0.1	0.0	0.5	1.9	0.4	0.1	0.0	0.1	1.6	2.0	0.9	0.0
Slender-billed Shearwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0
Christmas Shearwater	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0
Newell's Shearwater	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1
Dark-rumped Petrel	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1
Juan Fernandez Petrel	0.1	0.1	0.5	0.7	2.4	1.8	5.4	1.3	0.7	0.2	0.1	0.1	0.1	1.0	2.4
White-necked Petrel	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Mottled Petrel	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0
Black-winged Petrel	0.1	0.1	0.2	0.6	0.4	0.3	4.6	1.2	0.1	0.1	0.0	0.0	0.1	0.5	0.4
Kermadec Petrel	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1
Bulwer's Petrel	0.1	0.1	0.7	0.1	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.3	0.3	0.3
Leach's Storm Petrel	0.2	0.5	0.2	0.1	0.1	0.1	0.2	0.4	0.2	0.3	0.3	0.3	1.2	0.1	0.1
Red-tailed Tropicbird	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
White-tailed Tropicbird	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Blue-faced Booby	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Red-footed Booby	0.1	0.2	0.4	0.1	0.1	0.2	0.3	0.1	0.3	0.1	0.4	0.4	0.1	0.3	0.7
Brown Booby	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Great Frigatebird	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Pomarine Jaeger	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.2	0.1	0.1
Sooty Tern	5.3	6.7	12.3	9.4	10.4	2.5	10.0	2.5	2.7	9.6	8.0	10.0	6.4	19.9	8.7
Brown Noddy	0.1	0.6	1.2	0.1	1.2	2.0	0.6	0.1	0.5	0.3	0.7	0.7	1.7	5.5	0.1
Black Noddy	0.0	1.7	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
White Tern	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

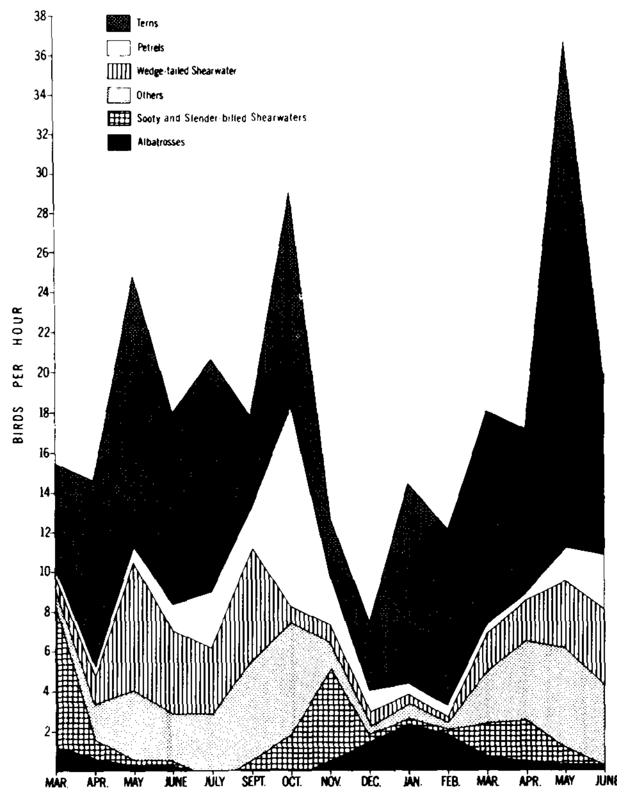


Figure 25.--Monthly abundance of species groups in birds per hour of observation.

June 1965

Although total density decreased considerably from May 1965, it still was higher than in June 1964. Sooty Terns and Wedge-tailed Shearwaters accounted for 64.6 percent of the total population. Most of these species were in the high-density center around Oahu, although numbers of dark-phase Wedge-tailed Shearwaters were seen at the southeastern corner. Numbers of Juan Fernandez Petrels increased considerably over May 1965 and were far ahead of their total in June 1964. Black-winged Petrels remained constant. No migrants were reported.

Table 4 and figure 25 show the monthly abundance of species or species groups in the study area in terms of birds per hour of observation.

COMPONENTS OF ABUNDANCE AND DISTRIBUTION

The abundance and distribution of sea birds at sea are governed by the interplay of an unknown number of environmental factors. Investigation of the relative abundance and distribution of species under several environmental conditions at one time is beyond the scope of the present work; however, it may prove fruitful to document the abundance and distribution of each species relative to a single environmental variable. Such treatment may suggest meaningful relations involving several variables that can be subjected to more analytical scrutiny at a later date. I have chosen to examine the following categories: the islands of origin of sea birds in the study area and the ways in which sea birds utilize the area; the abundance of various species relative to distance from nearest land; the abundance of various species in different portions of the study area; the direction of flight of various species; the daily cycles of activity; the abundance of species relative to five climatic parameters; and the participation of various species in flocks.

Islands of Origin of Sea Birds Recorded in the Study Area and Modes of Utilization of the Area

The avifauna of the study area is a composite of birds that breed throughout the Pacific Ocean. Several species breed in only one known locality and leave no doubt about their provenance; however, most have populations that breed on more than one island group. To establish a probable point of origin, factors such as breeding phenology, behavior in the study area, and extent of orientation to land must be considered. At least two populations from different islands of origin of the two most abundant species, Sooty Tern and Wedge-tailed Shearwater, are present at certain times of the year.

It is useful to distinguish between two basic patterns of utilization of the study area by the species that breed north or south of the central Pacific--direct migration and "wintering." Direct migrants seldom feed in the study area but pass through rapidly as they travel between temperate climatic zones. Wintering birds remain in the study area during all or part of their nonbreeding season and depend upon the waters of the study area for their food supply. I have set up for analysis the following seven categories of birds, based on origin and mode of utilization of study area: birds breeding in the main Hawaiian islands; birds breeding in the leeward Hawaiian islands; birds breeding in the South Pacific and wintering in the study area; birds breeding in the South Pacific and migrating through the study area; birds breeding in the North Pacific and wintering in the study area; birds breeding in the North Pacific and migrating through the study area; and birds recorded in the study area only rarely.

1. Birds breeding in the main Hawaiian islands.

   Dark-rumped Petrel
   Bulwer's Petrel
   Wedge-tailed Shearwater (light-phase)
   Newell's Shearwater
   White-tailed Tropicbird
   Brown Booby
   Red-footed Booby
   Sooty Tern
   Brown Noddy
   Black Noddy

Most of these species breed in the spring and summer. Two possible exceptions are the White-tailed Tropicbirds and Black Noddies; their breeding cycles in the main Hawaiian islands have not been accurately described, although there is some evidence that their breeding seasons are long. The petrels, shearwaters, and Sooty Terns migrate annually and are absent, or scarce, during the fall and early winter in the study area within 100 miles of their breeding grounds. The boobies and noddies are land-oriented and remain near the breeding islands all year, foraging out to sea usually no farther than 100 miles.

Probably most birds of these species observed in spring and summer in the study area within 100 miles of the main Hawaiian islands originate on those islands; their densities within this distance are consonant with estimates of populations breeding on these islands.

Several other species with very small populations in the main Hawaiian islands (Christmas Shearwater, Red-tailed Tropicbird, Blue-faced Booby, White Tern, Gray-backed Tern, Blue-gray Noddy) were observed in the study area. The first four were observed with far greater regularity and in greater numbers than could be expected from the main Hawaiian populations. The Gray-backed Tern and Blue-gray Noddy were seen on only one occasion each; they are considered rare in the study area and probably originate on islets off the main Hawaiian islands that support small populations of the species.

2. Birds breeding in the leeward Hawaiian islands.

   Black-footed Albatross
   Laysan Albatross
   Bonin Petrel
   Bulwer's Petrel
   Wedge-tailed Shearwater (light-phase)
   Christmas Shearwater
   Red-tailed Tropicbird
   Blue-faced Booby
   Brown Booby
   Red-footed Booby
   Great Frigatebird
   Sooty Tern
   White Tern

Only the albatrosses, Red-tailed Tropicbird, Great Frigatebird, and White Tern contribute appreciably to the avifauna of the study area. To this group might be added Bulwer's Petrel and Christmas Shearwater, which may enter the study area from the leeward Hawaiian chain, but probably not frequently or regularly. The remaining species more likely originate on the main Hawaiian islands, especially those observed within 100 miles of land, although individuals from the Leewards undoubtedly enter the area on occasion. The occurrence of light-phase Wedge-tailed Shearwaters and Sooty Terns in the southern half of the study area could as well be attributed to migration from the Leewards, from the main Hawaiian islands, or from other Pacific islands.

Bonin Petrel is an uncommon visitor from the Leewards to the northern half of the study area.

3. Birds breeding in the South Pacific and wintering in the study area.

   Juan Fernandez Petrel
   White-necked Petrel
   Tahiti or Phoenix Petrel
   Black-winged Petrel
   Kermadec Petrel
   Herald Petrel
   Bulwer's Petrel
   Wedge-tailed Shearwater (dark-phase)
   Christmas Shearwater
   Red-tailed Tropicbird
   Blue-faced Booby

Sooty Tern
White Tern

These species breed on tropical and subtropical islands in the central or South Pacific and migrate northward into the study area where they are observed regularly enough to say that the study area constitutes a part of their normal winter or prebreeding range. The islands of origin can be specified only for Juan Fernandez Petrel (Mas Afuera of the Juan Fernandez group, 500 miles west of Chile) and for White-necked and Black-winged Petrels (Kermadec Islands, 600 miles northeast of New Zealand). The other species each breed on many island groups so it is impossible to determine their islands of origin. Birds in this category are usually more abundant at the southern end of the study area and usually attain highest densities during the summer and fall.

4. Birds breeding in the South Pacific and migrating through the study area.

Mottled Petrel
White-winged Petrel
Pale-footed Shearwater
New Zealand Shearwater
Sooty Shearwater
Slender-billed Shearwater
Skua

All but one species in this category breed in the temperate zone in the New Zealand-Australia region and migrate north in the spring to the equivalent water zone in the North Pacific. The exception, White-winged Petrel, breeds in a marginally subtropical or tropical climate and migrates to a transitional area (subtropical-temperate) in the North Pacific. Skuas and Sooty Shearwaters might also originate on the South American side of the Pacific, although this is not likely. Birds in this category reach greatest abundance in spring (April-May) and fall (September-November) and are totally or nearly absent in summer and winter. One species, Slender-billed Shearwater, migrates south through the study area only in the fall. Its spring migration is restricted almost entirely to the western Pacific.

5. Birds breeding in the North Pacific and wintering in the study area.

Leach's Storm Petrel
Pomarine Jaeger

These species breed in the subarctic and arctic North Pacific in the summer and migrate to, and through, the study area in the fall. A substantial number remain in the study area throughout the winter, although evidence is clear that this wintering population is joined in early spring, just before the return to their northern breeding grounds, by birds that have wintered farther south.

6. Birds breeding in the North Pacific and migrating through the study area.

Golden Plover
Ruddy Turnstone
Bristle-thighed Curlew
Wandering Tattler
Sanderling
Red Phalarope
Pomarine Jaeger
Long-tailed Jaeger
Arctic Tern

These species migrate through the study area in spring or fall between arctic breeding grounds and islands (shore birds) or oceanic areas (phalarope, jaeger, and tern) south of the study area. Several species (shore birds and Pomarine Jaeger) also winter on or near the main Hawaiian islands as well. None of the shore birds observed in the study area was headed toward the Hawaiian group. During spring migration months, about half of the Pomarine Jaegers were heading north from areas south of the study area.

7. Birds recorded in the study area only rarely.

Black-browed Albatross
Fulmar
Solander's Petrel
Pink-footed Shearwater
Fork-tailed Petrel
Gull sp.
Gray-backed Tern
Blue-gray Noddy
Rock Dove

These species are stragglers and were not regularly recorded. Black-browed Albatross and Solander's Petrel originate on islands south of New Zealand and Lord Howe Island, respectively; Fulmar, Fork-tailed Petrel, and the gull species originate in the North Pacific; Pink-footed Shearwater comes from the temperate coast of South America, straggling west to the

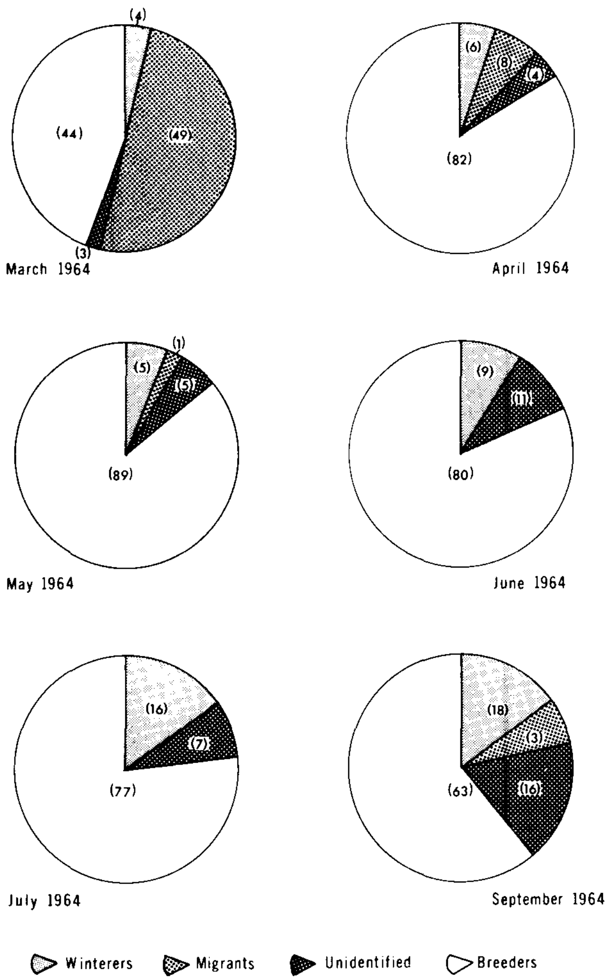


Figure 26a.--Relative composition of avifauna by species group, March-September 1964. Numbers in parentheses in each sector indicate the percentages of total birds in each category.

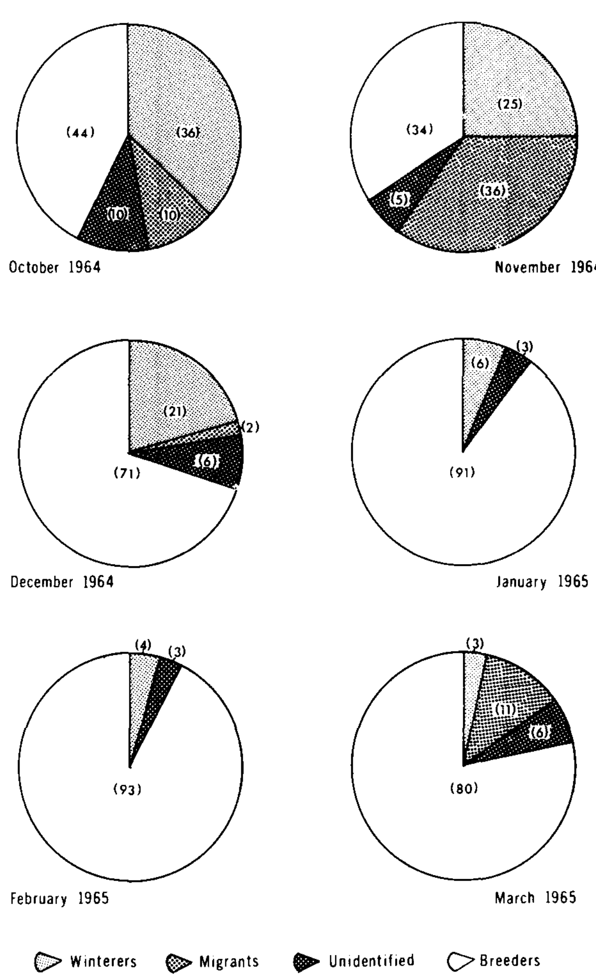


Figure 26b.--Relative composition of avifauna by species group, October 1964 to March 1965. Numbers in parentheses in each sector indicate percentages of total birds in each category.

study area on its northward migration to the North Pacific; Gray-backed Tern, Blue-gray Noddy, and Rock Dove originate on the main Hawaiian islands.

If we subdivide the species occurring in the study area somewhat more broadly into breeding birds (of the central Pacific, including Hawaiian, Line, and Phoenix Islands), wintering birds from the North or South Pacific, and direct migrants through the study area from the North or South Pacific, we can show the relative abundance of each of these groups, and, thus, the patterns of utilization of the study area as they relate to the location of breeding areas and breeding phenology (figs. 26a-c).

Generally, the species in the area during their breeding season have breeding grounds within 1,000 miles of the study area; those that occur during their nonbreeding season come from more than 1,000 miles away.

Resident in Breeding Season.

Black-footed Albatross
Laysan Albatross
Dark-rumped Petrel
Bulwer's Petrel
Wedge-tailed Shearwater
Christmas Shearwater
Newell's Shearwater
White-tailed Tropicbird

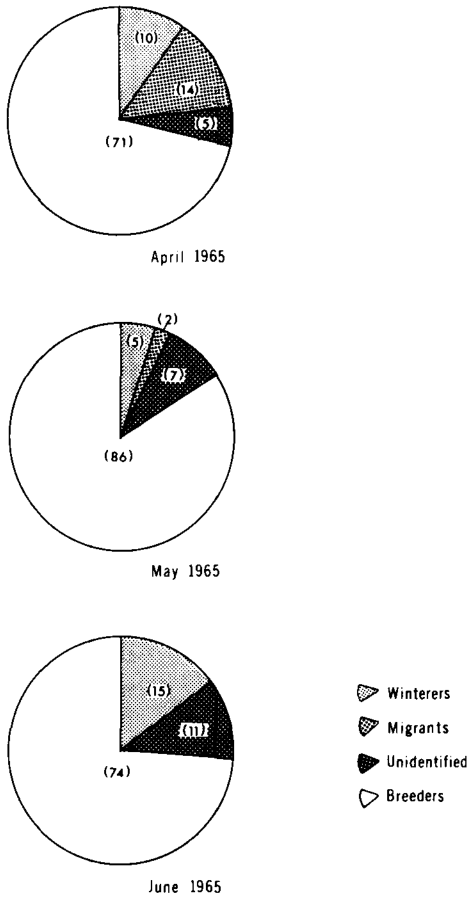


Figure 26c.--Relative composition of avifauna by species group, April-June 1965. Numbers in parentheses in each sector indicate the percentages of total birds in each category.

Red-tailed Tropicbird
Blue-faced Booby
Brown Booby
Red-footed Booby
Great Frigatebird
Brown Noddy
Black Noddy
Sooty Tern
White Tern

Resident in Nonbreeding Season.

Juan Fernandez Petrel
White-necked Petrel
Black-winged Petrel
Kermadec Petrel
Leach's Storm Petrel
Pomarine Jaeger

Direct Migrants.

Mottled Petrel
Pale-footed Shearwater
Sooty Shearwater
Slender-billed Shearwater
Golden Plover
Red Phalarope
Long-tailed Jaeger
Arctic Tern

Breeding birds dominated in all months except March and November 1964. In January and February 1965, breeding birds exceeded 90 percent, even though total population during these 2 months was low. The height of the breeding season in the Hawaiian area is indicated both by the large total population and by the high percentage of breeding birds during May 1964 (89 percent) and May 1965 (86 percent). Migrants were relatively numerous in the area only in March and April and from September through November. Wintering birds were well represented from June through December even though two of the wintering species, Leach's Storm Petrel and Pomarine Jaeger, were breeding in Alaska during at least the first 3 months of this period. The greatest representation of birds wintering in the area (36 percent) came in October 1964 when both Juan Fernandez Petrels and Black-winged Petrels, the two most abundant wintering forms, were at peak numbers just before their return to the Southern Hemisphere for the beginning of their breeding season.

Distance from Land

Birds of species that occurred in the study area in significant numbers were tallied, according to the distance from nearest land at the time of observation, in increments of 50 and 100 miles from nearest land. Figure 27 shows these distance-from-nearest-land isopleths superimposed on the nominal cruise track. The miles traveled while observations were underway were divided into the numbers of birds observed to yield a birds-per-mile figure. Table 5 illustrates the abundance of the more common species in relation to miles from nearest land.

Five patterns of distribution were noted:

1. Species that were observed predominantly within 50 miles of land:

Brown Booby
Red-footed Booby
Pomarine Jaeger
Brown Noddy
Black Noddy

All the birds in this category except the Pomarine Jaeger breed in the main Hawaiian islands and are land-dependent to the extent that they normally do not fly out from their roosting area farther than 1/2 day's flight in search of food so that they can return to their roosts nightly. A substantial population is present in the breeding area all year. The Pomarine Jaeger is common off the main Hawaiian islands only during the winter. In the spring, birds wintering farther south join the wintering Hawaiian population, and both groups migrate north in May and June. Pomarine Jaegers are absent from the study area during the summer.

2. Species whose numbers decreased gradually with increasing distance from land:

Dark-rumped Petrel
Bulwer's Petrel
White-tailed Tropicbird
Great Frigatebird
White Tern

This category comprises three birds that breed in the main Hawaiian islands--two procellariids and a tropicbird--and two wide-ranging birds that breed in the leeward Hawaiian chain, in the Line and Phoenix Islands, and in many other tropical Pacific island groups. They travel farther from land during their breeding season than those in the preceding category. The two petrels become more highly land-oriented during the breeding peak, but since they range more widely at sea at the beginning and end of their breeding cycles, the net effect is one of decreased land-orientation compared with the species in category 1. The other three species are present all year in the study area. They range far more widely in search of food than birds in category 1 and must frequently spend the night at sea, which for the frigatebird and the tern is remarkable since neither was observed to sit on the water in the 15 months of the pilot program, and they have very rarely been observed on the water elsewhere in the central Pacific by POBSP personnel. They show a general orientation toward land, however, unlike birds in the succeeding categories. This general orientation

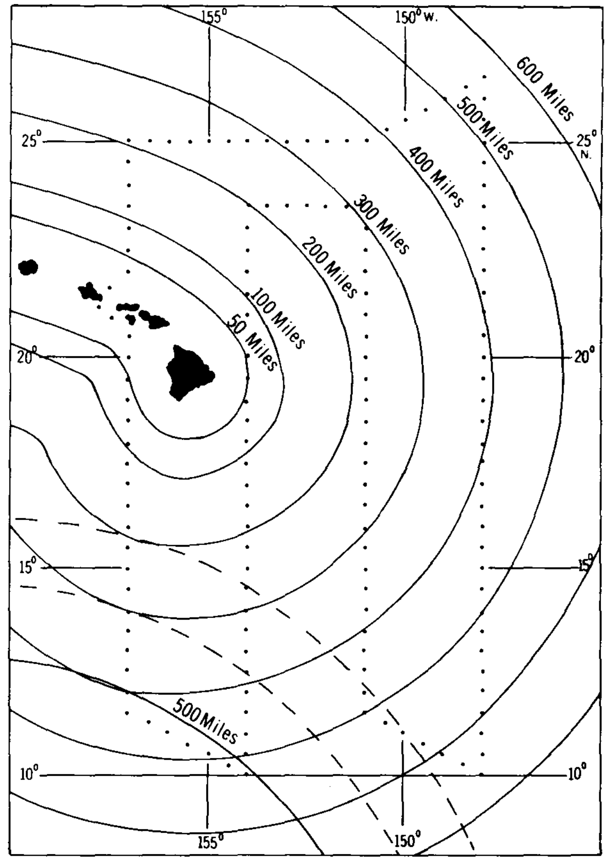


Figure 27.--Distance-from-nearest-land isopleths superimposed on the theoretical cruise track. Palmyra Island of the Line group is the closest point of land from the southwestern part of the study area.

toward land is weak evidence that the Hawaiian Islands are the islands of origin for the birds of these species found in the study area.

3. Species that were observed less frequently within 50 miles of land than over 100 from land:

Juan Fernandez Petrel
White-necked Petrel
Mottled Petrel
Black-winged Petrel
Kermadec Petrel
Herald Petrel
Sooty Shearwater
Slender-billed Shearwater
Christmas Shearwater
Blue-faced Booby
Golden Plover

Red Phalarope
Long-tailed Jaeger
Skua
Arctic Tern

Birds in this category include: first, migrants from the South or North Pacific that pass through the area rapidly on their way to or from more northerly or more southerly waters, and, second, birds that breed to the south of the area and winter mainly in the central Pacific (between the Equatorial Countercurrent and the Hawaiian Islands). Direct migrants demonstrate no marked distribution pattern in the study area that indicates orientation or navigation based on the position of the islands of the Hawaiian group. Birds that breed south of the area slowly infiltrate into it during the nonbreeding season so that the net effect is one of greatest abundance at the southern end, even though some birds, such as Juan Fernandez Petrel, are in all parts of the study area during peak months.

4. Species that were observed in roughly the same density regardless of distance from land:

   Black-footed Albatross
   Laysan Albatross
   Leach's Storm Petrel
   Red-tailed Tropicbird

Table 5.--Numbers of sea birds seen per 10 linear miles (18.5 km.) of observation at varying distances from nearest land

Species	Period	Miles from land							
		50	100	200	300	400	500	600	700
Black-footed Albatross	Total	1.12	0.37	0.74	0.76	0.83	0.23	0.50	0.01
Wedge-tailed Shearwater dark-phase	Total	0.11	0.08	0.03	0.07	0.10	0.72	0.38	1.84
Wedge-tailed Shearwater light-phase	Total	15.88	4.98	2.85	0.56	0.79	0.84	0.33	1.43
Sooty Shearwater	Spring	1.96	2.48	1.46	4.92	0.80	1.23	0.95	2.24
	Fall	2.95	0.24	0.36	1.12	0.53	1.13	0.66	1.70
Slender-billed Shearwater	Nov.	9.43	15.60	2.96	8.23	1.29	0.02	0.00	0.21
Newell's Shearwater	Total	0.20	0.09	0.11	0.05	0.02	0.08	0.08	0.10
Juan Fernandez, White-necked Petrel	Total	0.26	0.38	0.44	0.66	1.39	1.72	2.02	4.47
Black-winged Petrel	Total	0.32	0.47	0.34	0.42	0.62	0.98	0.47	0.99
Bulwer's Petrel	Total	0.87	0.29	0.20	0.12	0.07	0.15	0.05	0.06
Leach's Storm Petrel	Total	0.17	0.35	0.23	0.25	0.25	0.36	0.40	0.55
Red-tailed Tropicbird	Total	0.06	0.06	0.09	0.09	0.06	0.06	0.07	0.06
White-tailed Tropicbird	Total	0.11	0.08	0.06	0.04	0.04	0.01	0.01	0.01
Blue-faced Booby	Total	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.07
Red-footed Booby	Total	5.17	0.05	0.03	0.01	0.01	0.01	0.00	0.00
Brown Booby	Total	0.37	0.00	0.00	0.01	0.01	0.01	0.01	0.01
Great Frigatebird	Total	0.51	0.20	0.18	0.10	0.03	0.02	0.01	0.01
Pomarine Jaeger	Total	0.49	0.01	0.01	0.03	0.01	0.02	0.00	0.01
Sooty Tern	Spring	68.60	17.39	14.69	5.64	2.82	3.73	3.99	17.13
	Summer	42.78	39.89	15.73	7.08	4.89	3.30	0.55	3.08
	Fall	0.19	1.29	0.92	4.25	22.07	7.08	3.86	2.74
	Winter	23.89	15.67	8.99	2.80	2.04	2.46	9.38	16.39
	Total	40.65	19.08	11.68	5.09	6.32	4.13	4.35	11.35
Brown Noddy	Total	19.01	0.19	0.04	0.01	0.00	0.01	0.00	0.00
White Tern	Total	0.15	0.24	0.10	0.05	0.02	0.04	0.05	0.03

Birds in this category are distributed at random in the study area from the standpoint of miles from land. Albatrosses were recorded mainly in the northern half of the area, which suggests that albatross distribution shows a closer correlation with latitude-dependent factors--probably temperature and salinity--than land-dependent factors.

5. Species that demonstrated a bimodal distribution, i.e., high densities within 100 miles of land and more than 400 miles from land, but with low density between 100 and 400 miles:

   Wedge-tailed Shearwater
   Newell's Shearwater
   Sooty Tern

Wedge-tailed Shearwaters and Sooty Terns are the two most abundant species in the study area. Their distribution is complex. During the breeding season high densities of Sooty Terns and light-phase Wedge-tailed Shearwaters are found within 100 miles of the Hawaiian Islands. The peaks disappear during the nonbreeding season when these populations migrate to their wintering grounds. A second density center, at the southern end of the area, contains mainly dark-phase Wedge-tailed Shearwaters which come from unknown Southern Hemisphere breeding populations. The cycle of this southern density center is roughly in synchrony with the one in the north. If birds from the Southern Hemisphere have breeding cycles 6 months before and after the cycle of northern birds--which probably holds true for colonies in subtropical areas but probably not for those in the tropics where breeding cycles may be of extended length--then these birds represent a wintering population rather than foragers from nearby colonies. The cycle of the Sooty Terns in the south is not sufficiently regular to warrant an analysis. It is clear that at least two populations of each species are encountered, a nearby breeding population and a foreign wintering population, of which only the former shows orientation to land. Newell's Shearwaters at the southern end are mainly subadults or nonbreeding adults.

Analysis of Density

Density was analyzed after consideration was given to the maximum distances at which various types of birds could be identified and counted. To test the data for patterns of relative density, a further study was made of the distribution of birds in subareas.

Maximum distances of observation.--Distances at sea are notoriously difficult to estimate. Even when observers become familiar with the shape, build, behavior, and pattern of markings of sea birds, they can often mistake a species for a similar species of different size because no scale is afforded by the ocean surface. The distance at which a given species will be observed most of the time, or overlooked most of the time, is an essential element in the computation of population estimates based on samples made along transects at sea. Several factors interact to produce a maximum observation distance. This maximum observation distance changes from species to species, from day to day, from ship to ship, and from observer to observer. Species-variable factors include size of bird, height at which a bird is flying, flight speed and behavior, color or pattern, tendency to flock, and how much a ship attracts or repels the birds. Wind speed and direction, sea state, atmospheric visibility, and amount and direction of glare are among the factors which change from day to day, or even from hour to hour. The size of the ship is important; small ships tend to repel birds less than large ones, but large ships can be seen at a greater distance by birds that are attracted to ships. The height of the observation platform and the extent to which observations are impaired by ships' structures are important. An observer can see high-flying birds, such as terns, more readily from a high platform and can see low-flying birds, such as storm petrels, more readily from a low platform. Observers differ in the degree and length of their concentration, visual acuity, and familiarity with the techniques of observation and identification.

It is impossible to take all these factors into consideration in the determination of maximum observation distances. To do so would be to reappraise a list of many variables almost continuously. Some of these factors cancel out others, however; some can be disregarded under normal conditions; and the effects of some can be minimized by standardization of observation techniques, by the repetition of one cruise track over a long timespan, and by use of experienced observers only.

Our experience suggests that the following maximum ranges of observations from the

Townsend Cromwell are applicable to these species groups:

Species groups	Range of obs.		Effective area of survey for each: Mile traveled	Km. traveled
	Miles	Km.	Sq. miles	Ha.
Albatrosses	4	7.41	8	2,747.2
Shearwaters/ petrels	1	1.85	2	686.8
Storm petrels Bulwer's Petrel	1/4	0.46	1/2	171.7
Tropicbirds	1	1.85	2	686.8
Boobies	1	1.85	2	686.8
Frigatebirds	2	3.71	4	1,373.6
Shore birds	1/2	0.93	1	343.4
Jaegers	1	1.85	2	686.8
Terns	1-1/2	2.78	3	1,030.2
Noddies	1	1.85	2	686.8

Most birds of these groups will be observed at these distances. Some farther from the ship than the stated distance will be seen, but others that are nearer will probably be missed.

Overestimates of maximum distances of observation result in calculated population estimates that are conservative.

Table 6 gives population estimates of each species for the study area during the cruise on which each species was most abundant. The figure for birds per linear mile was weighted by the effective area of survey per linear mile of observation of each species group, and the resulting value for birds per square mile was multiplied by the approximate area covered by the study to yield a population estimate for each species.

Analysis of density by subareas.--Depending upon its islands of origin, breeding schedule, and pelagic habitat "preference," each species should show distinctive patterns of relative density in various parts of the study area in different seasons. To test the data for such patterns so that they can be demonstrated numerically as well as visually, the study area was divided into eight subareas of about equal size. A visual appraisal of distribution patterns indicated that the land masses of the Hawaiian group should be included in one subarea, that an area of low density east of the Hawaiian group should be in another, and that areas of relatively high density to the south should be in still others. Accordingly, quadrangles of 5° latitude by 4° longitude (ca. 72,000 sq. miles or 24.6 million ha.) were selected as being probably the most meaningful in terms of homogeneity of distribution within each subarea (fig. 28). Densities in terms of birds per linear mile of observations for the more numerous regularly occurring species were calculated for the four seasons, rather than for each month, to minimize inequalities in sampling and to simplify the presentation of the data. Spring was taken to mean March-May; summer, June-August; fall, September-November; and winter, December-February.

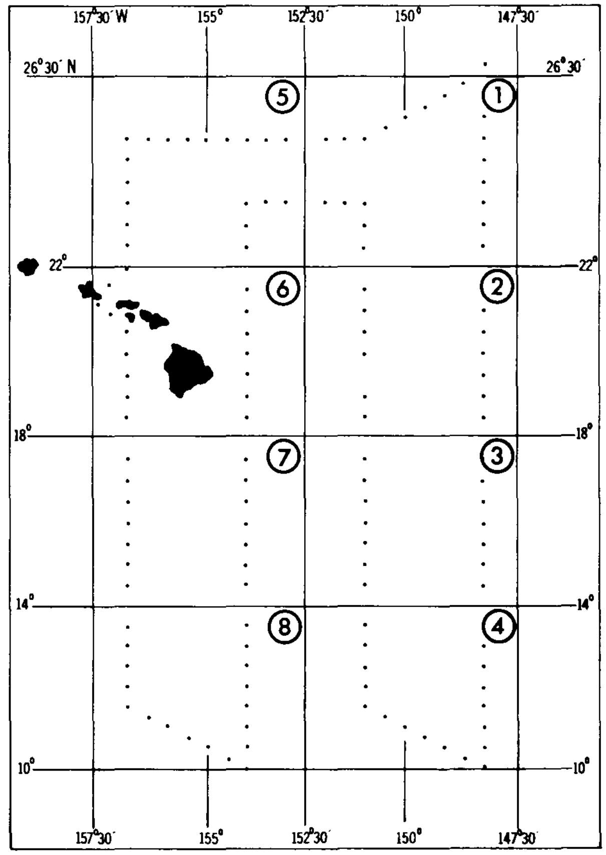


Figure 28.--Location of eight 5° x 4° subdivisions of the study area. Each subdivision contains ca. 72,000 square miles (24.6 million ha.).

Table 6.--Weighted estimates of maximum monthly populations of sea birds in the study area

Species	Maximum number of sea birds observed	Month and year	Birds per 10 linear miles	Weighted population estimate
	Number		Number	Number
Black-footed Albatross	92	February 1965	0.43	2,688
Laysan Albatross	11	March 1965	0.05	312
Dark-rumped Petrel	9	May 1965	0.03	750
Juan Fernandez Petrel	1,206	October 1964	5.56	139,000
White-necked Petrel	14	May 1965	0.05	1,250
Mottled Petrel	50	October 1964	0.23	5,750
Black-winged Petrel	1,033	October 1964	4.76	119,000
Kermadec Petrel	16	January 1965	0.07	1,750
Herald Petrel	6	December 1964	0.02	500
Bulwer's Petrel	178	May 1964	0.71	71,000
Wedge-tailed Shearwater				
(light-phase)	1,637	May 1964	6.52	163,000
(dark-phase)	444	May 1964	1.77	44,250
Sooty Shearwater	1,684	March 1964	7.50	187,500
Slender-billed Shearwater	871	November 1964	4.12	103,000
Christmas Shearwater	6	September 1964	0.02	500
Newell's Shearwater	66	May 1964	0.26	6,500
Leach's Storm Petrel	297	April 1965	1.22	122,000
White-tailed Tropicbird	24	May 1964	0.09	2,250
Red-tailed Tropicbird	38	October 1964	0.17	4,250
Blue-faced Booby	9	May 1964	0.03	750
Brown Booby	18	October 1964	0.08	[1]2,000
Red-footed Booby	221	June 1965	0.90	[1]22,500
Great Frigatebird	62	June 1965	0.25	3,125
Golden Plover	159	October 1964	0.73	36,500
Red Phalarope	53	March 1965	0.24	12,000
Pomarine Jaeger	60	April 1965	0.24	[1]6,000
Skua	3	October 1964	0.01	250
Arctic Tern	27	April 1965	0.11	2,063
Sooty Tern	5,020	May 1965	20.64	387,000
Brown Noddy	1,516	May 1965	6.23	[1]155,750
White Tern	24	April 1965	0.09	1,687

[1]Estimate exaggerated by local nature of distribution.

Total abundance for each species was estimated on the basis of linear densities, taking into account the effective range of observation for each species and the area of the octants. Figure 29 shows the densities of birds per 10 linear miles in each octant and the estimated daily population in a given season within that octant. The estimates of population in table 5 are for maximum numbers encountered in any one month, whereas the estimates in figure 29 are averaged for a whole season. Albatross density was based on cumulative totals through the day rather than the highest number at one time, the value used in the species account.

Densities of total avifauna were highest in spring, slightly lower in summer and fall, and substantially lower in winter. The distribution of high and low densities appears not to be at random. Octant 6, which contained the land masses, consistently contained the highest density of birds in all seasons but summer, when it was second by a narrow margin. Octant 5, the northwestern corner, varied considerably. It ranked sixth in the fall after it ranked first in the summer--which may well indicate that Sooty Terns and Wedge-tailed Shearwaters breeding in the main Hawaiian area do not disperse in a northerly direction after their breeding seasons.

Octant 4, and to a lesser extent octant 8, at the southern end of the study area, show consistently high densities, especially in fall, caused presumably by the attractiveness of the area of relatively high productivity near lat. 10° N. where an underlying cold water dome comes very close to the surface. Nonbreeding populations of Sooty Terns, Wedge-tailed Shearwaters, Juan Fernandez Petrels, and Black-winged Petrels make up the bulk of the populations in octants 4 and 8. Octants 1, 2, and 3 were consistently low in avian density--especially octant 2, which ranked last or next to last in all seasons.

The following general patterns may be seen in the analysis of density by octant:

1. Birds that breed in the main or leeward Hawaiian group in the spring and summer are most abundant in octants 5 and 6 in spring and summer.
2. Birds that breed in the leeward Hawaiian group in the winter attain highest densities in octants 5 and 1 in winter and spring.
3. Birds that migrate rapidly in waves show high densities in one or two octants and low densities in all others.
4. Birds that breed at a distance from the study area and spend their nonbreeding seasons in the study area attain highest densities in octants 4 and 8.

The estimates of total populations permit the calculation of total bird-days, from which, with certain assumptions about the food requirements of sea birds, can be derived the annual consumption by sea birds in the study area. To simplify calculations, two categories of body weights were assumed, 180 g. (terns, noddies, Bulwer's Petrels, and Leach's Storm Petrels), and 400 g. (all others). Many species, especially boobies, frigatebirds, and albatrosses, weighed far more than 400 g. but did not occur in substantial numbers. Most of the shearwaters and petrels that did occur in substantial numbers weighed about 400 g. Direct migrants (Sooty and Slender-billed Shearwaters) were omitted from the calculations.

Jordán (1959) studied the daily consumption of the Guanay Cormorant <u>Phalacrocorax bougainvillii</u> Linnaeus. He found that the average Guanay weighed 2,000 g. and daily ate 430 g., or 21.5 percent of its body weight. Lack (1954) stated that daily food consumption of land birds is tied directly to body weight, regardless of the kind of food taken. The average daily consumption of several species of land birds weighing between 100 and 1,000 g. was between 5 and 9 percent, and land birds weighing less than 100 g. consumed 10 or more percent of their body weight daily.

The difference in the average daily food intake of sea birds and land birds may be explained in part by the relatively greater amount of water in fish than in seeds or insects. Taking Jordán's daily consumption figure of 21.5 percent, tern-sized sea birds weighing 180 g. would eat 38.7 g. of food daily, and shearwater-sized sea birds weighing 400 g. would eat 86 g. of food daily.

In one year in the study area tern-sized (180 g.) birds ate 3,069.7 metric tons of food in 79,313,614 bird-days, and shearwater-sized (400 g.) birds ate 4,316.9 metric tons in 50,196,912 bird-days for a total of 7,386.6 metric tons. I assumed that birds larger than shearwaters eat only as much as shearwaters, so these figures are conservative.

ALL SPECIES

Spring		Summer		Fall		Winter	
42.18	4.46	53.89	5.49	8.30	4.94	14.61	6.92
101,282	10,704	129,336	13,176	19,920	11,856	35,064	16,608
87.98	2.24	50.00	8.67	42.05	4.60	40.92	1.50
211,152	5,376	120,000	20,808	100,920	11,040	98,208	3,600
10.83	3.71	9.68	14.77	22.26	22.31	7.18	3.98
25,992	8,904	23,232	35,448	53,424	53,544	17,232	9,552
12.13	30.79	15.21	17.11	36.52	30.09	7.04	26.61
29,112	73,896	36,504	41,064	87,648	72,216	16,896	63,864
Totals	466,368		419,568		410,568		261,024

BLACK-FOOTED ALBATROSS

Spring		Summer		Fall		Winter	
3.04	1.62		0.01	1.03	0.14	7.51	5.33
2,736	1,458	0.00	9	927	126	6,759	4,797
1.13	0.23	0.01				1.97	0.15
1,017	207	9	0.00	0.00	0.00	1,773	135
	0.05		0.01				
0.00	45	0.00	9	0.00	0.00	0.00	0.00
0.01	0.12						0.28
9	108	0.00	0.00	0.00	0.00	0.00	252
Totals	5,580		27		1,053		13,716

WEDGE-TAILED SHEARWATER

Spring		Summer		Fall		Winter	
3.59	0.12	8.93	0.26	1.09	0.15	0.38	0.03
12,924	432	32,148	936	3,924	540	1,368	108
11.06	0.30	12.49	0.49	18.18	0.12	0.68	0.07
40,816	1,080	44,964	1,764	65,448	432	2,448	252
1.66	0.71	4.14	0.40	0.82	0.66	0.19	0.05
5,976	2,556	14,904	1,440	2,952	2,376	684	180
2.40	5.60	5.27	2.17	0.82	1.31	0.18	0.78
8,640	20,160	18,972	7,812	2,952	4,716	648	2,808
Totals	92,584		122,940		83,340		8,496

Figure 29.--Sea bird abundance in subareas in the study area. The squares of the table repeat the geographical layout of figure 28. The upper figure in each square is the density in birds per 10 linear miles (18.5 km.) of observation; the lower figure is the estimated population, weighted by the effective range of observation of each species. Density and population figures are daily averages during each season.

SOOTY SHEARWATER

Spring		Summer		Fall		Winter	
10.31 37,116	1.35 4,860	0.00	0.00	0.82 2,952	0.56 2,160	0.01 36	0.00
2.23 8,028	0.34 1,224	0.00	0.00	1.68 6,048	0.31 1,116	0.03 103	0.01 36
1.28 4,608	0.57 2,052	0.00	0.01 36	1.47 5,292	0.32 1,152	0.00	0.00
1.00 3,600	1.68 6,048	0.00	0.00	1.81 6,516	1.23 4,428	0.01 36	0.00
Totals	67,536		36		29,664		216

SLENDER-BILLED SHEARWATER

Spring		Summer		Fall		Winter	
0.00	0.01 36	0.00	0.00	0.00	1.02 3,672	0.03 108	0.02 72
0.00	0.00	0.00	0.00	4.62 16,632	0.15 540	0.12 432	0.01 36
0.00	0.00	0.00	0.00	5.37 19,332	0.04 144	0.01 36	0.01 36
0.00	0.00	0.00	0.00	0.00	0.03 108	0.01 36	0.03 108
Totals	36		0		40,428		864

NEWELL'S SHEARWATER

Spring		Summer		Fall		Winter	
0.22 792	0.03 108	0.12 432	0.01 36	0.21 756	0.04 144	0.03 108	0.01 36
0.25 900	0.01 36	0.20 720	0.03 108	0.07 252	0.01 36	0.00	0.00
0.05 180	0.05 180	0.04 144	0.04 144	0.01 36	0.01 36	0.00	0.00
0.20 720	0.18 648	0.22 792	0.06 216	0.00	0.06 216	0.04 144	0.03 108
Totals	3,564		2,592		1,476		396

Figure 29.--Sea bird abundance in subareas in the study area. The squares of the table repeat the geographical layout of figure 28. The upper figure in each square is the density in birds per 10 linear miles (18.5 km.) of observation; the lower figure is the estimated population, weighted by the effective range of observation of each species. Density and population figures are daily averages during each season.--Continued.

JUAN FERNANDEZ, WHITE-NECKED PETRELS

Spring		Summer		Fall		Winter	
0.03 108	0.01 36	0.08 288	0.66 2,376	0.34 1,224	0.52 1,872	0.13 468	0.10 360
0.04 144	0.40 1,800	0.77 2,772	2.20 7,920	0.85 3,060	0.43 1,548	0.17 612	0.10 360
0.04 144	0.39 1,404	1.81 6,516	3.42 12,312	2.90 10,440	4.38 15,768	0.16 576	0.20 720
0.16 5,760	2.27 8,172	2.38 8,568	6.32 22,752	6.92 24,912	10.62 38,232	0.48 1,728	1.84 6,624
Totals	17,568		63,504		97,056		11,448

BLACK-WINGED PETREL

Spring		Summer		Fall		Winter	
0.01 36	0.01 36	0.56 2,016	0.15 540	0.71 2,556	1.01 3,636	0.04 144	0.02 72
0.02 72	0.01 36	0.50 1,800	0.29 1,044	1.48 5,328	0.93 3,348	0.03 108	0.01 36
0.09 324	0.10 360	0.73 2,628	0.40 1,440	2.79 10,044	2.55 9,180	0.03 108	0.01 36
0.72 2,592	0.20 720	0.84 3,024	1.23 4,428	5.06 18,216	2.78 10,008	0.11 396	0.04 144
Totals	4,500		16,920		62,316		1,044

BULWER'S PETREL

Spring		Summer		Fall		Winter	
0.29 4,176	0.09 1,296	0.55 7,920	0.28 4,036	0.01 144	0.00	0.00	0.00
1.08 15,552	0.04 576	0.92 13,248	0.07 1,008	0.12 1,728	0.00	0.01 144	0.00
0.27 3,888	0.09 1,296	0.20 2,880	0.11 1,584	0.01 144	0.00	0.00	0.01 144
0.42 6,048	0.22 3,168	0.07 1,008	0.06 864	0.05 120	0.00	0.01 144	0.00
Totals	36,000		32,544		2,736		432

Figure 29.--Sea bird abundance in subareas in the study area. The squares of the table repeat the geographical layout of figure 28. The upper figure in each square is the density in birds per 10 linear miles (18.5 km.) of observation; the lower figure is the estimated population, weighted by the effective range of observation of each species. Density and population figures are daily averages during each season.--Continued.

LEACH'S STORM PETREL

Spring		Summer		Fall		Winter	
0.66	0.74	0.05	0.01	0.26	0.20	0.15	0.34
9,504	10,656	720	144	3,744	2,880	2,160	4,896
0.40	0.23			0.11	0.13	0.50	0.30
5,760	3,312	0.00	0.00	1,584	1,872	7,200	4,320
0.38	0.31	0.02	0.02	0.05	0.15	0.34	0.27
5,472	4,464	288	288	720	2,160	4,896	3,888
0.38	0.76			0.33	0.84	0.26	0.67
5,472	10,944	0.00	0.00	4,752	12,096	3,744	9,648
Totals	55,584		1,440		29,808		40,752

RED-TAILED TROPICBIRD

Spring		Summer		Fall		Winter	
0.16	0.08	0.15	0.10	0.18	0.14	0.01	0.02
576	288	540	360	648	504	36	72
0.06	0.03	0.13	0.08	0.03	0.13	0.03	0.01
216	108	468	288	108	468	108	36
0.09	0.01	0.13	0.08	0.15	0.13	0.04	0.01
324	36	468	288	540	468	144	36
0.03	0.10	0.02	0.10	0.13	0.03	0.07	0.03
108	360	72	360	468	108	252	108
Totals	2,016		2,844		3,312		792

WHITE-TAILED TROPIC BIRD

Spring		Summer		Fall		Winter	
0.07	0.02	0.12	0.06	0.05	0.03	0.13	0.04
252	72	432	216	180	108	468	144
0.12	0.03	0.09	0.04	0.08	0.06	0.17	0.05
432	108	324	144	288	216	612	180
0.04	0.02	0.05	0.04	0.00	0.01	0.05	0.02
144	72	180	144		36	180	72
0.03	0.01	0.00	0.02	0.00	0.00	0.00	0.00
108	36		72				
Totals	1,224		1,512		828		1,656

Figure 29.--Sea bird abundance in subareas in the study area. The squares of the table repeat the geographical layout of figure 28. The upper figure in each square is the density in birds per 10 linear miles (18.5 km.) of observation; the lower figure is the estimated population, weighted by the effective range of observation of each species. Density and population figures are daily averages during each season.--Continued.

GREAT FRIGATEBIRD

Spring		Summer		Fall		Winter	
0.16	0.03	0.29	0.02	0.39	0.03	0.07	0.03
288	54	522	36	702	54	126	54
0.34	0.03	0.32	0.07	0.30	0.05	0.27	0.01
612	54	576	126	540	90	486	18
0.08	0.01	0.04		0.12	0.05	0.03	0.01
144	18	72	0.00	216	90	54	18
0.01				0.04		0.10	0.07
18	0.00	0.00	0.00	72	0.00	180	126
Totals 1,188		1,332		1,764		1,062	

SOOTY TERN

Spring		Summer		Fall		Winter	
22.04	0.19	40.76	2.64	0.69	0.01	5.31	0.67
52,896	456	97,824	6,336	1,656	24	12,744	1,608
45.11	0.25	25.27	3.98	0.44	1.16	24.35	0.52
108,264	600	60,648	9,552	1,056	2,880	58,440	1,248
5.82	0.77	1.82	5.55	5.74	9.94	5.49	2.52
13,968	1,848	4,368	13,320	13,776	23,856	13,176	6,048
5.46	16.12	4.25	1.86	18.02	7.34	5.08	18.92
13,104	38,688	10,200	4,488	43,248	17,616	12,192	45,408
Totals 229,824		206,712		104,112		150,864	

BROWN NODDY

Spring		Summer		Fall		Winter	
0.20	0.01	0.19					
720	36	684	0.00	0.00	0.00	0.00	0.00
16.01		4.53		8.40		4.90	
57,636	0.00	16,308	0.00	30,240	0.00	17,640	0.00
0.03				0.03		0.14	
108	0.00	0.00	0.00	108	0.00	504	0.00
0.01							
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals 58,536		16,992		30,348		18,144	

Figure 29.--Sea bird abundance in subareas in the study area. The squares of the table repeat the geographical layout of figure 28. The upper figure in each square is the density in birds per 10 linear miles (18.5 km.) of observation; the lower figure is the estimated population, weighted by the effective range of observation of each species. Density and population figures are daily averages during each season.--Continued.

WHITE TERN

Spring		Summer		Fall		Winter	
0.08 192	0.00	0.16 384	0.02 48	0.05 120	0.01 24	0.06 144	0.00
0.26 624	0.00	0.33 792	0.04 96	0.30 720	0.00	0.23 552	0.01 24
0.06 144	0.00	0.02 48	0.03 72	0.05 120	0.17 408	0.23 552	0.00
0.03 72	0.04 96	0.09 216	0.00	0.04 96	0.17 408	0.06 144	0.09 216
Totals 1,128		1,656		1,896		1,632	

Figure 29.--Sea bird abundance in subareas in the study area. The squares of the table repeat the geographical layout of figure 28. The upper figure in each square is the density in birds per 10 linear miles (18.5 km.) of observation; the lower figure is the estimated population, weighted by the effective range of observation of each species. Density and population figures are daily averages during each season.--Continued.

Direction of Movement

The direction in which birds were flying was noted at the time of each sighting. Often it was not possible to assign one particular direction of movement because many species, especially some of the shearwaters and petrels, have a meandering flight that is probably indicative of random searching for food. Figure 30 shows the percentage of birds of different species seen flying in each direction during each season. The data are most conclusive for species that migrate directly through the study area, e.g., Sooty and Slender-billed Shearwaters. Direction of movement of albatrosses almost always coincided with that of the ship, so they were not included in the figure. Biases to the data include alterations in course as a reaction to the ship, and the tendency of birds breeding in the main Hawaiian group to radiate out from land in the morning and to return to land in the evening. Because the ship normally spent little time near land, records of direction of movement of species that breed in substantial numbers in the main Hawaiian group, e.g., light-phase Wedge-tailed Shearwaters and Sooty Terns, may be biased by the chance arrival of the ship in that area in the morning or afternoon.

Certain trends are probably significant, however. Species that breed in the main Hawaiian group generally tend to fly north (or northeast or northwest) in spring and summer, and east to southwest in fall and winter. Direct migrants head north or northwest in the spring in convincing numbers, and south in the fall in equally convincing numbers. Species that breed in the South or North Pacific and winter in the study area, e.g., Juan Fernandez Petrel and Leach's Storm Petrel, fly north to west in the spring and summer and south to east in the fall and winter.

Daily Cycles of Activity

I totaled numbers of each of the more common species, according to the number of hours between sunrise and sunset they were observed, to indicate their activity cycles (fig. 31). For some, e.g., Laysan Albatross, the small sample size and the large erratic fluctuations in numbers indicate insufficient data. Others show fairly smooth curves that comply with the general impression of activity I have formed from many hours of observation. Hours six and seven after sunrise overlap hours seven and six before sunset in figure 31 as a compromise solution to the problem of including some birds in both a.m. and p.m. totals on short (11-hour) winter days, but not on long summer days of 13 hours or more.

Four basic patterns of activity are evident:

1. Peak activity near mealtimes aboard the ship. The Black-footed Albatross showed this pattern--which is not unexpected because this bird is a scavenger.

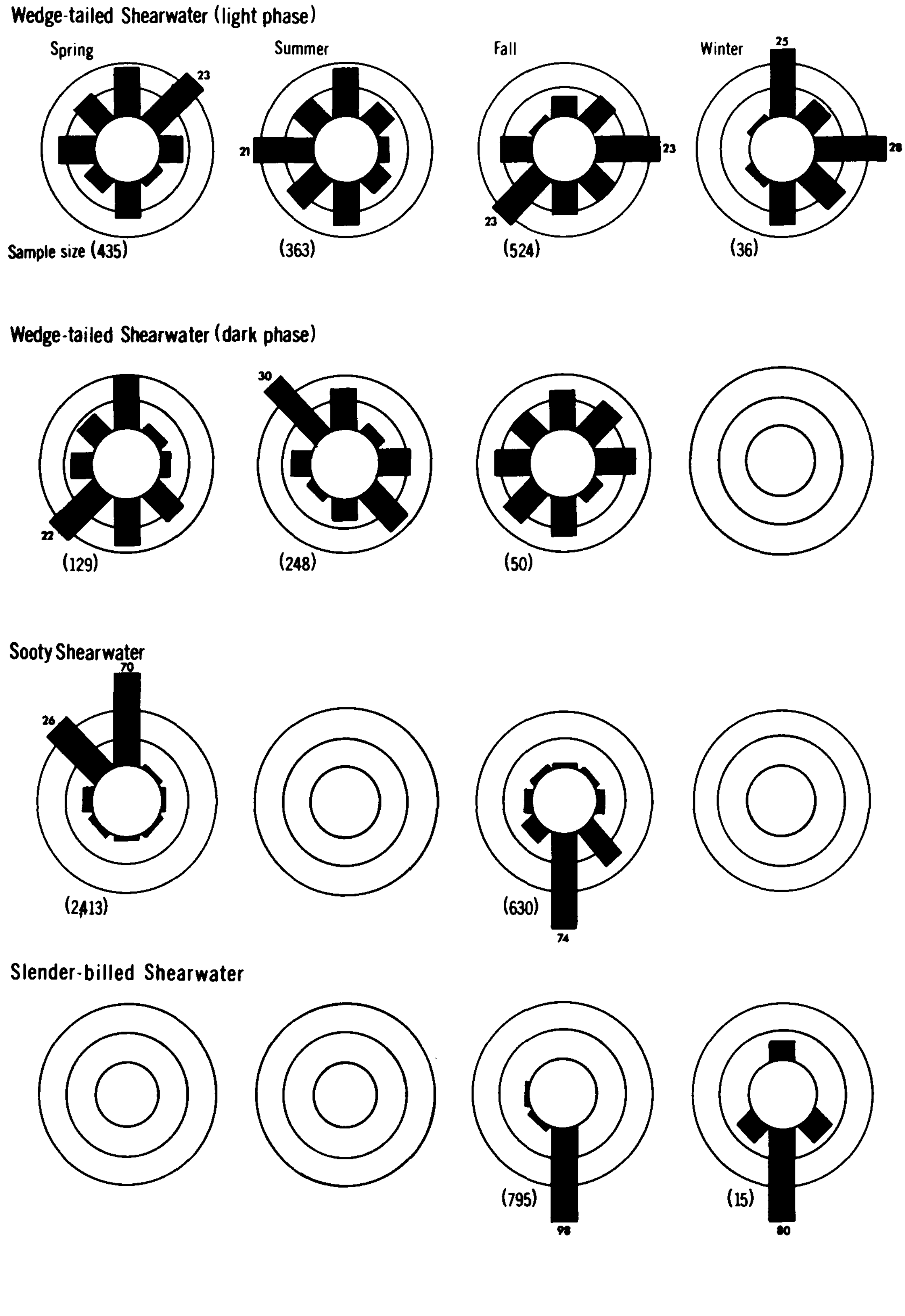


Figure 30.--Percent of sea birds seen flying in various directions in different seasons. The outer circle represents 20 percent of the total; the second circle 10 percent. If birds flying in one direction exceeded 20 percent, the bar extends past the outer circle and the percentage is indicated at the end of the bar. The sample size is given in parentheses under each figure.

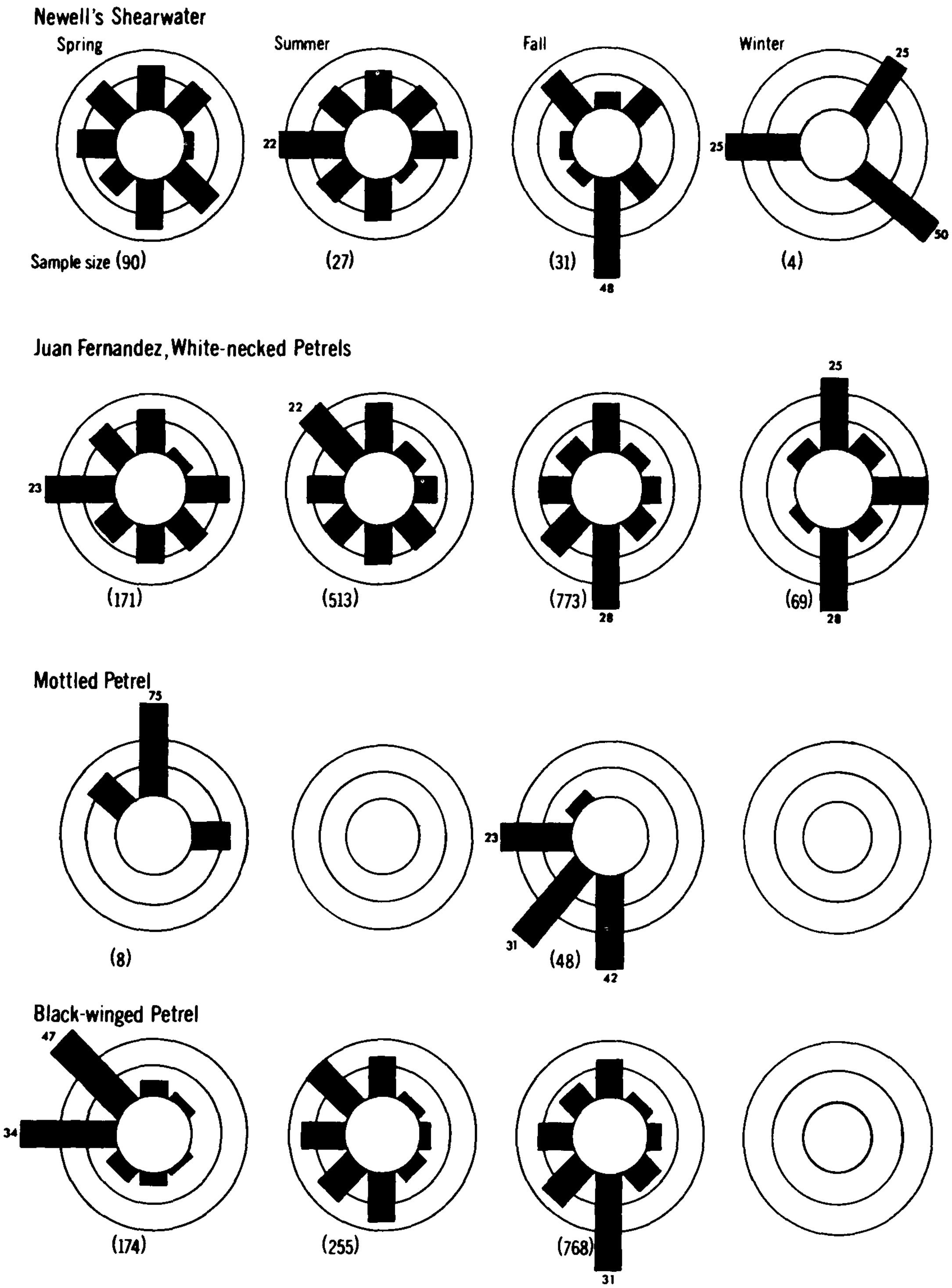


Figure 30.--Percent of sea birds seen flying in various directions in different seasons. The outer circle represents 20 percent of the total; the second circle 10 percent. If birds flying in one direction exceeded 20 percent, the bar extends past the outer circle and the percentage is indicated at the end of the bar. The sample size is given in parentheses under each figure.--Con.

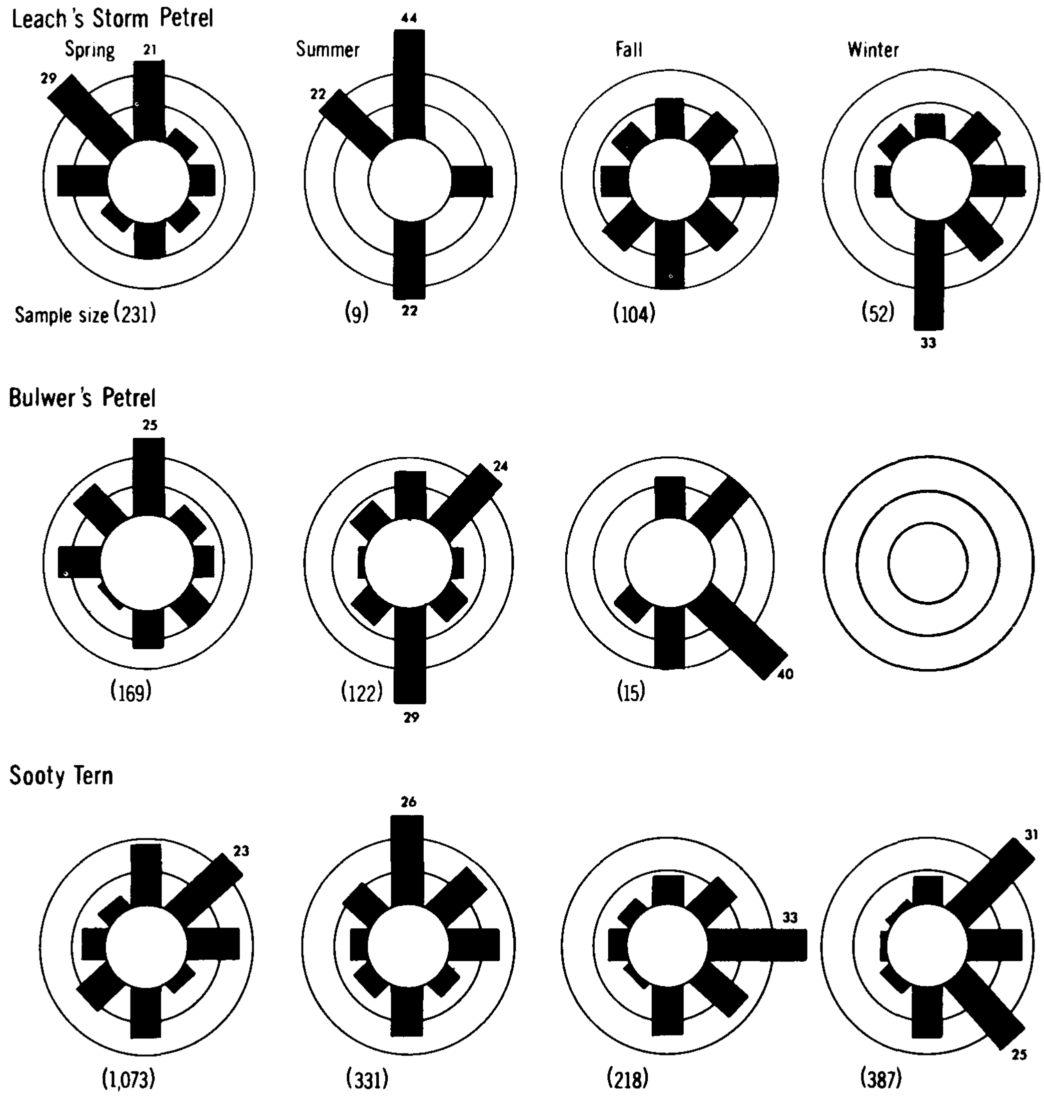


Figure 30.--Percent of sea birds seen flying in various directions in different seasons. The outer circle represents 20 percent of the total; the second circle 10 percent. If birds flying in one direction exceeded 20 percent, the bar extends past the outer circle and the percentage is indicated at the end of the bar. The sample size is given in parentheses under each figure.--Con.

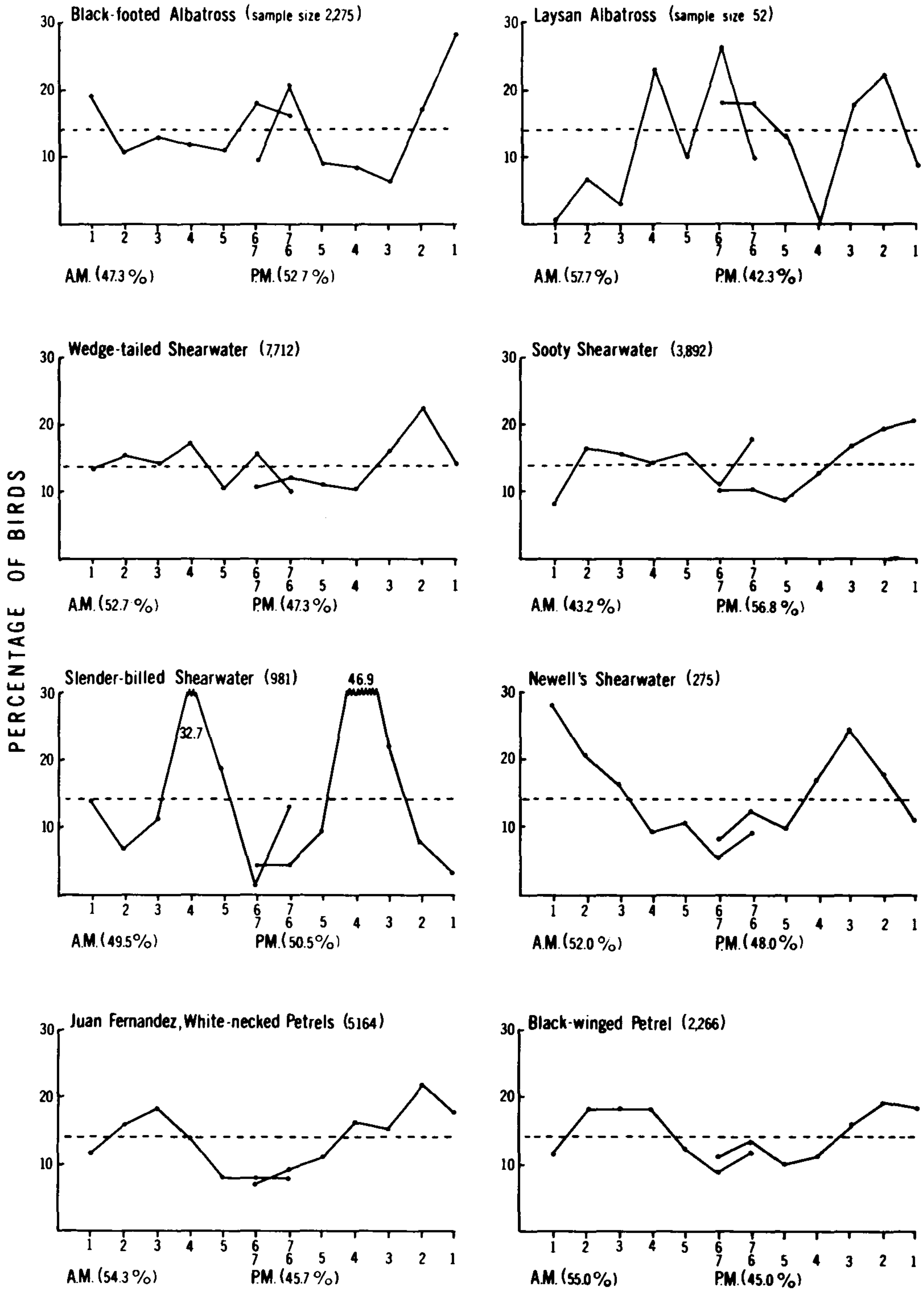


Figure 31.--Percentage of sea birds observed during each hour, 1 to 7 hours after sunrise and 1 to 7 hours before sunset. The dashed line indicates the theoretical line if birds were observed in equal numbers each hour. The number in parentheses after the species' name indicates the sample size. The numbers in parentheses after a.m. or p.m. are the percentages of total birds seen in the morning or afternoon.

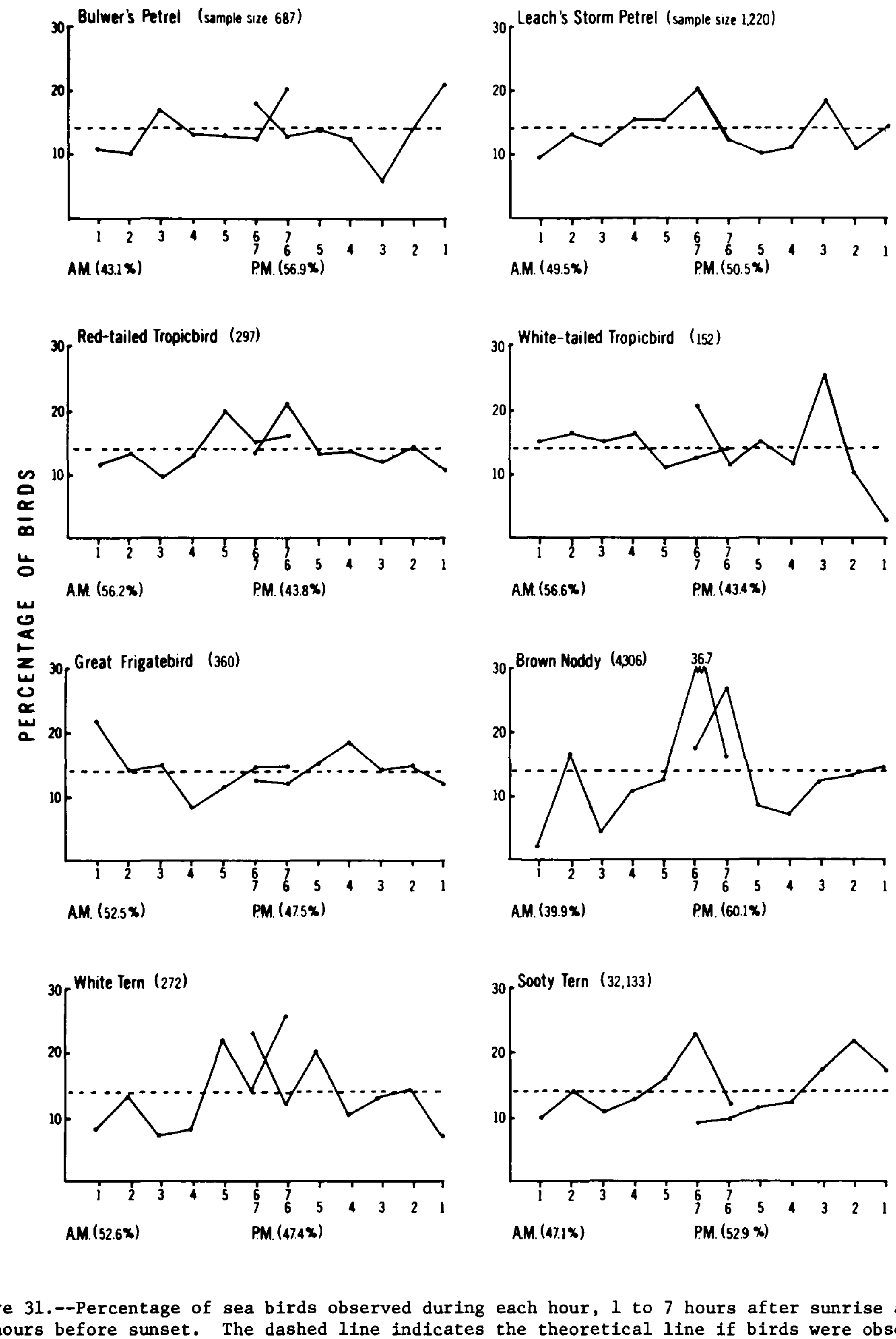


Figure 31.--Percentage of sea birds observed during each hour, 1 to 7 hours after sunrise and 1 to 7 hours before sunset. The dashed line indicates the theoretical line if birds were observed in equal numbers each hour. The number in parentheses after the species' name indicates the sample size. The numbers in parentheses after a.m. or p.m. are the percentages of total birds seen in the morning or afternoon.--Continued.

2. Peaks in the morning and late afternoon. Juan Fernandez and Black-winged Petrels showed this activity cycle most clearly.

3. Peak in the middle of the day. Leach's Storm Petrels, Red-tailed Tropicbirds, Brown Noddies, and White Terns appeared most often in the middle of the day.

4. Peak activity at noon or late morning and again late in the afternoon. This pattern was followed by Sooty Terns, Bulwer's Petrels, and, to a lesser extent, Wedge-tailed Shearwaters.

It is difficult to assess the meaning of these data in terms of what birds are actually doing. Theoretically, if movement is sporadic and unmotivated, fewer birds will be observed and more will be sitting on the water; conversely, if there is a heightened urge to feed or travel, activity should increase and a greater number of birds should be seen. The similarity in the activity cycles of species related systematically or by similar feeding habits, e.g., Juan Fernandez and Black-winged Petrels, lends some support to the data as a measure of avian activity.

Environmental Influences

A preliminary analysis of how wind direction, wind speed, air temperature, surface water temperature, and surface salinity affect the density of the more common sea bird species is presented below. The environmental data are arbitrarily applied to all sightings made in the period from one environmental observation to the next. Because environmental observations were made every 3 hours or less, the greatest distance a bird might have been seen from the site of the environmental observation within which it was included was about 30 miles. Environmental observations were grouped arbitrarily to yield from 5 to 10 incremental categories. Only observations taken between hours 0500 and 1900 were tallied. The number of birds recorded under each category was divided by the number of environmental observations made in that category. Since the environment was sampled every 30 miles the resulting figure of birds per sample is equivalent to birds per 30 miles of observation.

Wind direction.--Relative densities of birds at various wind directions (table 7) showed no conclusive relations, although the relatively high numbers of tropicbirds and Great Frigatebirds observed when the wind was from the west or southwest may be significant. A west wind could blow these species to the study area from the main or leeward Hawaiian islands.

Wind speed.--The numbers of birds observed at various wind speeds is believed to be a measure of the effect of wind on the observability of the birds, rather than an indication of movement of birds to avoid or to take advantage of the winds. Figure 32 shows densities of the more common species at various wind speeds in increments of 4 knots. Several basic patterns are evident. The first, typified by Leach's Storm Petrel and Bulwer's Petrel, has two peaks--a high peak when the wind is calm, or nearly so, making small, low-flying birds visible at a greater distance, and a lower peak at the greater wind speeds, when they arc higher than normal (reach the high point in an undulating flight). The second pattern, typified by Sooty and Slender-billed Shearwaters, has a single peak at medium to high winds. As winds increase, these species arc higher and are visible at a greater distance. Albatrosses are seen most often during strong winds because they arc higher with increasing wind speeds and their large size makes them visible at a distance. Tropicbirds are observed most often during light winds; they are most often seen sitting on the water or are spotted directly above the ship because their call attracts the observer's attention. Waves obscure sitting birds from view, and the noise of the wind makes it difficult to hear them calling.

Air temperature.--Avian densities calculated for each of seven categories of air temperature at 2° increments between 16° and 30° C. are presented in figure 33. Several species show remarkably well-defined "preferences" for certain air temperatures. Even though the numbers of environmental samples at the lowest and highest categories were low (three and nine, respectively), it is probably significant that only albatrosses were seen at temperatures in the lowest category and that they were most abundant at those temperatures. No albatrosses were observed at the temperatures in the highest category.

Several species were observed in greatest densities at 26° to 27° C. These included the two most abundant breeders in the main Ha-

Table 7.--Birds seen per 30 linear miles (55.6 km.) of observation at various wind directions

Species	Season	Wind direction							
		N.	NE.	E.	SE.	S.	SW.	W.	NW.
		Number of birds							
Black-footed Albatross	Spring	1.16	0.24	0.34	0.96	1.21	0.00	2.30	2.65
	Summer	0.00	0.01	0.00	0.00	0.00	-	-	-
	Fall	0.00	0.00	0.01	0.00	0.83	1.39	0.00	0.00
	Winter	5.33	0.54	0.42	0.17	1.25	10.50	0.90	3.15
	Total	6.49	0.78	0.78	1.13	3.29	11.95	3.20	5.80
Laysan Albatross	Spring	0.11	0.01	0.01	0.07	0.05	0.00	0.35	0.08
	Summer	0.00	0.00	0.00	0.00	0.00	-	-	-
	Fall	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	Winter	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.04
	Total	0.16	0.01	0.02	0.07	0.06	0.00	0.35	0.12
Wedge-tailed Shearwater	Spring	0.67	1.78	3.70	2.13	1.82	0.89	4.55	10.42
	Summer	1.46	3.75	2.01	0.43	0.18	-	-	-
	Fall	0.18	0.52	1.67	0.24	1.21	0.17	11.60	0.04
	Winter	0.03	0.13	0.12	0.17	0.18	0.33	0.05	0.00
	Total	2.34	6.18	7.50	2.97	3.39	1.39	16.20	10.46
Sooty Shearwater	Spring	0.20	0.32	1.45	15.67	1.23	0.11	4.80	4.65
	Summer	0.00	0.00	0.17	0.00	0.00	-	-	-
	Fall	0.31	0.16	0.59	0.00	0.20	0.56	0.40	0.08
	Winter	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	Total	0.51	0.49	2.22	15.67	1.43	0.67	5.20	4.73
Slender-billed Shearwater	Fall	0.00	0.02	1.20	0.05	0.03	0.17	0.05	0.04
	Winter	0.00	0.02	0.01	0.00	0.03	0.11	0.05	0.00
	Total	0.00	0.04	1.21	0.05	0.06	0.28	0.10	0.04
Newell's Shearwater	Spring	0.03	0.08	0.15	0.10	0.11	0.22	0.05	0.19
	Summer	0.02	0.05	0.06	0.00	0.03	-	-	-
	Fall	0.00	0.03	0.03	0.00	0.04	0.00	0.00	0.04
	Winter	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00
	Total	0.07	0.17	0.25	0.11	0.19	0.22	0.05	0.23
Juan Fernandez,White-necked Petrel	Spring	0.02	0.73	0.48	0.01	0.01	0.06	0.05	0.31
	Summer	1.51	2.33	0.97	0.16	0.00	-	-	-
	Fall	0.08	0.96	2.02	0.25	3.48	0.44	0.00	2.50
	Winter	0.12	0.11	0.20	0.23	0.23	0.44	0.00	0.00
	Total	1.63	4.13	3.67	0.65	3.72	0.94	0.05	2.81
Black-winged Petrel	Spring	0.02	0.19	0.20	0.15	0.00	0.00	0.00	0.04
	Summer	0.07	0.48	0.33	0.18	0.00	-	-	-
	Fall	0.44	0.71	1.39	0.35	1.32	0.50	0.00	0.12
	Winter	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00
	Total	0.55	1.40	1.94	0.70	1.32	0.50	0.00	0.16
Bulwer's Petrel	Spring	0.10	0.16	0.35	0.45	0.39	0.83	0.35	0.31
	Summer	0.07	0.18	0.17	0.04	0.10	-	-	-
	Fall	0.00	0.01	0.01	0.02	0.03	0.00	0.05	0.00
	Total	0.17	0.35	0.53	0.51	0.42	0.83	0.40	0.31
Leach's Storm Petrel	Spring	0.87	0.36	0.44	0.48	0.54	0.44	0.80	0.35
	Summer	0.05	0.00	0.01	0.01	0.01	-	-	-
	Fall	0.18	0.10	0.09	0.10	0.24	0.39	0.00	0.58
	Winter	0.36	0.18	0.08	0.46	0.34	0.22	0.20	0.04
	Total	1.46	0.64	0.62	1.05	1.13	1.05	1.00	0.97

Table 7.--Birds seen per 30 linear miles (55.6 km.) of observation at various wind directions.--Con.

Species	Season	Wind direction							
		N.	NE.	E.	SE.	S.	SW.	W.	NW.
		Number of birds							
Red-tailed Tropicbird	Spring	0.08	0.05	0.06	0.07	0.06	0.11	0.75	0.12
	Summer	0.02	0.08	0.06	0.00	0.01	-	-	-
	Fall	0.00	0.06	0.07	0.03	0.07	0.06	0.00	0.00
	Winter	0.02	0.02	0.01	0.00	0.01	0.00	0.00	0.00
	Total	0.12	0.21	0.20	0.10	0.15	0.17	0.75	0.12
White-tailed Tropicbird	Spring	0.02	0.01	0.03	0.01	0.01	0.06	0.00	0.12
	Summer	0.03	0.04	0.03	0.00	0.01	-	-	-
	Fall	0.00	0.01	0.02	0.00	0.01	0.00	0.10	0.00
	Winter	0.08	0.04	0.01	0.02	0.06	0.28	0.05	0.00
	Total	0.13	0.10	0.09	0.03	0.09	0.34	0.15	0.12
Great Frigatebird	Spring	0.13	0.02	0.05	0.15	0.10	0.17	0.30	0.12
	Summer	0.00	0.11	0.08	0.03	0.16	-	-	-
	Fall	0.11	0.04	0.05	0.00	0.14	0.11	0.30	0.00
	Winter	0.03	0.04	0.03	0.02	0.01	0.17	0.00	0.04
	Total	0.27	0.21	0.21	0.20	0.31	0.45	0.60	0.16
Sooty Tern	Spring	3.08	5.92	14.00	7.47	13.20	4.61	22.75	27.69
	Summer	11.61	8.74	4.74	0.22	0.11	-	-	-
	Fall	0.08	2.18	3.48	0.08	3.87	0.00	0.00	0.00
	Winter	6.13	2.14	3.27	6.40	3.72	4.50	1.70	0.04
	Total	20.90	18.98	25.49	14.17	20.90	9.11	24.45	27.73
Brown Noddy	Spring	0.00	0.14	2.77	3.27	2.93	0.00	0.00	1.00
	Summer	0.00	0.26	0.42	0.00	0.00	-	-	-
	Fall	0.00	0.01	0.36	0.00	0.00	0.00	18.05	0.00
	Winter	0.11	0.03	0.28	0.01	2.48	0.00	0.00	1.00
	Total	0.11	0.44	3.83	3.28	5.41	0.00	18.05	2.00
White Tern	Spring	0.10	0.04	0.04	0.03	0.28	0.11	0.05	0.04
	Summer	0.05	0.06	0.05	0.01	0.01	-	-	-
	Fall	0.31	0.07	0.02	0.08	0.04	0.00	0.00	0.00
	Winter	0.03	0.02	0.04	0.02	0.21	0.11	0.05	0.04
	Total	0.49	0.19	0.15	0.14	0.54	0.22	0.10	0.08
Number of environmental observations		N.	NE.	E.	SE.	S.	SW.	W.	NW.
	Spring	14	86	325	54	16	6	13	18
	Summer	8	107	160	7	1	0	0	0
	Fall	7	67	140	13	22	4	2	3
	Winter	32	76	85	28	32	8	5	5
	Total	61	336	710	102	71	18	20	26

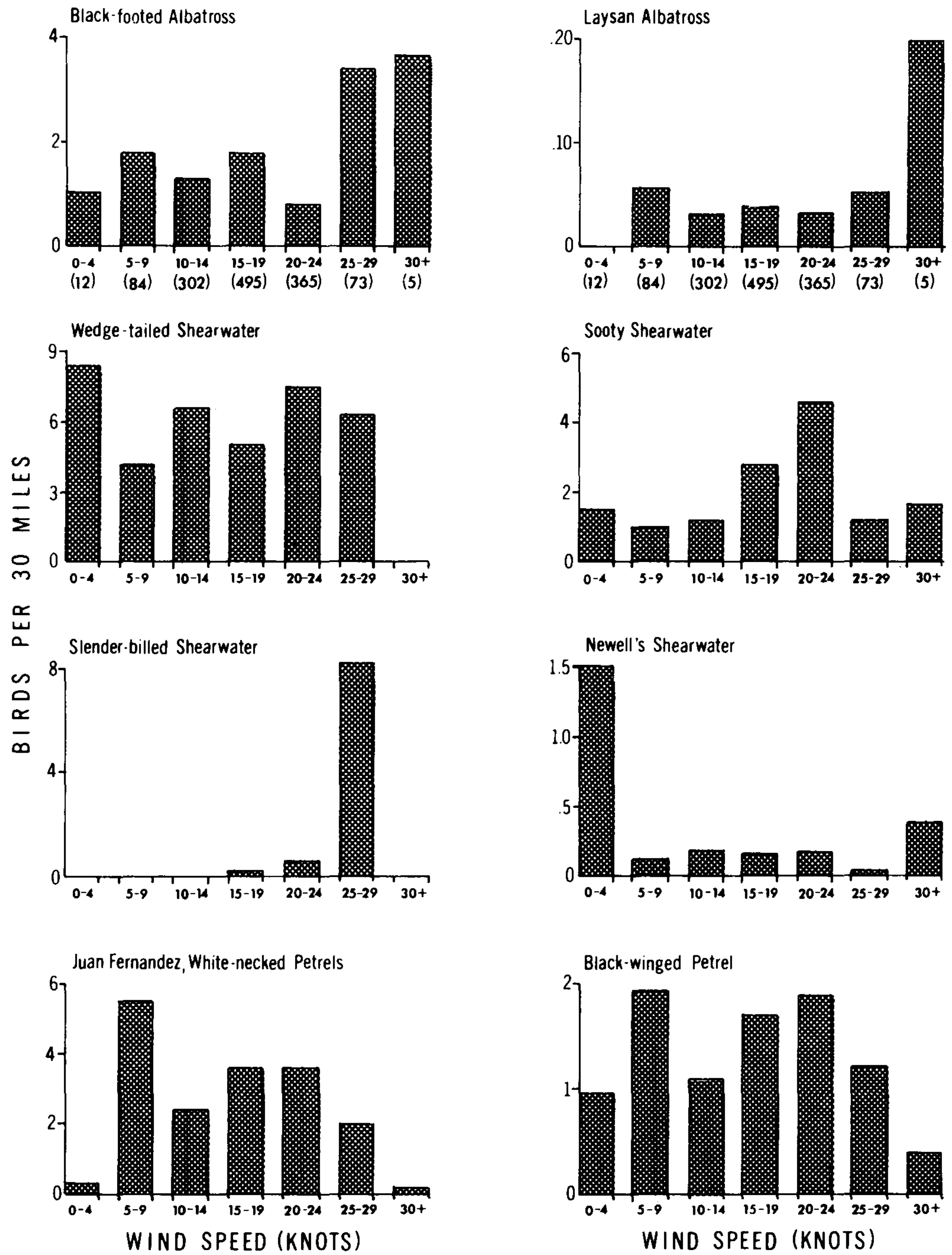


Figure 32.--Number of birds per 30 linear miles (55.6 km.) of observation at various wind speeds in increments of 4 knots (2 m. per second). The number of samples at each increment shown in parentheses below the upper figures applies to all figures.

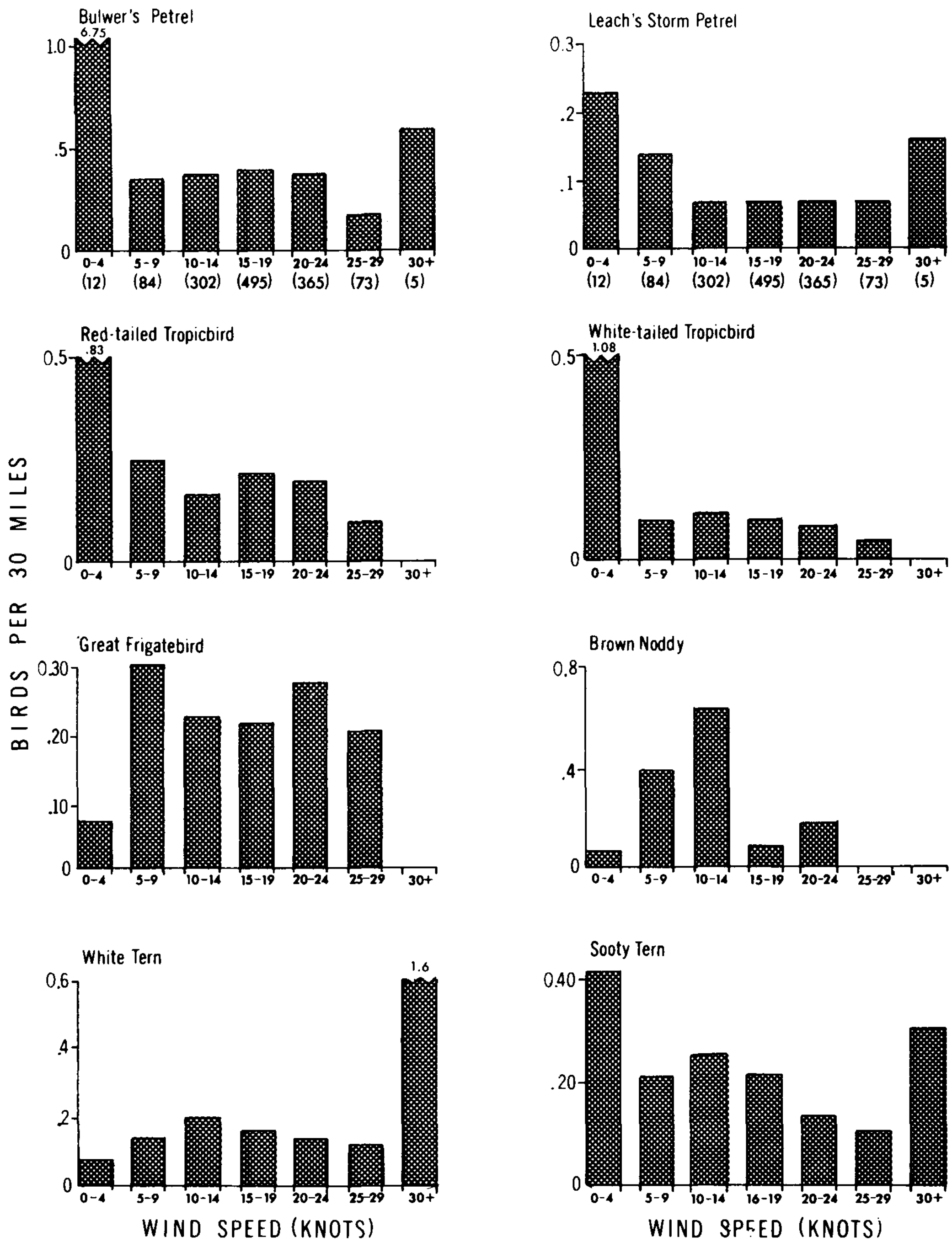


Figure 32.--Number of birds per 30 linear miles (55.6 km.) of observation at various wind speeds in increments of 4 knots (2 m. per second). The number of samples at each increment shown in parentheses below the upper figures applies to all figures.--Continued.

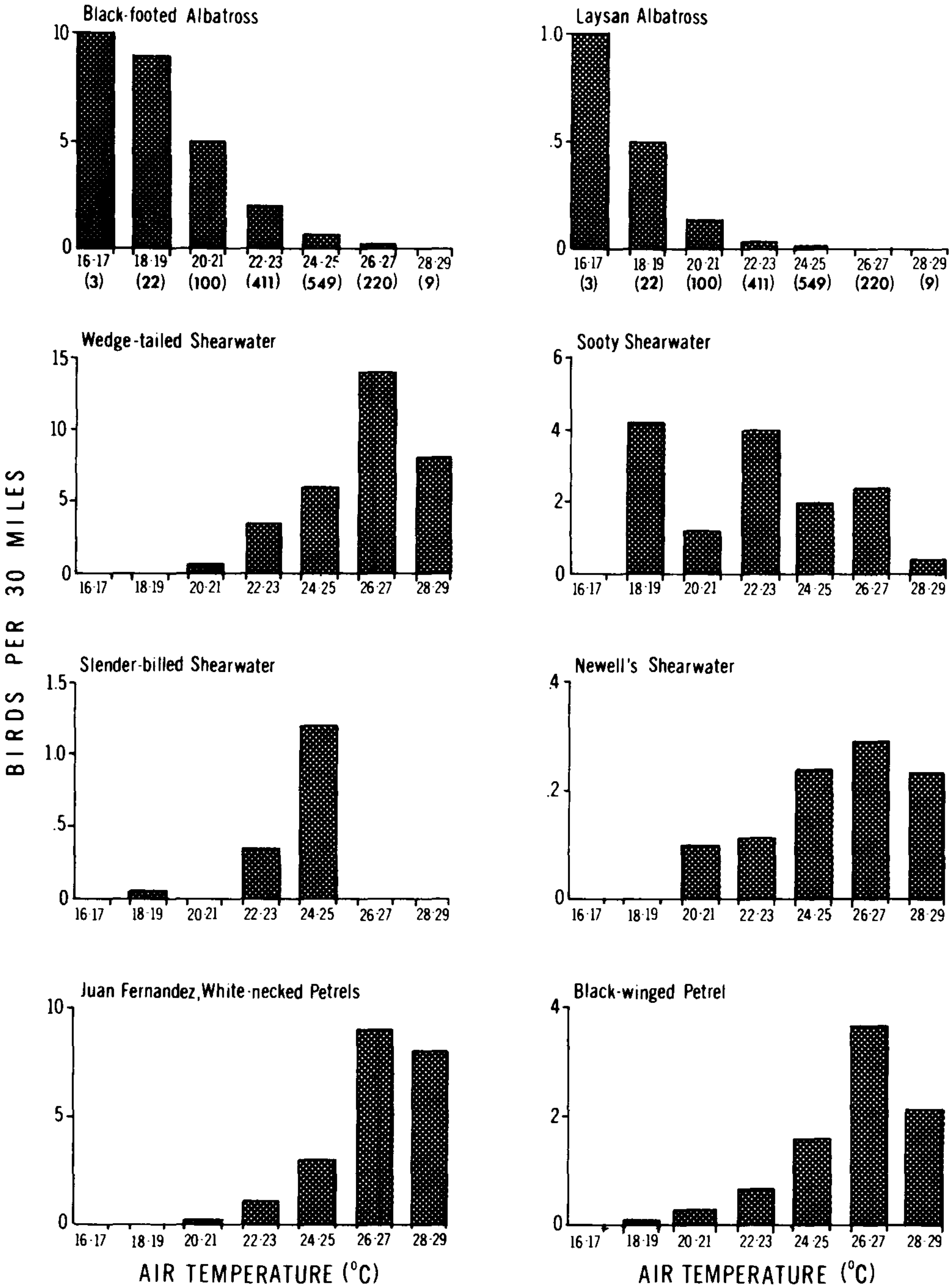


Figure 33.--Number of birds seen per 30 linear miles (55.6 km.) of observation at various air temperatures in increments of 2° C. The number of samples at each increment is in parentheses under the upper figures, but pertains to all figures.

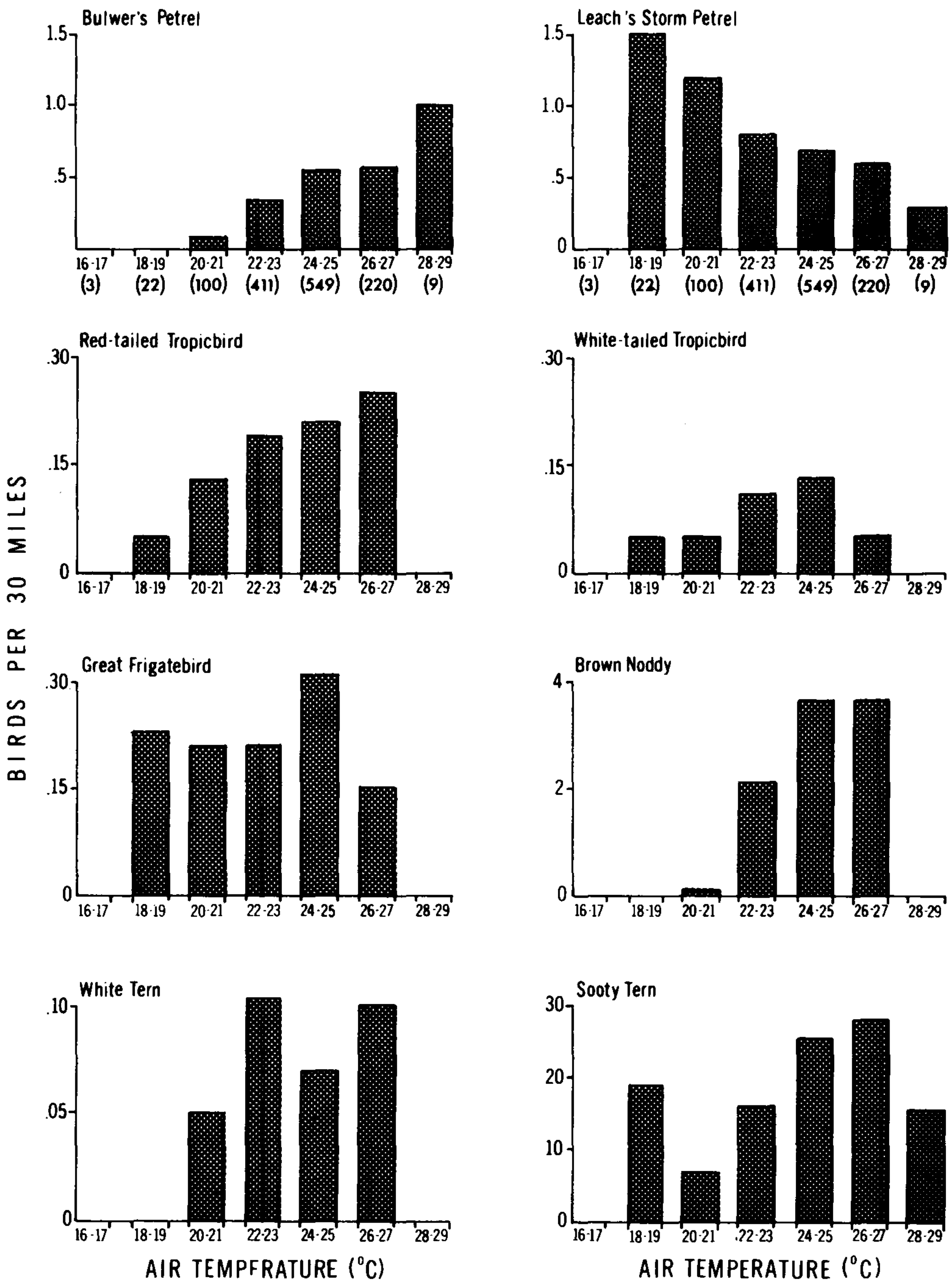


Figure 33.--Number of birds seen per 30 linear miles (55.6 km.) of observation at various air temperatures in increments of 2° C. The number of samples at each increment is in parentheses under the upper figures, but pertains to all figures.--Continued.

waiian island group, the Wedge-tailed Shearwater and Sooty Tern, as well as the two that winter in large numbers in the South Pacific, the Juan Fernandez and Black-winged Petrel. The "winterers" reach peak density in the fall at the southern end of the study area, whereas the breeders reach their peak density in the spring at the northern end.

Red-tailed Tropicbirds were associated with slightly warmer air on the average than were White-tailed Tropicbirds. Leach's Storm Petrels showed increasing densities at the lower temperatures and Bulwer's Petrels at the higher temperatures.

As would be expected for a direct migrant, Sooty Shearwaters showed no clearcut association with a particular temperature. The high density of Slender-billed Shearwaters at temperatures from 24° to 26° C. is undoubtedly a coincidence, reflecting the "wave" migration of this species (96 percent of all birds were observed in a 5-day period).

The relative randomness in the abundance of Great Frigatebirds and White Terns at different air temperatures is more difficult to explain. Possibly the sample size of species that show a spotty distribution and are in low abundance would have to be larger to show any clearcut association. A second possibility is that other conditions, environmental or otherwise, have an overriding effect on the distribution of these species.

The marked association that some species have with certain air temperatures suggest that air temperature may be a contributing factor in the north-south distribution of birds in the study area.

Surface water temperature.--Many species showed clear-cut associations with certain water temperatures (fig. 34). Albatrosses were seldom found over water warmer than 23° C., whereas Juan Fernandez Petrels, Black-winged Petrels, and dark-phase Wedge-tailed Shearwaters were seldom found over water colder than 23° C. Sooty Terns were most dense at 24° and 25°, and also at 27°, a reflection of their bimodal distribution discussed in the species accounts. In general, the species that were distributed predominantly in the north or the south of the study area showed associations with colder or warmer water, whereas the species that were distributed at random showed no particular temperature associations. These patterns would be expected since water temperature is directly related to latitude in the study area. Brown Noddy distribution was unchanged regardless of seasonal change of water temperature.

Surface salinity.--Sea bird densities at various salinity categories in increments of 0.30 p.p.t. (parts per thousand) showed several poorly defined patterns (table 8). The most notable were in the albatrosses, which tended to be most numerous over high-salinity water, and the wintering southern petrels--Juan Fernandez and Black-winged--which were generally in less saline water. These patterns undoubtedly reflect the difference in geographical ranges of these species, however, because the water was less saline toward the southern end of the study area than at the northern end. A much clearer picture is presented in the sea surface-temperature analysis, which is more directly a factor of latitude. From the present arbitrarily chosen set of increments it appears unlikely that surface salinity is a significant limiting factor in the distribution of sea birds in the study area.

From the data presented here it cannot be said that temperature actually limits distribution, but it is clear that relative densities of many sea birds are associated much more closely with air and surface water temperatures than with wind direction, wind speed, and surface salinity.

Flock Analysis

For this analysis a flock is regarded as a group of five or more birds acting as a unit. Flocks of direct migrants, e.g., Sooty Shearwaters or Golden Plovers, are excluded from consideration because they use airspace only. Exceptions are the few Sooty Shearwaters (53 of 3,725, or 1.4 percent) observed feeding in flocks. Included in the analysis are flocks of birds not observed feeding but which probably fed in the study area during the 24-hour period in which observations took place. This analysis deals with the abundance, distribution, composition, species participation and tendency to flock of 893 flocks.

Flock abundance.--Birds in flocks accounted for 69.5 percent of the total birds observed (table 9). The 3 months which fell substantially below this percentage--March 1964, November 1964, and April 1965--were months of heavy

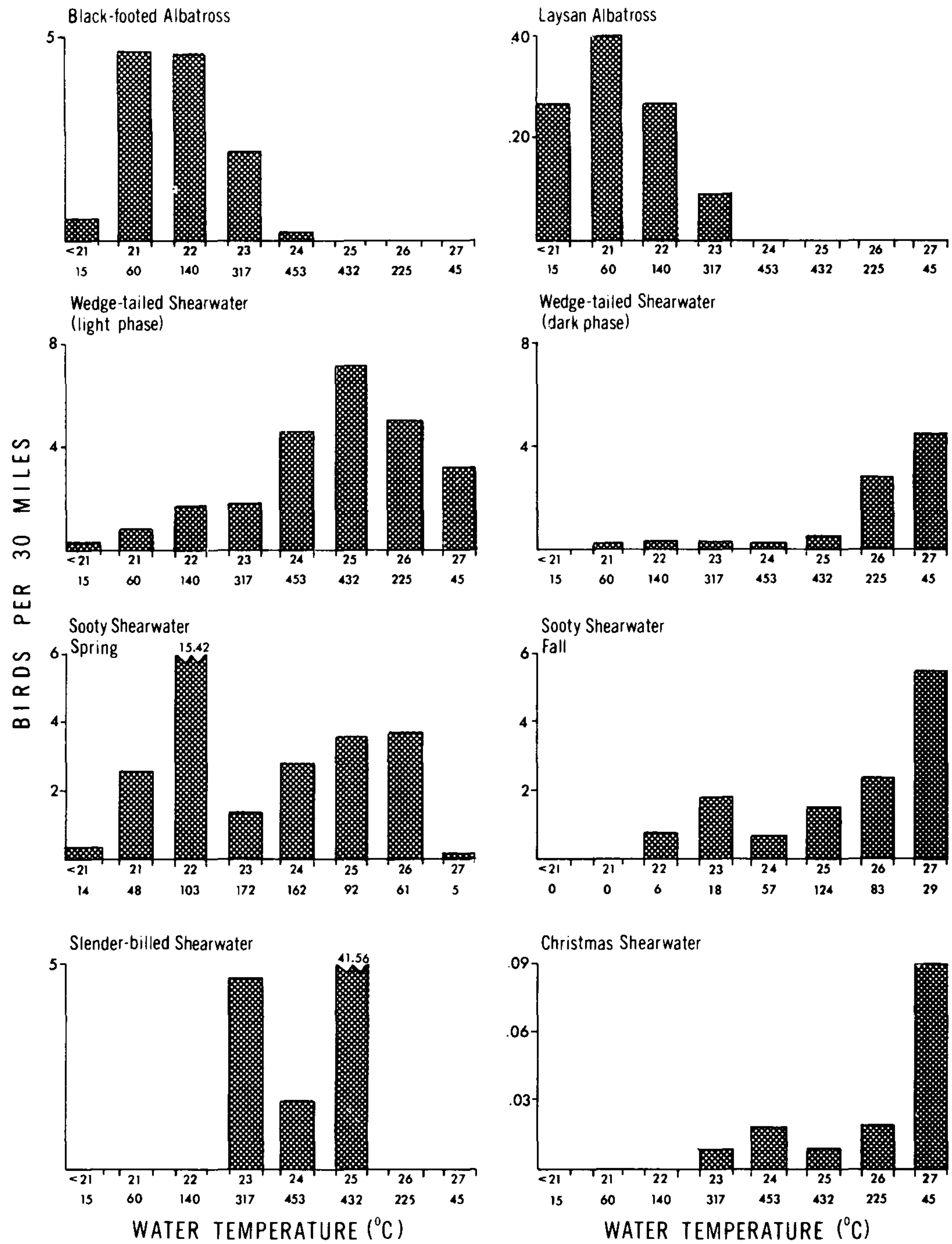


Figure 34.--Number of birds seen per 30 linear miles (55.6 km.) of observation at various water temperatures in increments of 1° C. The number of samples in each increment is given below the temperature.

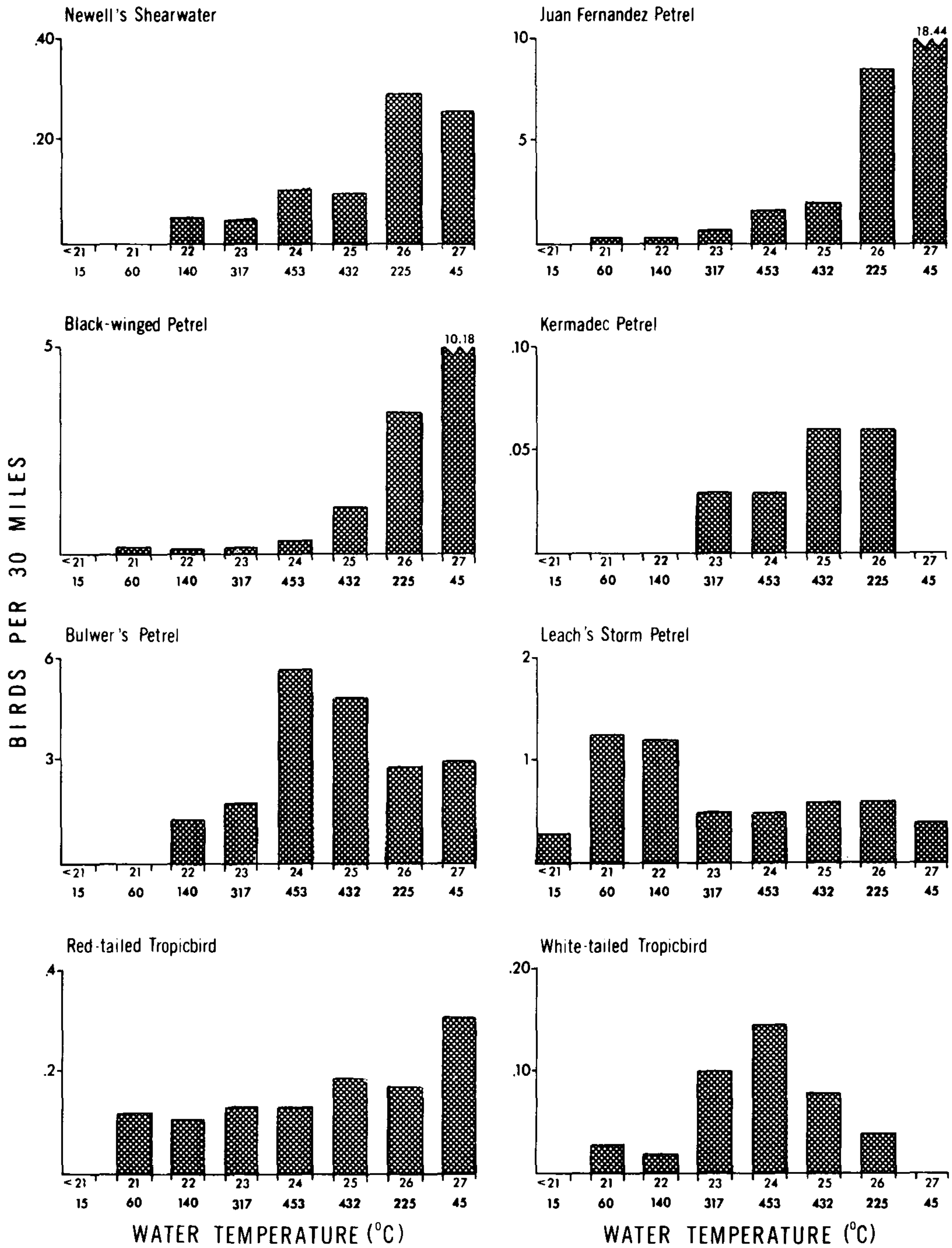


Figure 34.--Number of birds seen per 30 linear miles (55.6 km.) of observation at various water temperatures in increments of 1° C. The number of samples in each increment is given below the temperature.--Continued.

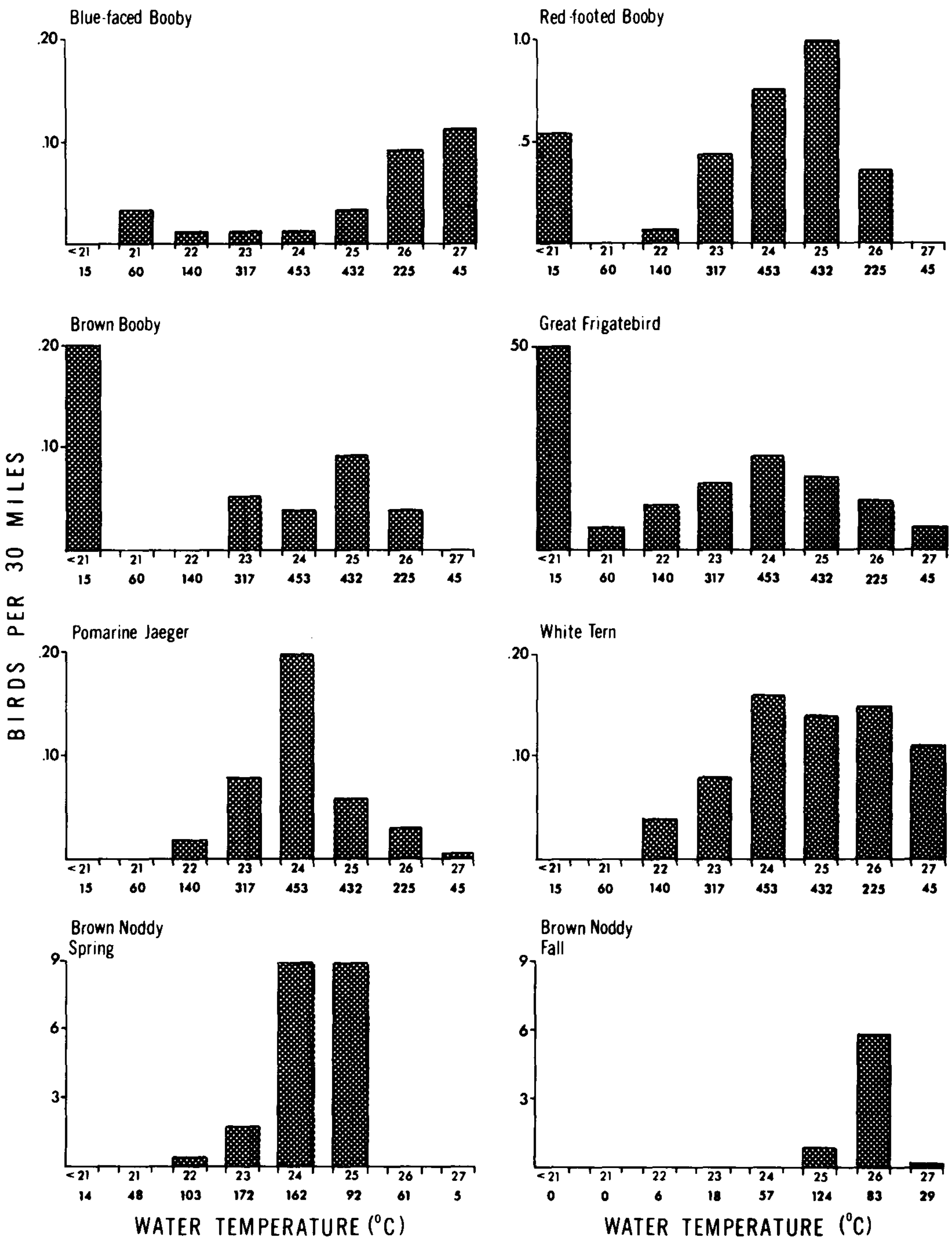


Figure 34.--Number of birds seen per 30 linear miles (55.6 km.) of observation at various water temperatures in increments of 1° C. The number of samples in each increment is given below the temperature.--Continued.

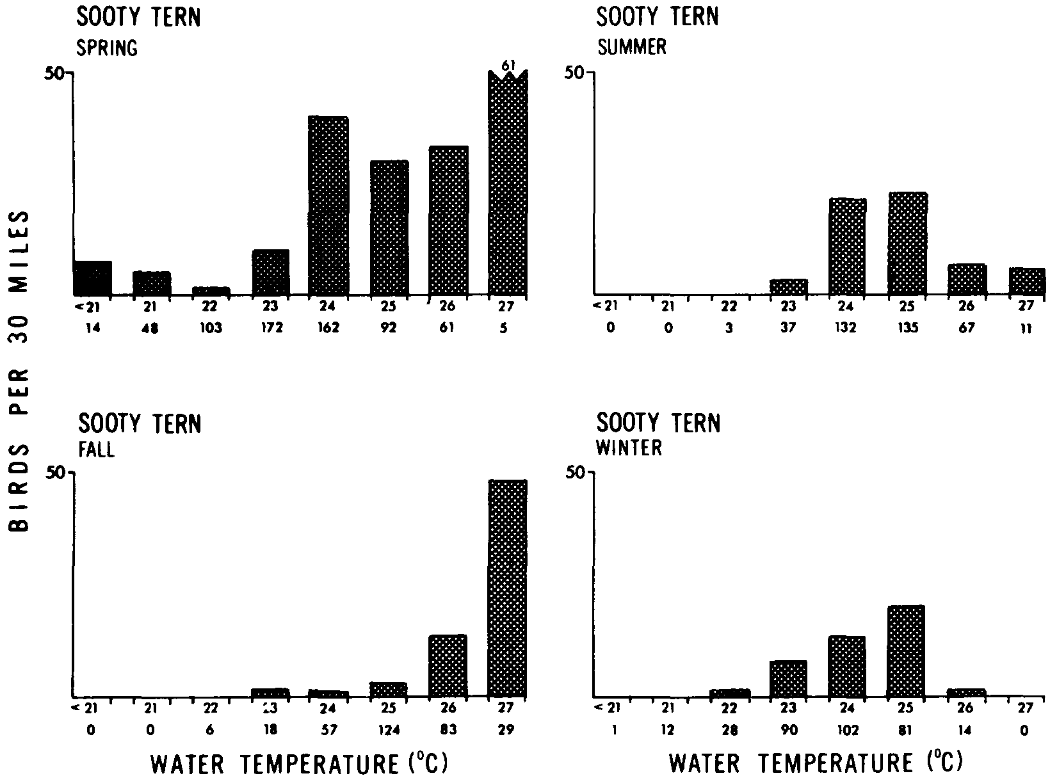


Figure 34.--Number of birds seen per 30 linear miles (55.6 km.) of observation at various water temperatures in increments of 1° C. The number of samples in each increment is given below the temperature.--Continued.

migration. The numbers of migrants increased the totals in these months and caused a decrease in the relative abundance of flocking birds.

The greatest numbers of birds in flocks were in May of both years. Sooty Terns, Wedge-tailed Shearwaters, and Brown Noddies feeding in the main Hawaiian area accounted for the large numbers. A high plateau was maintained from June to September, and a second peak was recorded in October. Numbers in flocks were lowest in November and December, when breeding activity was almost nil in the main Hawaiian area. In November 1964 the number of birds in flocks (925) was second lowest, and the mean number per flock (27.2) was lowest for the 15 months of the study. In December 1964 21 flocks had only 880 birds--the lowest monthly total recorded. Birds in flocks increased in January as Sooty Terns returned to the Hawaiian Islands and remained steady until May, when numbers reached a peak again.

Although the number of flocks observed in a month was highest (100) in June 1965, the mean number of birds per flock was low. In May of both years 87 flocks were seen, and the mean number of birds per flock in May 1965 (88.1) was the highest average in any month.

The largest single flock contained 955±300 birds. It was observed on May 31, 1965 about 50 miles north of Oahu.

Table 8.--Sea bird densities in birds per 30 linear miles (55.6 km.) of observation at various surface salinities in increments of 0.30 p.p.t. (parts per thousand)

Species	Period	Salinity (p.p.t.) 33.00 33.29	33.30 33.59	33.60 33.89	33.90 34.19	34.20 34.49	34.50 34.79	34.80 35.09	35.10 35.39	35.40 35.69
		Number of birds								
Black-footed Albatross	Spring	-	-	-	0.55	0.29	0.58	1.57	3.51	1.00
	Winter	-	-	0.00	0.81	0.35	1.39	14.48	16.09	0.00
Laysan Albatross	Spring	-	-	-	0.05	0.11	0.21	0.05	0.30	0.00
Wedge-tailed Shearwater	Spring	-	-	-	6.95	2.68	9.65	8.88	1.30	0.00
	Summer	-	-	5.89	3.85	7.51	6.99	7.53	2.69	0.67
	Fall	3.57	1.88	1.12	3.53	1.00	1.52	15.20	0.95	0.00
	Winter	-	-	3.18	0.33	0.23	0.88	0.58	0.24	0.00
Sooty Shearwater	Spring	-	-	-	1.45	3.58	2.08	1.69	19.14	0.00
	Fall	0.00	8.06	1.92	1.27	0.20	3.59	1.97	1.35	1.00
Slender-billed Shearwater	November	0.00	0.17	0.15	20.18	0.00	44.50	3.86	7.60	0.00
Christmas Shearwater	Total	0.00	0.00	0.03	0.03	0.02	0.01	0.01	0.01	0.00
Newell's Shearwater	Spring	-	-	-	0.14	0.14	0.26	0.55	0.15	0.00
	Summer	-	-	0.00	0.00	0.20	0.20	0.28	0.00	0.00
	Fall	0.14	0.12	0.10	0.03	0.00	0.04	0.19	0.09	0.15
	Winter	-	-	0.09	0.01	0.05	0.00	0.00	0.14	0.00
Juan Fernandez, White-necked Petrel	Spring	-	-	-	0.27	0.94	1.16	0.83	0.03	0.00
	Summer	-	-	12.89	3.25	1.83	4.62	7.40	0.27	0.33
	Fall	19.71	36.18	13.00	8.47	2.13	7.04	1.93	0.85	0.15
	Winter	-	-	3.45	1.40	0.41	0.33	0.16	0.09	0.00
Black-winged Petrel	Spring	-	-	-	0.05	0.38	0.55	0.19	0.02	0.00
	Summer	-	-	0.78	2.20	4.46	1.08	1.88	0.31	0.00
	Fall	1.29	13.59	8.39	10.93	3.27	4.59	2.52	1.67	2.08
	Winter	-	-	0.27	0.11	0.01	0.04	0.06	0.07	0.00
Kermadec Petrel	Total	0.43	0.06	0.10	0.03	0.07	0.03	0.02	0.03	0.00
Bulwer's Petrel	Spring	-	-	-	1.64	0.56	0.48	1.36	0.15	0.00
	Summer	-	-	0.11	0.05	0.54	0.45	1.13	0.46	1.33
	Fall	0.00	0.00	0.04	0.07	0.07	0.00	0.11	0.00	0.00
Leach's Storm Petrel	Spring	-	-	-	1.73	0.95	0.84	1.38	1.13	1.00
	Summer	-	-	0.00	0.05	0.00	0.02	0.04	0.08	0.00
	Fall	1.86	0.94	1.06	0.60	0.27	0.26	0.22	0.47	0.54
	Winter	-	-	0.64	0.78	0.94	0.71	0.28	0.38	0.00
Red-tailed Tropicbird	Spring	-	-	-	0.27	0.12	0.11	0.15	0.30	0.00
	Summer	-	-	0.00	0.05	0.37	0.17	0.14	0.31	0.67
	Fall	0.00	0.47	0.14	0.17	0.40	0.37	0.26	0.22	0.23
	Winter	-	-	0.09	0.03	0.04	0.16	0.04	0.00	0.00
White-tailed Tropicbird	Spring	-	-	-	0.05	0.09	0.07	0.16	0.06	0.00
	Summer	-	-	0.00	0.00	0.20	0.08	0.08	0.08	0.00
	Fall	0.00	0.00	0.00	0.03	0.07	0.07	0.11	0.05	0.15
	Winter	-	-	0.00	0.02	0.16	0.18	0.18	0.07	0.00
Blue-faced Booby	Winter	-	-	0.00	0.02	0.03	0.05	0.04	0.02	0.00
Great Frigatebird	Spring	-	-	-	0.18	0.14	0.24	0.17	0.08	0.00
	Summer	-	-	0.00	0.00	0.27	0.35	0.40	0.04	0.00
	Fall	0.00	0.00	0.12	0.13	0.07	0.22	0.33	0.24	0.38
	Winter	-	-	0.18	0.07	0.13	0.10	0.34	0.07	0.00
Sooty Tern	Spring	-	-	-	29.18	12.99	31.51	29.49	16.16	0.00
	Summer	-	-	1.22	4.15	8.20	18.66	46.60	19.27	0.67
	Fall	6.43	51.41	25.61	12.97	15.40	13.04	3.56	0.04	0.08
	Winter	-	-	9.09	8.60	19.36	19.90	20.08	0.07	0.00

Table 8.--Sea bird densities in birds per 30 linear miles (55.6 km.) of observation at various surface salinities in increments of 0.30 p.p.t. (parts per thousand).--Con.

Species	Period	Salinity (p.p.t.)								
		33.00 33.29	33.30 33.59	33.60 33.89	33.90 34.19	34.20 34.49	34.50 34.79	34.80 35.09	35.10 35.39	35.40 35.69
		Number of birds								
Brown Noddy	Spring	-	-	-	11.27	0.43	8.74	1.87	0.03	0.00
	Summer	-	-	0.00	0.00	0.00	0.33	4.60	0.00	0.00
	Fall	0.00	0.00	0.02	0.00	0.00	0.00	6.99	0.04	0.00
	Winter	-	-	0.00	0.00	0.15	0.63	6.14	0.00	0.00
White Tern	Spring	-	-	-	0.50	0.18	0.08	0.01	0.07	0.00
	Summer	-	-	0.00	0.00	0.17	0.19	0.28	0.12	0.00
	Fall	0.00	0.18	0.08	0.57	0.27	0.11	0.08	0.00	0.00
	Winter	-	-	0.18	0.04	0.31	0.31	0.04	0.00	0.00
Number of environmental observations										
	Spring	0	0	0	22	185	237	195	88	1
	Summer	0	0	9	20	41	169	72	26	3
	Fall	7	17	49	30	15	27	88	55	13
	Winter	0	0	11	90	80	51	50	45	1
	Total	7	17	69	162	321	484	405	214	18

Table 9.--Monthly abundance and size of flocks

Date	Flocks	Total birds in flocks	Mean per flock	Percentage of total birds
1964	Number	Number	Number	Percent
March	31	1,237	39.9	35.5
April	27	2,188	81.0	65.3
May	87	4,917	56.5	79.1
June	58	3,397	58.6	75.9
July	69	3,932	57.0	78.3
September	52	2,612	50.2	63.8
October	86	4,354	50.6	67.0
November	34	925	27.2	34.6
December	21	880	41.9	64.3
1965				
January	42	2,551	60.7	86.2
February	63	1,907	30.3	78.0
March	58	3,142	54.2	76.3
April	78	2,255	28.9	55.4
May	87	7,661	88.1	83.4
June	100	3,638	36.4	65.1
Total	893	45,596		
Mean	59.5	3,039.7	51.1	69.5

Flock distribution.--Almost all months showed two pronounced density centers--one within 50 miles of the main Hawaiian islands and the other at the southern end of the study area, usually in the southeastern corner (fig. 35a-d).

The density center near the Hawaiian Islands was absent in November and December, and the southern density center was lacking in May 1965 (but not May 1964, when it was probably most pronounced). In addition, secondary density centers developed during some months, usually in the area between the two main centers or at the northwestern corner. Only in July 1964 were flocks of any size seen in the northeastern corner. In all other months this area was devoid of flocks, or nearly so.

Flock composition.--Sooty Terns dominated the composition of flocks in the study area in all months except September 1964 (fig. 36). Wedge-tailed Shearwaters were second most abundant in flocks. These two species accounted for over three-quarters of all birds in flocks. Although both species were most abundant in the main Hawaiian island area, both were well represented in more pelagic flocks too, especially in the southern center of flock density. Noddies and boobies were in the flocks near

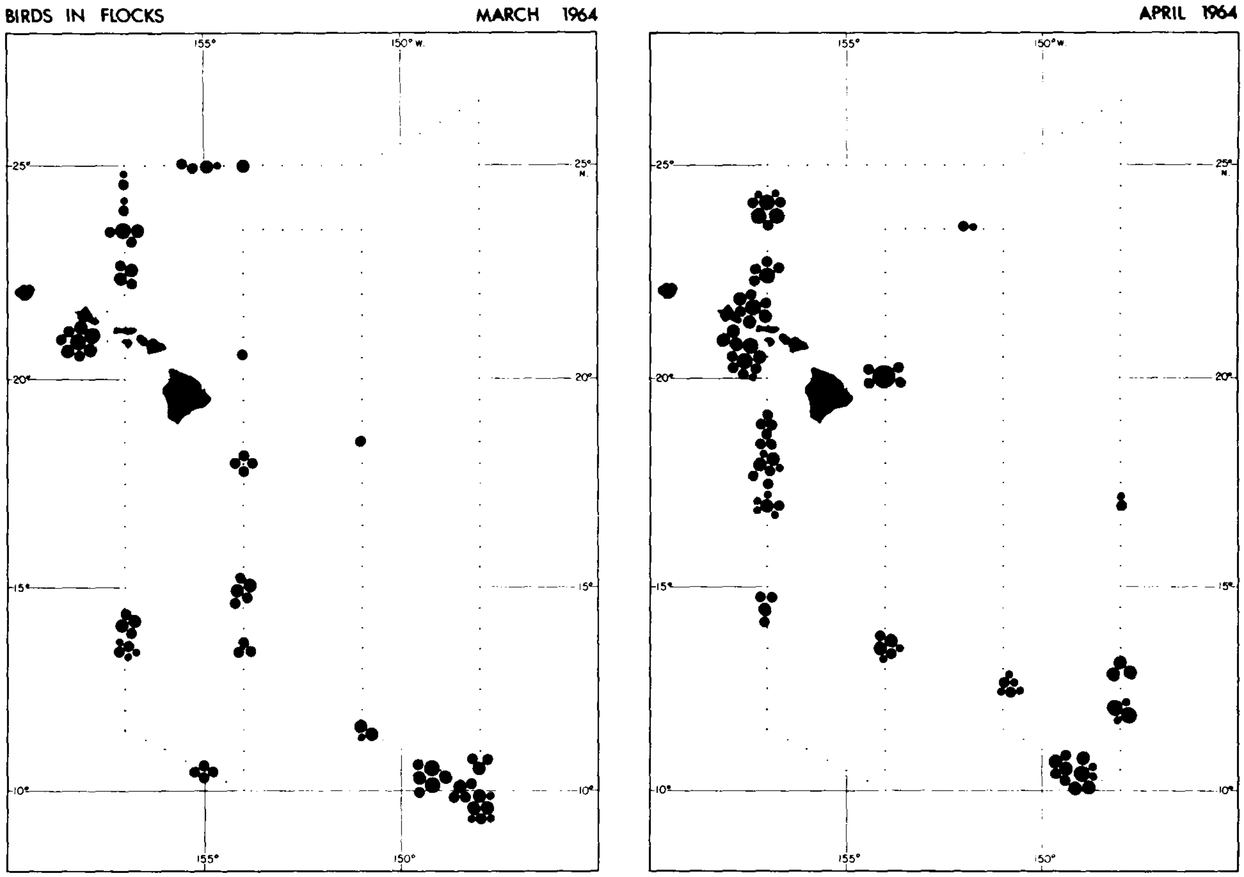


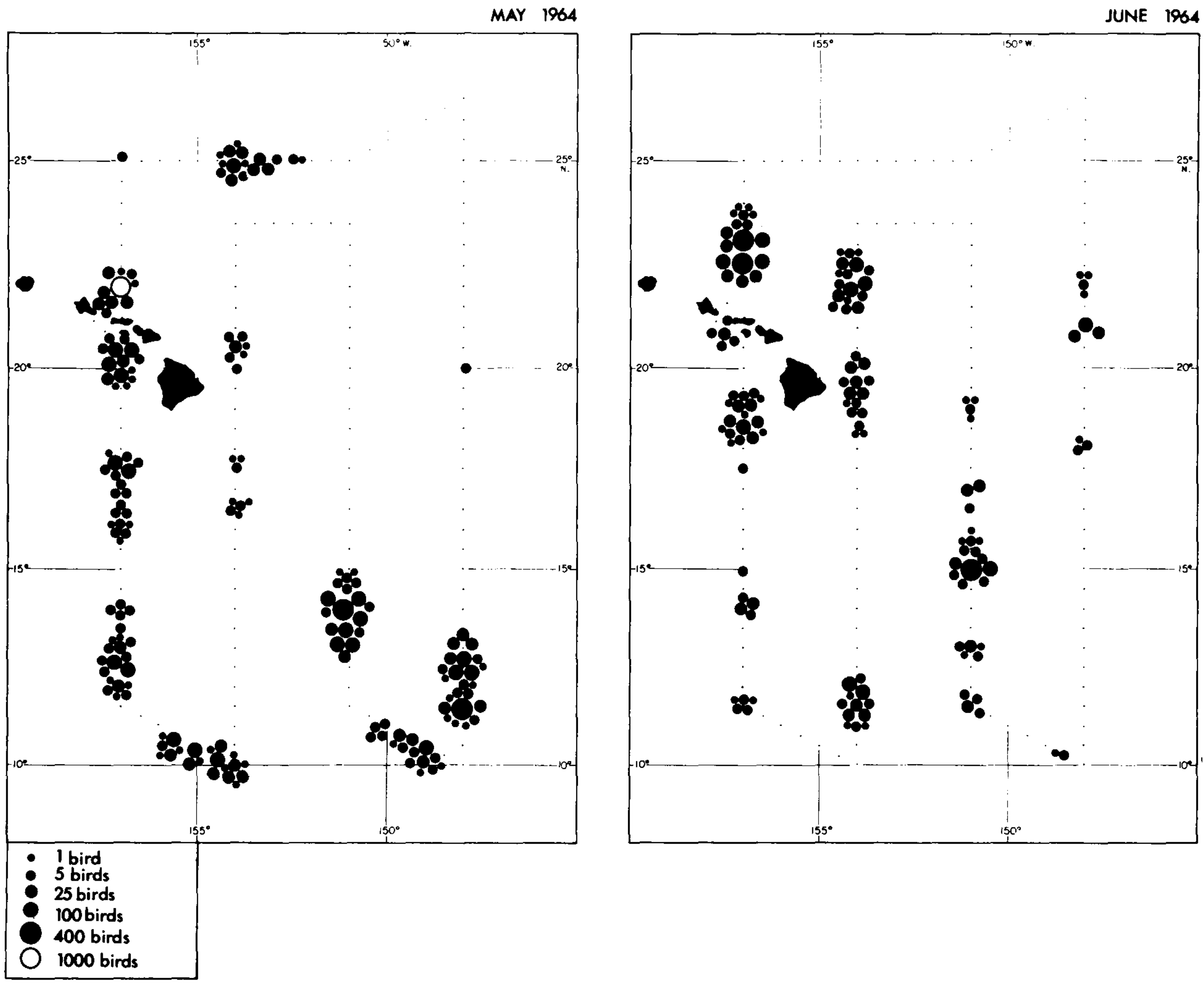
Figure 35a.--Distribution of birds in flocks, March-June 1964.

the main Hawaiian islands where they were fairly abundant. Juan Fernandez Petrels and Black-winged Petrels were found most frequently in flocks in the southern end of the study area.

The following species were also observed in mixed or pure flocks but their numbers never accounted for more than 1 percent of total numbers of birds in flocks for any one month:

Kermadec Petrel
Phoenix Petrel
Bulwer's Petrel
Pink-footed Shearwater
Newell's Shearwater
Sooty Shearwater
Christmas Shearwater
Leach's Storm Petrel
Red-tailed Tropicbird
White-tailed Tropicbird
Great Frigatebird
Pomarine Jaeger
Long-tailed Jaeger
Skua
Blue-gray Noddy
Black Noddy
White Tern

Flock participation.--Sooty Terns participated in 76.0 percent of all flocks--considerably more than the next closest species, Wedge-tailed Shearwater (39.0 percent, table 10). No other species participated in more than one-quarter of all flocks. Wedge-tailed Shearwaters were the second-most-abundant birds in flocks, although they had a lower tendency to flock than did the Sooty Tern. Their presence most of the year in the area increased their relative flock participation over Brown Noddies, which were restricted geographically, and Juan Fernandez



Petrels, which were somewhat restricted phenologically.

Flocking tendency.--Among regularly observed species Sooty Terns exhibited the greatest tendency to flock (table 11). Brown Noddies tended to flock nearly as frequently, although only around the main Hawaiian islands. Juan Fernandez Petrels showed an almost equally strong tendency in a more pelagic situation. Of interest was the relatively high flocking tendency of White Terns and Great Frigatebirds.

These figures express, first of all, the feeding patterns of the various species. Those species or species groups which tend to feed in a solitary manner--e.g., Leach's Storm Petrel, Bulwer's Petrel, and tropicbirds--demonstrate a relatively low percentage of participation in flocks, whereas those that feed collectively show relatively high percentages. The selec-

Table 10.--Participation by species or species groups in 893 bird flocks in the study area

Species	Flocks	Participation
	Number	Percent
Sooty Tern	679	76.0
Wedge-tailed Shearwater	348	39.0
Other shearwaters or petrels	219	24.5
Juan Fernandez Petrel	207	23.2
Boobies	110	12.3
Brown Noddy	100	11.2
Great Frigatebird	80	9.0
White Tern	79	8.8
Black-winged Petrel	72	8.1

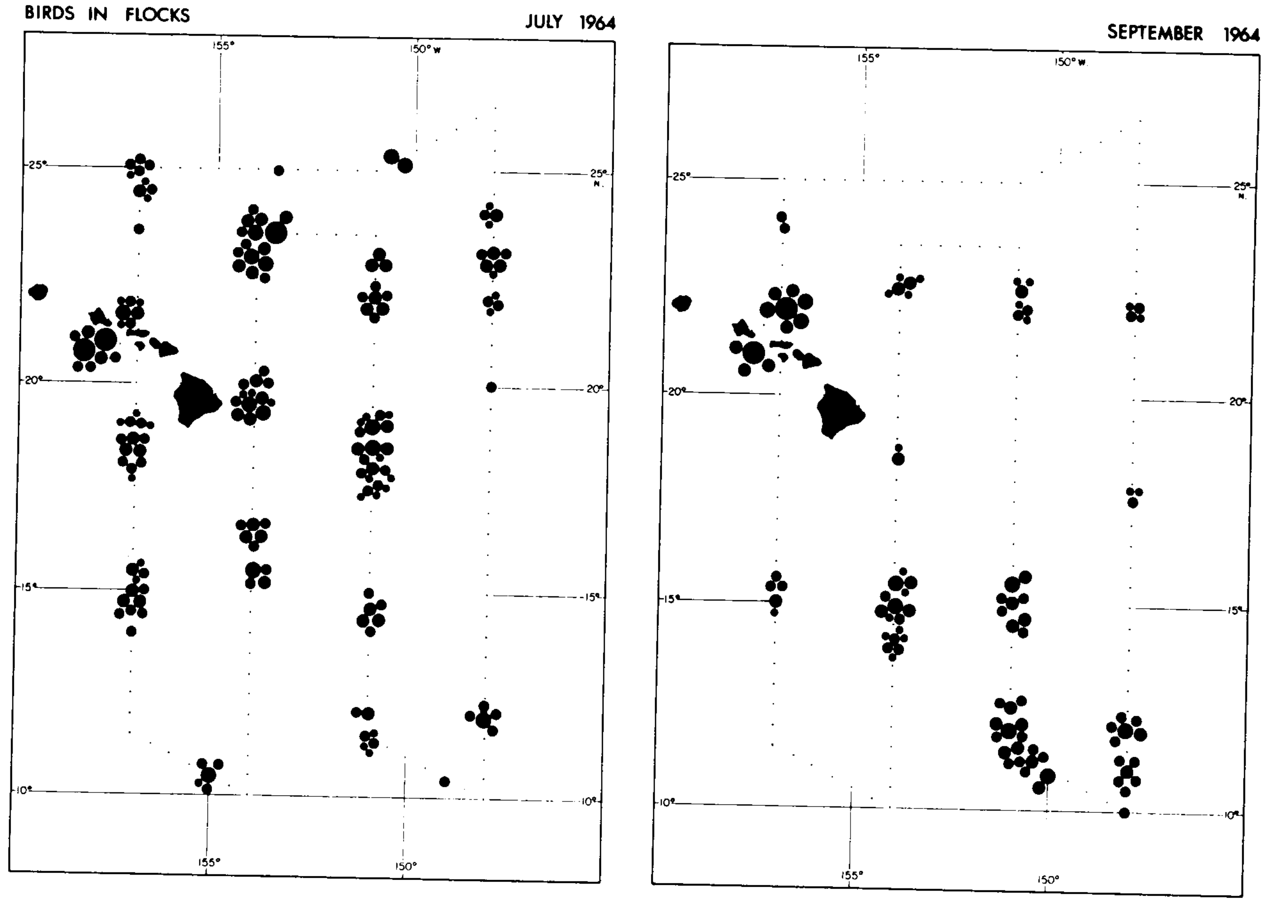


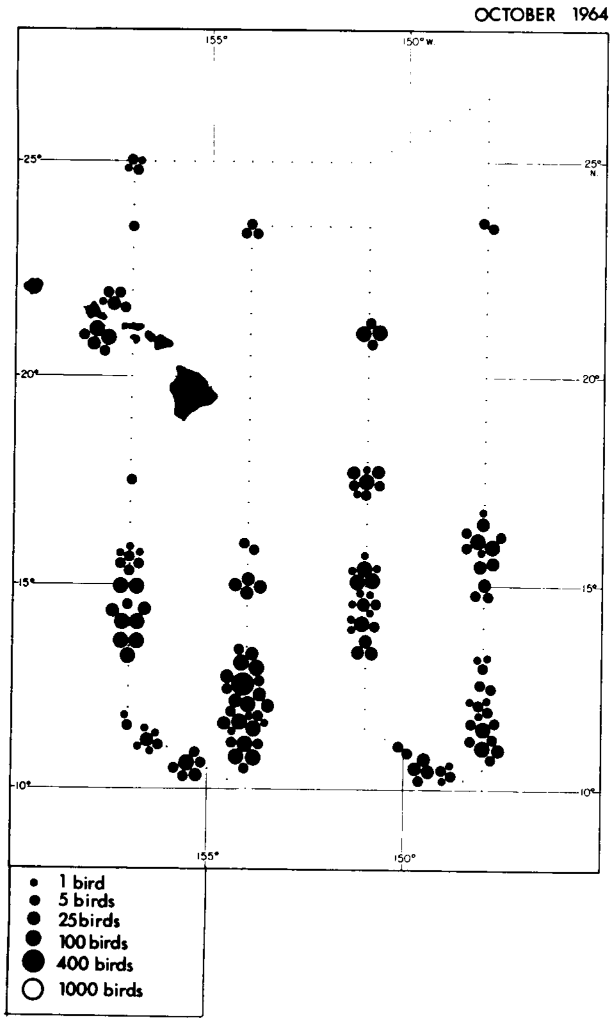
Figure 35b.--Distribution of birds in flocks, July-November 1964.

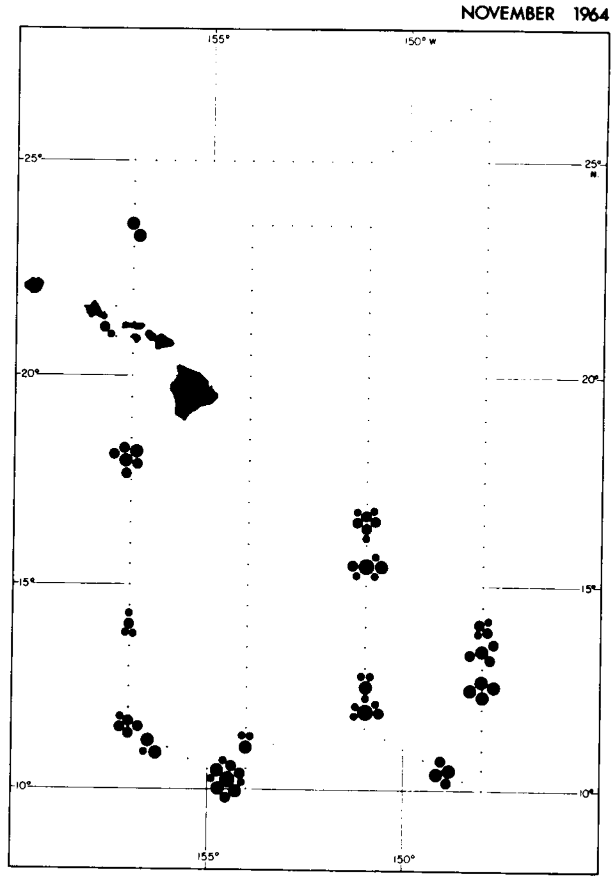
tive advantage of flock feeding, e.g., many eyes to spot food and a larger area under surveillance, is partially counterbalanced by the necessity for sharing the food supply, once found, because of intraflock competition.

A low flocking tendency index may also be the result of direct migration through the area, e.g., Sooty Shearwater, so that even though this species feeds in large flocks in its breeding and nonbreeding ranges, the marginal attraction of an unaccustomed food supply is usually more than outweighed by the migration tendency.

Thus, flocking tendency provides a measure of species utilization of the area. The fact that 83.3 percent of Juan Fernandez Petrels and only 1.4 percent of Sooty Shearwaters were in flocks suggest that Juan Fernandez Petrels were resident in the area for part of the year, and that Sooty Shearwaters were not.

No account can be taken of nocturnal feeding behavior, since all observations were made between sunrise and sunset. It is presumed that nocturnal feeding by some, if not all, species is considerable, and that it may exceed diurnal feeding (see Gould, 1967).


OCTOBER 1964
155°
150° W.
25°
25° N.
20°
15°
10°
155°
150°
1 bird
5 birds
25 birds
100 birds
400 birds
1000 birds


NOVEMBER 1964
155°
150° W
25°
25° N.
20°
15°
10°
155°
150°

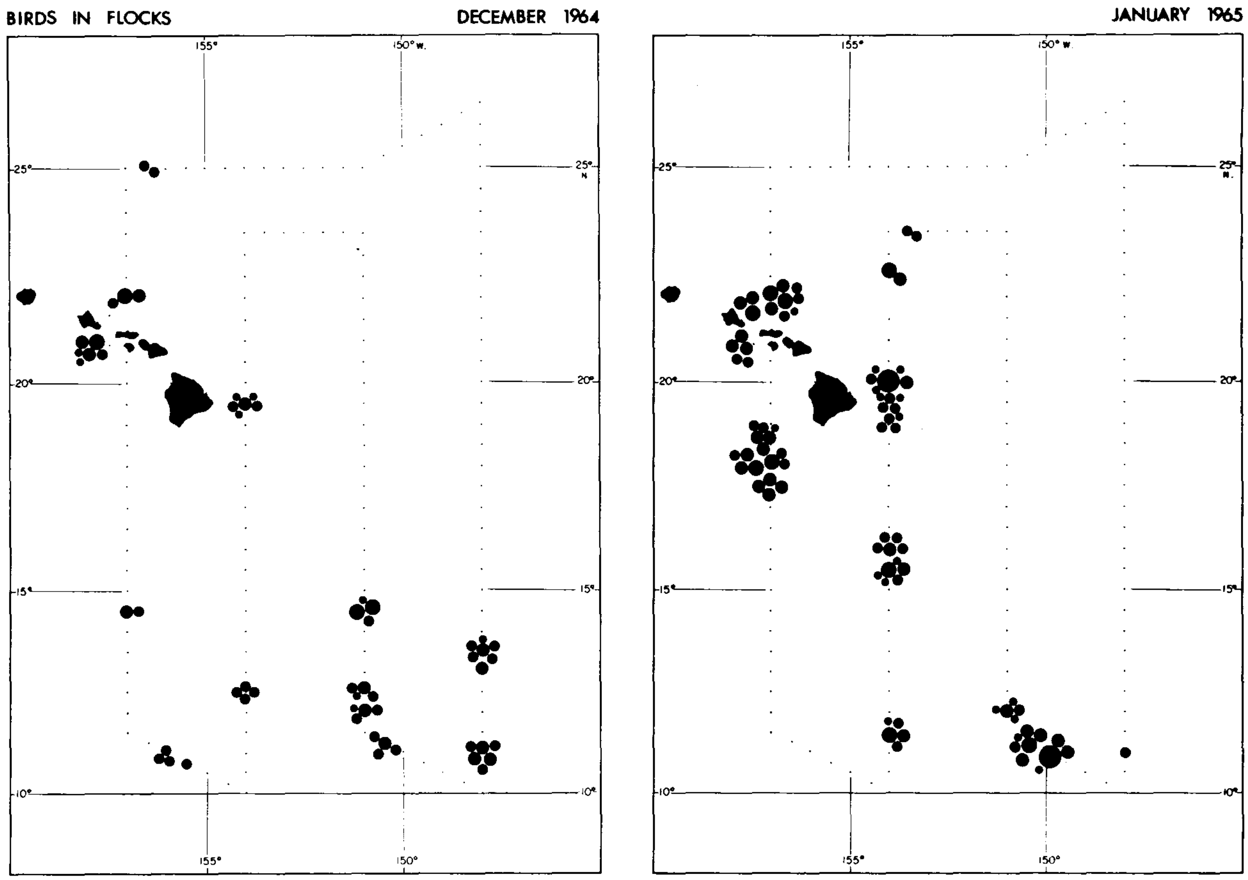
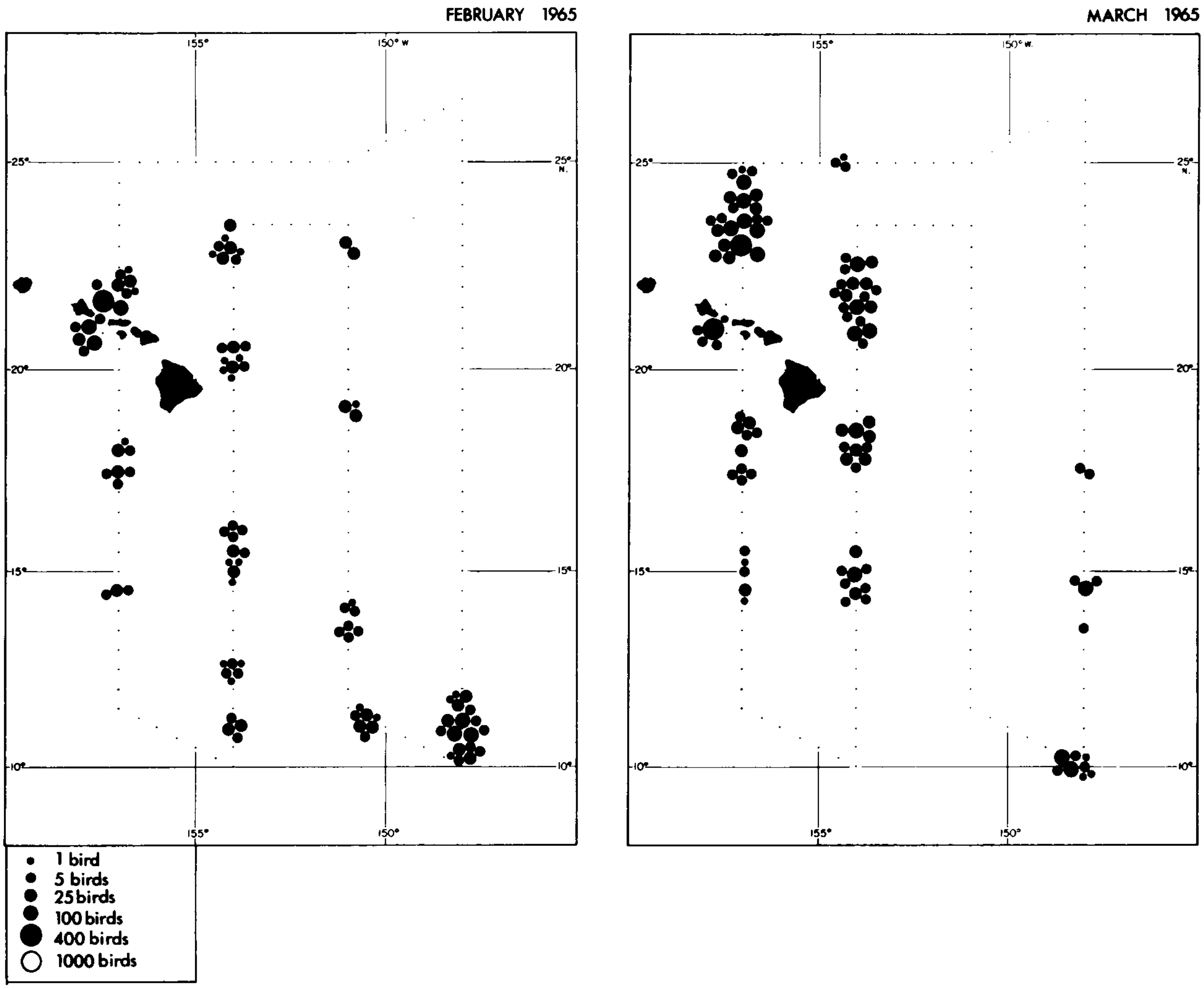


Figure 35c.--Distribution of birds in flocks, December 1964 to March 1965.


FEBRUARY 1965
MARCH 1965
155°
150° W
25°
20°
15°
10°
1 bird
5 birds
25 birds
100 birds
400 birds
1000 birds

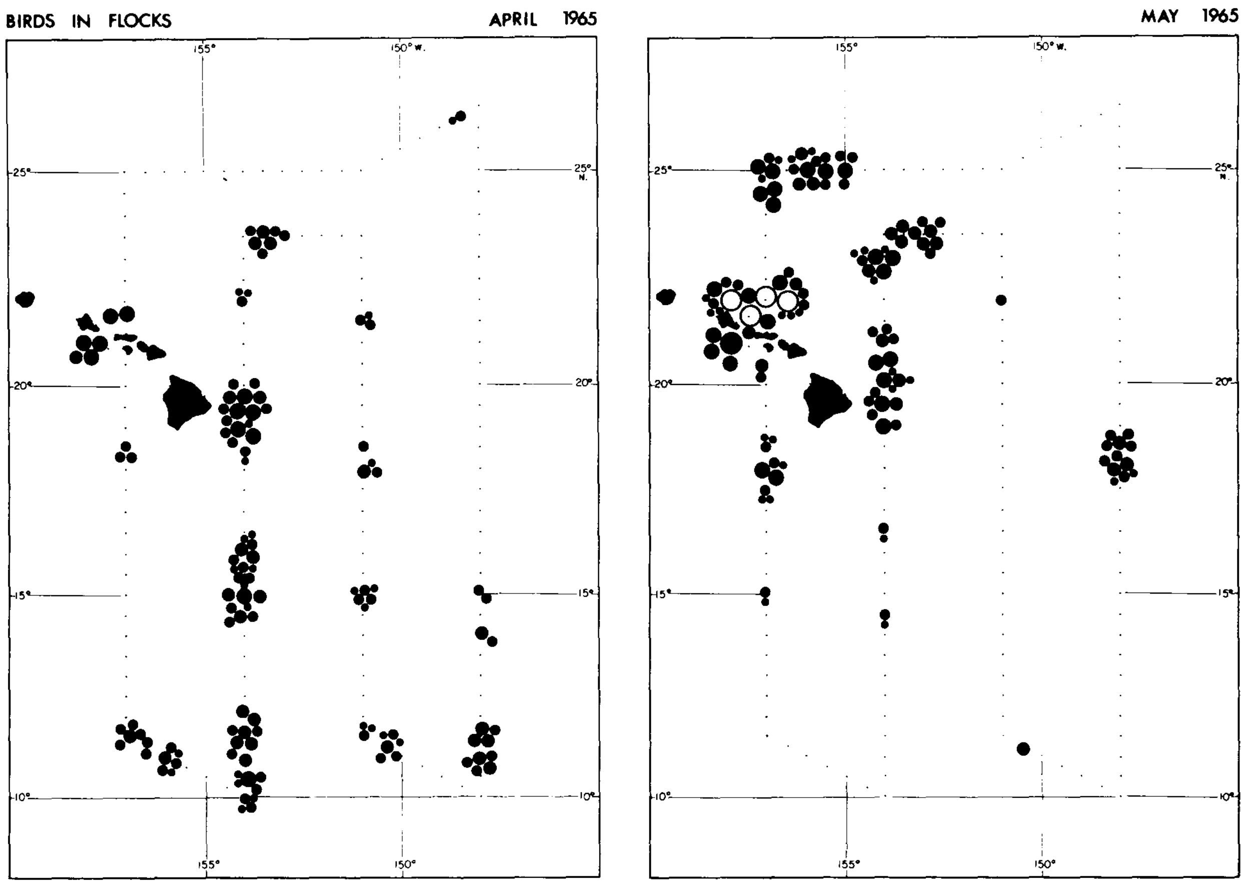


Figure 35d.--Distribution of birds in flocks, April-June 1965.

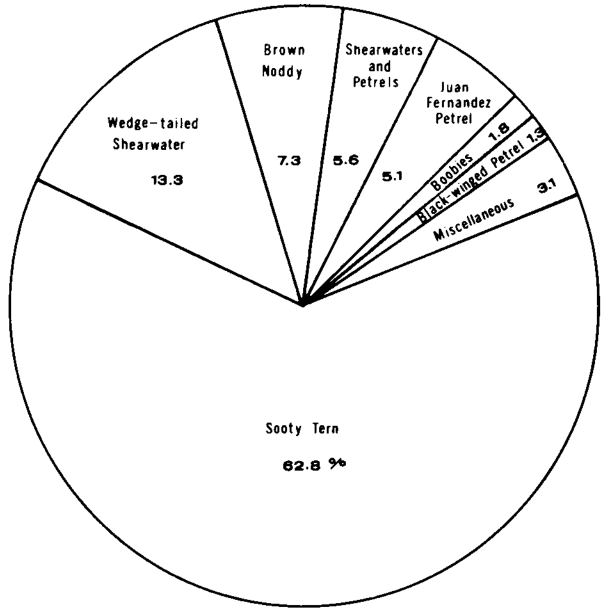


Figure 36.--Relative abundance of species or species groups found in flocks, averaged over 15 months.

Table 11.--Flocking tendency by species or species group

Species or group	Total birds	Birds in flocks	Percentage in flocks
	Number	Number	Percent
Sooty Tern	30,802	28,625	92.9
Wedge-tailed Shearwater	8,733	5,941	68.0
Brown Noddy	3,937	3,344	84.9
Sooty Shearwater	3,725	53	1.4
Juan Fernandez Petrel	2,766	2,303	83.3
Black-winged Petrel	2,061	594	28.8
Boobies	1,209	817	67.6
Leach's Storm Petrel	1,050	64	6.1
Bulwer's Petrel	624	58	9.3
Black Noddy	435	420	96.6
Tropicbirds	413	19	4.6
Great Frigatebird	304	124	40.8
Newell's Shearwater	267	44	16.5
White Tern	227	152	67.0
Jaegers	184	41	22.3
Kermadec Petrel	66	18	27.3

SUMMARY

The avifauna of the study area was composed of birds breeding in the North Pacific (Alaska and Siberia: 13 species) and the South Pacific (New Zealand, Australia, and South America: 15 species), in addition to those breeding in the nearby Hawaiian group or other island groups of the central Pacific (23 species). In general, breeding species of the Hawaiian area were most abundant from March to September, direct migrants were most abundant from March to May and October to November, and wintering birds from May to November with a peak in October.

Analysis of the distribution of birds with respect to their distance from nearest land showed that birds breeding in the main Hawaiian group were most abundant within 50 miles of land, although many were seen as far as 700 miles from land. Sooty Terns and Wedge-tailed Shearwaters were most abundant up to 200 miles from land, and again at 700 miles from land. Direct migrants showed no land-orientation. Wintering birds were most abundant farthest from land.

Birds were not distributed at random in the study area. The area within 50 miles of the main Hawaiian islands consistently maintained the highest sea bird densities. The southern end of the area (between lat. 10° and 12° N.) also maintained high densities even though it was farthest from land. Density was consistently low in the northeastern portion of the area. High density near the main Hawaiian islands was a result of concentrations of sea birds (primarily Sooty Terns, Brown Noddies, and Wedge-tailed Shearwaters) on islets off the main Hawaiian islands during the breeding season, March-November. High density at the southern end was apparently due to the attraction of birds to an area where cooler, subsurface, food-rich water domes came close to the surface. The estimated average total population of all species on any day was: 466,320 birds in spring (March-May); 419,750 in summer (June-August); 410,640 in fall (September-November); and 260,880 birds in winter (December-February).

Taking into account the estimated number of sea birds in the study area, their body weights, and the percentage of their weights that they consume daily, the birds consume 7,386.6 metric tons of fish, squid, and other marine organisms annually.

Sooty Tern was the most abundant species, followed in order of decreasing abundance by Wedge-tailed Shearwater, Sooty Shearwater, Brown Noddy, Juan Fernandez Petrel, Leach's Storm Petrel, Black-winged Petrel, and Slender-billed Shearwater.

Analysis of the direction of movement of sea birds in the study area showed that almost all direct migrants headed north or northwest in the spring, and south or southeast in the fall. Wintering species flew mainly west in the spring and south in the fall. The direction of movement of the main Hawaiian group was away from breeding islands in the morning and toward them in the evening.

The relative abundance of sea birds at each hour after sunrise and before sunset showed that most species were more active in the early morning or at noon, and again shortly before sunset. As would be expected of birds that scavenge behind ships regularly, albatrosses

were most active when meals were being served on board ship.

The number of birds associated with each of several categories of water surface salinity, surface temperature, air temperature, wind speed, and wind direction, suggests associations between certain species and certain environmental conditions. Albatrosses and Leach's Storm Petrels were most abundant at low air and water temperatures. Wedge-tailed Shearwaters were most abundant at a water temperature of 25° C. (light-phase) or 27° C. (dark-phase); Juan Fernandez and Black-winged Petrels increased in abundance as air and water became warmer. Sooty Terns were most abundant between 23° and 27° C. air and water temperatures. Data on sea bird numbers at various wind speeds, wind directions, and surface salinities showed only weak associations, suggesting that these environmental influences do not play a significant role in delimiting sea bird distribution in the study area.

The composition, size, and distribution of 893 flocks were analyzed. Seventy percent of all birds observed were seen in flocks. Sooty Terns had the strongest flocking tendency. Ninety-three percent of all Sooty Terns were in flocks, and 76 percent of all flocks contained Sooty Terns.

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APPENDIX TABLES

Appendix table 1.--Birds and other animals observed in the study area and their ADP numerical equivalents

007000	Porpoise	
007007	Whale	
010000	Sea turtle	
100000	Bird	
121000	Albatross	Diomedeidae
121110	Black-footed Albatross	*Diomedea nigripes*
121111	Laysan Albatross	*Diomedea immutabilis*
121112	Black-browed Albatross	*Diomedea melanophris*
122000	Shearwater-petrel	Procellariidae
122101	Fulmar	*Fulmarus glacialis*
122500	Shearwater	*Puffinus* sp.
122501	Pale-footed Shearwater	*Puffinus carneipes*
122504	Pink-footed Shearwater	*Puffinus creatopus*
122510	Wedge-tailed Shearwater	*Puffinus pacificus*
122518	New Zealand Shearwater	*Puffinus bulleri*
122519	Sooty Shearwater	*Puffinus griseus*
122520	Slender-billed Shearwater	*Puffinus tenuirostris*
122521	Christmas Shearwater	*Puffinus nativitatis*
122524	Newell's Shearwater	*Puffinus puffinus*
122600	Petrel	*Pterodroma* sp.
122601	Capped Petrel	*Pterodroma hasitata* supersp.
122606	Dark-rumped Petrel	*Pterodroma phaeopygia*
122608	Juan Fernandez Petrel	*Pterodroma externa externa*
122609	White-necked Petrel	*Pterodroma externa cervicalis*
122615	Solander's Petrel	*Pterodroma solandri*
122624	Mottled Petrel	*Pterodroma inexpectata*
122629	Bonin or Black-winged Petrel	*Pterodroma hypoleuca*
122630	Bonin Petrel	*Pterodroma hypoleuca hypoleuca*
122631	Black-winged Petrel	*Pterodroma hypoleuca nigripennis*
122633	Kermadec Petrel	*Pterodroma neglecta*
122636	Phoenix Petrel	*Pterodroma alba*
122642	Herald Petrel	*Pterodroma arminjoniana heraldica*
122653	White-winged Petrel	*Pterodroma leucoptera*
122701	Bulwer's Petrel	*Bulweria bulwerii*
123000	Storm Petrel	Hydrobatidae
123409	Leach's Storm Petrel	*Oceanodroma leucorhoa*
123419	Sooty Storm Petrel	*Oceanodroma tristrami*
123423	Fork-tailed Storm Petrel	*Oceanodroma furcata*

Appendix table 1.--Birds and other animals observed in the study area and their ADP numerical equivalents.--Continued

131100	Tropicbird	Phaethontidae
131106	Red-tailed Tropicbird	Phaethon rubricauda
131112	White-tailed Tropicbird	Phaethon lepturus
133200	Booby	Sulidae
133206	Blue-faced Booby	Sula dactylatra
133213	Red-footed Booby	Sula sula
133217	Brown Booby	Sula leucogaster
136107	Great Frigatebird	Fregata minor
141000	Shore bird	Charadriiformes
141209	Golden Plover	Pluvialis dominica
141401	Ruddy Turnstone	Arenaria interpres
142101	Bristle-thighed Curlew	Numenius tahitiensis
142201	Wandering Tattler	Heteroscelus incanum
142700	Sanderling	Crocethia alba
143000	Phalarope	Phalaropodidae
144100	Jaeger	Stercorariidae
144101	Pomarine Jaeger	Stercorarius pomarinus
144103	Long-tailed Jaeger	Stercorarius longicaudus
144201	Skua	Catharacta skua
145100	Gull	Larinae
145184	Glaucous-winged Gull	Larus glaucescens
146000	Tern	Sterninae
146100	Noddy	Anous sp.
146101	Brown Noddy	Anous stolidus
146110	Black Noddy	Anous tenuirostris
146201	Blue-gray Noddy	Procelsterna cerulea
146301	White Tern	Gygis alba
146835	Arctic Tern	Sterna paradisaea
146866	Gray-backed Tern	Sterna lunata
146867	Sooty Tern	Sterna fuscata
190000	Non sea bird	

Appendix table 2.--Daily data summaries. Identification is the ADP-coded species name. Quantity is the total number of birds of a species seen in a day; incidents are the number of sightings of that species in a day. Noon location is expressed in octant, degrees and minutes latitude, degrees and minutes longitude. Octant 1 is the area within lat. 0°-90° N. and long. 90° W.-180°. The initial digit of longitudes 100° or greater is omitted, hence if longitude is 5740, read 157°40'. Hours are the duration of observations; miles are the nautical miles traveled during observations. Ship 6 is the *Townsend Cromwell*.

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
03 16 64	007000	1	.2	.02	1	1 2100 5740	4.1	50	2	6
	007007	3	.7	.06	3					
	122000	1	.2	.02	1					
	122510	1	.2	.02	1					
	122524	6	1.4	.12	2					
	133200	7	1.7	.14	1					
	133213	10	2.4	.20	7					
	144101	21	5.1	.42	13					
	146101	3	.7	.06	2					
	146867	304	74.1	6.08	18					
03 17 64	010003	1	.1	.01	1	1 1817 5701	12.0	110	2	6
	100000	1	.1	.01	1					
	122000	2	.1	.01	2					
	122510	1	.1	.01	1					
	122524	1	.1	.01	1					
	122600	3	.2	.02	2					
	122601	3	.2	.02	2					
	122630	2	.1	.01	2					
	123409	2	.1	.01	2					
	131100	2	.1	.01	1					
	141000	1	.1	.01	1					
	146867	14	1.1	.12	7					
03 18 64	122000	1	.1	.01	1	1 1423 5704	12.0	137	2	6
	122500	3	.2	.02	3					
	122510	10	.8	.07	1					
	122518	1	.1	.01	1					
	123409	2	.1	.01	2					
	131106	7	.5	.05	5					
	144100	1	.1	.01	1					
	146867	63	5.2	.45	4					
03 19 64	122000	2	.1	.01	2	1 1128 5549	11.9	129	2	6
	122500	2	.1	.01	2					
	122510	2	.1	.01	2					
	122519	5	.4	.03	4					
	122521	1	.1	.01	1					
	122631	2	.1	.01	2					
	123409	4	.3	.03	4					
	131106	2	.1	.01	2					
	144100	1	.1	.01	1					
	146101	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	20	1.6	.15	1					
03 20 64	007007	4	.3	.03	1	1 1351 5359	12.3	122	2	6
	122000	1	.1	.01	1					
	122500	8	.6	.06	8					
	122510	6	.4	.04	5					
	122519	13	1.0	.10	8					
	122524	1	.1	.01	1					
	122701	2	.1	.01	2					
	123000	2	.1	.01	2					
	123409	6	.4	.04	6					
	131100	2	.1	.01	1					
	146867	85	6.9	.69	5					
03 21 64	100000	1	.1	.01	1	1 1756 5401	12.3	123	2	6
	121111	1	.1	.01	1					
	122000	5	.4	.04	3					
	122500	10	.8	.08	6					
	122510	19	1.5	.15	13					
	122519	7	.5	.05	7					
	122524	1	.1	.01	1					
	122600	2	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
03 21 64	122601	1	.1	.01	1	1 1756 5401	12.3	123	2	6
	122701	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	9	.7	.07	7					
	131106	2	.1	.01	2					
	136107	2	.1	.01	2					
	146867	16	1.3	.13	1					
03 22 64	121110	59	4.8	.59	12	1 2002 5440	12.1	99	2	6
	122000	4	.3	.04	2					
	122500	14	1.1	.14	8					
	122510	5	.4	.05	5					
	122519	20	1.6	.20	13					
	122600	1	.1	.01	1					
	122701	2	.1	.02	2					
	123409	1	.1	.01	1					
	131106	2	.1	.02	2					
	131112	1	.1	.01	1					
	143000	4	.3	.04	1					
	144101	2	.1	.02	1					
	145100	1	.1	.01	1					
	146000	2	.1	.02	1					
	146100	22	1.8	.22	3					
	146101	1	.1	.01	1					
	146110	1	.1	.01	1					
	146867	5	.4	.05	1					
03 23 64	121110	29	2.4	.23	7	1 2330 5353	12.0	124	2	6
	122000	3	.2	.02	2					
	122500	1	.1	.01	1					
	122510	2	.1	.01	2					
	122519	4	.3	.03	4					
	122601	1	.1	.01	1					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	143000	1	.1	.01	1					
	146867	10	.8	.08	4					
03 24 64	121000	1	.1	.01	1	1 2203 5057	12.2	127	2	6
	121110	16	1.3	.12	7					
	122000	4	.3	.03	4					
	122519	1	.1	.01	1					
	123409	1	.1	.01	1					
	131100	1	.1	.01	1					
	136107	1	.1	.01	1					
03 25 64	121110	1	.1	.01	1	1 1813 5101	12.2	112	2	6
	122500	1	.1	.01	1					
	122510	7	.5	.06	5					
	123409	2	.1	.01	2					
	131100	2	.1	.01	2					
	131112	1	.1	.01	1					
	143000	1	.1	.01	1					
	146867	6	.4	.05	2					
03 26 64	122000	4	.3	.02	4	1 1417 5101	12.2	138	2	6
	122500	6	.4	.04	4					
	122510	4	.3	.02	2					
	122519	2	.1	.01	2					
	122701	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	3	.2	.02	3					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	143000	3	.2	.02	2					
	146301	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
03 26 64	146867	2	.1	.01	1	1 1417 5101	12.2	138	2	6
03 27 64	121111	1	.1	.00	1	1 1130 5104	12.2	0	2	6
	122000	10	.8	.00	8					
	122500	11	.9	.00	2					
	122510	7	.5	.00	6					
	122519	10	.8	.00	6					
	122521	1	.1	.00	1					
	122524	1	.1	.00	1					
	122601	2	.1	.00	2					
	122701	1	.1	.00	1					
	123000	1	.1	.00	1					
	123409	1	.1	.00	1					
	131130	1	.1	.00	1					
	131106	2	.1	.00	2					
	133206	2	.1	.00	2					
	146867	41	3.3	.00	2					
03 28 64	122000	16	1.3	.14	10	1 1010 4816	12.2	111	2	6
	122500	6	.4	.05	3					
	122510	20	1.6	.18	11					
	122519	8	.6	.07	6					
	122524	2	.1	.01	2					
	122630	6	.4	.05	6					
	122601	4	.3	.03	4					
	122608	5	.4	.04	4					
	123000	8	.6	.07	8					
	123409	12	.9	.10	9					
	133206	3	.2	.02	3					
	143000	1	.1	.01	1					
	146867	390	31.9	3.51	4					
03 29 64	121000	1	.1	.01	1	1 1315 4759	12.2	129	2	6
	122000	10	.8	.07	9					
	122500	2	.1	.01	2					
	122510	3	.2	.02	3					
	122519	9	.7	.06	7					
	122524	1	.1	.01	1					
	122600	5	.4	.03	4					
	122609	1	.1	.01	1					
	122630	1	.1	.01	1					
	122701	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	4	.3	.03	4					
	143000	3	.2	.02	3					
	146867	1	.1	.01	1					
03 30 64	122000	5	.4	.04	3	1 1702 4801	12.3	115	2	6
	122510	1	.1	.01	1					
	122519	24	1.9	.20	22					
	122601	1	.1	.01	1					
	122608	1	.1	.01	1					
	123409	1	.1	.01	1					
	143000	1	.1	.01	1					
03 31 64	121111	1	.1	.01	1	1 2041 4758	12.3	123	2	6
	122000	1	.1	.01	1					
	122519	18	1.4	.14	18					
	123000	4	.3	.03	4					
	123409	2	.1	.01	2					
04 01 64	121110	3	.2	.02	3	1 2440 4800	12.3	122	2	6
	121111	1	.1	.01	1					
	122000	2	.1	.01	2					
	122519	17	1.3	.13	12					
	123409	1	.1	.01	1					
	143000	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
04 02 64	121110	23	1.8	.20	5	1 2531 5001	12.5	113	2	6
	121111	3	.2	.02	3					
	122000	4	.3	.03	3					
	122500	2	.1	.01	2					
	122519	186	14.8	1.64	109					
	122631	1	.1	.01	1					
	122701	1	.1	.01	1					
	123409	7	.5	.06	6					
	123419	1	.1	.01	1					
	131106	1	.1	.01	1					
	141000	3	.2	.02	3					
	143000	5	.4	.04	5					
	146867	1	.1	.01	1					
04 03 64	087000	25	1.9	.17	1	1 2459 5401	12.6	140	2	6
	121110	2	.1	.01	2					
	122000	5	.3	.03	3					
	122510	2	.1	.01	2					
	122519	1333	105.7	9.52	135					
	123000	1	.1	.01	1					
	123409	2	.1	.01	2					
	131104	1	.1	.01	1					
	136107	1	.1	.01	1					
	141000	3	.2	.02	3					
	143000	4	.3	.02	3					
	146867	76	6.0	.54	11					
04 04 64	087007	8	.6	.06	1	1 2325 5700	12.5	121	2	6
	100000	1	.1	.01	1					
	121110	119	9.5	.98	8					
	121111	12	.9	.09	7					
	122000	3	.2	.02	2					
	122500	1	.1	.01	1					
	122510	25	2.0	.20	14					
	122519	1	.1	.01	1					
	131106	1	.1	.01	1					
	144101	1	.1	.01	1					
	146301	5	.4	.04	2					
	146867	229	18.3	1.89	21					
04 12 64	100000	2	.3	.03	2	1 2100 5737	5.8	55	3	6
	121110	47	8.1	.85	8					
	122000	1	.1	.01	1					
	122510	18	3.1	.32	12					
	122600	1	.1	.01	1					
	122701	2	.3	.03	2					
	133213	44	7.5	.80	5					
	143000	1	.1	.01	1					
	144101	2	.3	.03	2					
	146101	56	9.6	1.01	5					
	146867	254	43.7	4.61	23					
04 13 64	122000	3	.2	.02	2	1 1759 5659	12.6	125	3	6
	122500	5	.3	.04	1					
	122510	19	1.5	.15	8					
	122519	9	.7	.07	4					
	122701	7	.5	.05	6					
	123000	3	.2	.02	3					
	133213	1	.1	.01	1					
	136107	1	.1	.01	1					
	146000	1	.1	.01	1					
	146867	120	9.5	.96	9					
04 14 64	100000	1	.1	.01	1	1 1391 5700	12.4	129	3	6
	122519	6	.4	.04	6					
	122524	2	.1	.01	2					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
04 14 64	122701	3	.2	.02	3	1 1351 5700	12.4	129	3	6
	123409	2	.1	.01	2					
	133206	1	.1	.01	1					
	146867	40	3.2	.31	1					
04 15 64	100000	2	.1	.01	2	1 1131 5534	12.2	119	3	6
	122000	7	.5	.05	6					
	122510	2	.1	.01	2					
	122519	36	2.9	.30	30					
	122524	2	.1	.01	2					
	122600	2	.1	.01	2					
	122601	2	.1	.01	2					
	122608	3	.2	.02	3					
	122631	1	.1	.01	1					
	122701	11	.9	.09	11					
	123409	10	.8	.08	10					
	131100	2	.1	.01	1					
	144101	1	.1	.01	1					
	146867	4	.3	.03	2					
04 16 64	122000	7	.5	.06	5	1 1341 5403	12.4	109	3	6
	122510	6	.4	.05	1					
	122519	5	.4	.04	4					
	122600	2	.1	.01	2					
	122608	2	.1	.01	2					
	122701	2	.1	.01	2					
	123000	1	.1	.01	1					
	144101	3	.2	.02	1					
	146867	50	4.0	.45	1					
04 17 64	100000	2	.1	.01	2	1 1731 5359	12.6	129	3	6
	122000	5	.3	.03	5					
	122504	1	.1	.01	1					
	122510	3	.2	.02	2					
	122519	7	.5	.05	6					
	122600	1	.1	.01	1					
	122608	1	.1	.01	1					
04 18 64	122000	2	.6	.08	2	1 1947 5453	3.1	24	3	6
	122519	9	2.9	.37	4					
	146000	1	.3	.04	1					
	146110	420	135.4	17.50	2					
	146867	5	1.6	.20	2					
04 21 64	121110	2	.1	.01	2	1 2218 5402	12.8	138	3	6
	122000	4	.3	.02	1					
	122510	1	.1	.01	1					
	122519	1	.1	.01	1					
	122608	2	.1	.01	2					
	123000	1	.1	.01	1					
	123409	7	.5	.05	7					
	131106	1	.1	.01	1					
	146867	1	.1	.01	1					
04 22 64	100000	1	.1	.01	1	1 2330 5103	12.8	137	3	6
	121110	1	.1	.01	1					
	122504	3	.2	.02	2					
	122519	2	.1	.01	2					
	122631	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	5	.3	.03	4					
	123419	1	.1	.01	1					
	131106	1	.1	.01	1					
	146867	7	.5	.05	2					
04 23 64	121110	3	.2	.02	3	1 1938 5103	12.7	105	3	6
	122000	1	.1	.01	1					
	122504	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
04 23 64	122510	1	.1	.01	1	1 1938 5103	12.7	105	3	6
	122519	6	.4	.05	4					
	122600	1	.1	.01	1					
	123000	2	.1	.01	2					
	123409	4	.3	.03	4					
	131106	2	.1	.01	2					
	144101	5	.3	.04	4					
	146835	1	.1	.01	1					
04 24 64	122000	6	.4	.04	4	1 1600 5101	12.6	138	3	6
	122530	1	.1	.01	1					
	122510	8	.6	.05	6					
	122519	9	.7	.06	9					
	122600	3	.2	.02	2					
	122701	2	.1	.01	2					
	123000	2	.1	.01	2					
	123409	13	1.0	.09	10					
	131112	1	.1	.01	1					
	144100	1	.1	.01	1					
	144101	3	.2	.02	3					
	146000	1	.1	.01	1					
	146835	1	.1	.01	1					
04 25 64	100000	1	.1	.01	1	1 1255 5100	12.5	57	3	6
	122000	5	.4	.08	3					
	122500	1	.1	.01	1					
	122510	12	.9	.21	11					
	122519	9	.7	.15	8					
	122521	1	.1	.01	1					
	122600	2	.1	.03	2					
	122631	1	.1	.01	1					
	123000	3	.2	.05	3					
	123409	15	1.2	.26	12					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	133206	1	.1	.01	1					
	144101	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	15	1.2	.26	4					
04 26 64	100000	1	.1	.01	1	1 1021 4848	12.3	122	3	6
	122000	15	1.2	.12	9					
	122504	2	.1	.01	2					
	122510	130	10.5	1.06	22					
	122519	25	2.0	.20	20					
	122524	3	.2	.02	3					
	122600	2	.1	.01	2					
	122601	1	.1	.01	1					
	122608	8	.6	.06	5					
	122701	2	.1	.01	2					
	123000	2	.1	.01	2					
	123409	11	.8	.09	9					
	133206	2	.1	.01	1					
	144101	1	.1	.01	1					
	146867	132	10.7	1.08	2					
04 27 64	100000	2	.1	.01	1	1 1250 4802	12.6	115	3	6
	122000	10	.7	.08	4					
	122510	3	.2	.02	3					
	122519	3	.2	.02	2					
	122600	2	.1	.01	1					
	122608	1	.1	.01	1					
	123409	2	.1	.01	2					
	131106	1	.1	.01	1					
	146835	2	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
04 27 64	146867	269	21.3	2.33	4	1 1250 4802	12.6	115	3	6
04 28 64	180000	1	.1	.01	1	1 1622 4803	12.7	125	3	6
	122000	1	.1	.01	1					
	122510	2	.1	.02	2					
	122519	25	1.9	.20	14					
	122524	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	12	.9	.09	10					
	144101	1	.1	.01	1					
	146835	3	.2	.02	2					
	146867	6	.4	.04	1					
04 29 64	122500	5	.3	.03	5	1 2021 4800	12.8	134	3	6
	122510	5	.3	.03	5					
	122519	10	.7	.07	7					
	123000	4	.3	.02	4					
	123409	6	.4	.04	6					
	141000	1	.1	.01	1					
	143000	2	.1	.01	1					
	146835	3	.2	.02	2					
04 30 64	121110	2	.1	.01	2	1 2345 4800	13.0	125	3	6
	121111	1	.1	.01	1					
	122500	2	.1	.01	2					
	122519	4	.3	.03	4					
	123000	5	.3	.04	5					
	123409	11	.8	.08	9					
	144101	1	.1	.01	1					
05 01 64	121110	45	3.3	.31	9	1 2555 4903	13.3	144	3	6
	121111	1	.1	.01	1					
	122000	4	.3	.02	4					
	122500	1	.1	.01	1					
	122504	1	.1	.01	1					
	122510	2	.1	.01	2					
	122519	10	.7	.06	9					
	123000	4	.3	.02	4					
	123409	14	1.0	.09	13					
	141000	1	.1	.01	1					
	143000	1	.1	.01	1					
	146835	1	.1	.01	1					
05 02 64	180000	2	.1	.01	2	1 2500 5340	13.2	155	3	6
	121110	31	2.3	.20	5					
	121111	1	.1	.01	1					
	122000	2	.1	.01	2					
	122500	1	.1	.01	1					
	122510	1	.1	.01	1					
	122519	2	.1	.01	2					
	122524	1	.1	.01	1					
	123000	3	.2	.02	3					
	123409	10	.7	.06	7					
	131106	1	.1	.01	1					
	141000	1	.1	.01	1					
	143000	1	.1	.01	1					
	146000	1	.1	.01	1					
	146835	1	.1	.01	1					
	146867	6	.4	.03	3					
05 03 64	121110	7	.5	.07	4	1 2438 5703	13.1	91	3	6
	122000	2	.1	.02	2					
	122510	1	.1	.01	1					
	122519	55	4.1	.60	42					
	122524	2	.1	.02	2					
	122600	1	.1	.01	1					
	122608	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
05 03 64	123000	2	.1	.02	2	1 2438 5703	13.1	91	3	6
	123409	7	.5	.07	7					
	131112	2	.1	.02	2					
	136107	1	.1	.01	1					
	143000	1	.1	.01	1					
	146867	392	29.9	4.31	21					
05 04 64	087000	12	2.0	.19	1	1 2130 5724	5.8	62	3	6
	121110	5	.8	.08	3					
	122510	137	23.6	2.21	37					
	122519	5	.8	.08	2					
	122524	1	.1	.01	1					
	122701	2	.3	.03	2					
	133213	27	4.6	.43	13					
	133217	4	.6	.06	4					
	143000	1	.1	.01	1					
	144101	1	.1	.01	1					
	146101	109	18.7	1.75	19					
	146867	332	57.2	5.35	61					
	180000	1	.1	.01	1					
05 17 64	122000	4	.3	.03	3	1 2035 5715	11.0	105	4	6
	122510	229	20.8	2.18	38					
	122519	6	.5	.05	6					
	122524	9	.8	.08	6					
	122608	1	.1	.01	1					
	122701	81	7.3	.77	40					
	131112	12	1.0	.11	6					
	133213	5	.4	.04	3					
	144201	1	.1	.01	1					
	146101	13	1.1	.12	4					
	146110	5	.4	.04	4					
	146867	253	23.0	2.40	16					
05 18 64	122000	6	.4	.04	5	1 1658 5701	12.9	131	4	6
	122500	16	1.2	.12	2					
	122510	123	9.5	.93	14					
	122519	9	.6	.06	7					
	122524	2	.1	.01	2					
	122600	1	.1	.01	1					
	122701	2	.1	.01	2					
	123409	1	.1	.01	1					
	131100	1	.1	.01	1					
	131112	1	.1	.01	1					
	146867	158	12.2	1.20	13					
05 19 64	121110	1	.1	.01	1	1 1309 5703	12.8	135	4	6
	122000	55	4.2	.41	10					
	122510	58	4.5	.42	21					
	122519	23	1.7	.17	16					
	122524	14	1.0	.10	10					
	122600	5	.3	.03	2					
	122601	2	.1	.01	2					
	122608	1	.1	.01	1					
	122631	10	.7	.07	10					
	122701	8	.6	.05	8					
	123409	5	.3	.03	5					
	131106	1	.1	.01	1					
	133200	3	.2	.02	1					
	133206	6	.4	.04	5					
	144101	1	.1	.01	1					
	146301	4	.3	.02	2					
	146867	213	16.6	1.57	8					
05 20 64	180000	2	.1	.01	1	1 1028 5447	12.5	124	4	6
	122000	7	.5	.05	6					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
05 20 64	122500	11	.8	.08	2	1 1028 5447	12.5	124	4	6
	122510	235	18.8	1.89	31					
	122524	9	.7	.07	8					
	122600	1	.1	.01	1					
	122601	9	.7	.07	8					
	122608	3	.2	.02	3					
	122631	9	.7	.07	8					
	122701	8	.6	.06	8					
	123000	2	.1	.02	1					
	123409	7	.5	.05	7					
	131100	3	.2	.02	3					
	133206	3	.2	.02	3					
	136107	2	.1	.02	2					
	144100	1	.1	.01	1					
	146867	280	22.4	2.25	7					
05 21 64	122000	3	.2	.02	3	1 1304 5400	12.8	131	4	6
	122500	1	.1	.01	1					
	122510	2	.1	.01	2					
	122519	1	.1	.01	1					
	122521	1	.1	.01	1					
	122524	1	.1	.01	1					
	122600	1	.1	.01	1					
	122601	1	.1	.01	1					
	122608	1	.1	.01	1					
	122631	12	.9	.09	10					
	123000	1	.1	.01	1					
	123409	1	.1	.01	1					
	131112	1	.1	.01	1					
	146000	1	.1	.01	1					
	146867	1	.1	.01	1					
05 22 64	122000	2	.1	.01	1	1 1646 5359	13.0	123	4	6
	122504	1	.1	.01	1					
	122510	10	.7	.08	6					
	122524	1	.1	.01	1					
	122701	6	.4	.04	5					
	123000	2	.1	.01	2					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	146867	12	.9	.09	2					
05 23 64	122000	2	.1	.01	2	1 2049 5401	13.2	136	4	6
	122510	61	4.6	.44	14					
	122519	2	.1	.01	2					
	122524	1	.1	.01	1					
	122701	3	.2	.02	3					
	123409	4	.3	.02	3					
	131100	1	.1	.01	1					
	144101	1	.1	.01	1					
	146867	18	1.3	.13	8					
05 24 64	121110	4	.3	.03	3	1 2326 5302	13.3	124	4	6
	122510	3	.2	.02	3					
	122519	2	.1	.01	1					
	122608	1	.1	.01	1					
	123409	5	.3	.04	5					
	146867	1	.1	.01	1					
05 25 64	122519	1	.1	.01	1	1 2148 5059	13.3	138	4	6
	122524	1	.1	.01	1					
	123409	3	.2	.02	3					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	146867	1	.1	.01	1					
05 26 64	122000	2	.1	.01	2	1 1745 5101	13.1	133	4	6

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
05 26 64	122510	6	.4	.04	5	1 1745 5101	13.1	133	4	6
	122608	1	.1	.01	1					
	122701	7	.5	.05	6					
	123409	3	.2	.02	3					
05 27 64	122000	12	.9	.09	10	1 1348 5058	12.9	129	4	6
	122510	414	32.0	3.20	27					
	122519	1	.1	.01	1					
	122600	3	.2	.02	3					
	122601	9	.6	.06	8					
	122608	24	1.8	.18	18					
	122631	7	.5	.05	7					
	122701	11	.8	.08	11					
	123409	2	.1	.01	2					
	131100	2	.1	.01	2					
	146301	1	.1	.01	1					
	146867	706	54.7	5.47	12					
05 28 64	122000	19	1.5	.14	11	1 1045 4928	12.5	133	4	6
	122510	97	7.7	.72	16					
	122524	3	.2	.02	3					
	122600	2	.1	.01	2					
	122601	4	.3	.03	4					
	122608	37	2.9	.27	22					
	122631	9	.7	.06	9					
	122701	2	.1	.01	2					
	123409	9	.7	.06	8					
	131106	1	.1	.01	1					
	146867	116	9.2	.87	5					
05 29 64	122000	99	7.7	.86	6	1 1226 4808	12.8	115	4	6
	122510	100	7.8	.86	26					
	122524	4	.3	.03	4					
	122600	5	.3	.04	4					
	122601	13	1.0	.11	12					
	122608	56	4.3	.48	21					
	122631	9	.7	.07	9					
	122701	7	.5	.06	7					
	123409	1	.1	.01	1					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	146867	321	25.0	2.79	10					
05 30 64	122000	10	.7	.07	8	1 1617 4757	13.0	139	4	6
	122510	6	.4	.04	3					
	122608	2	.1	.01	2					
	122631	10	.7	.07	7					
	122701	1	.1	.01	1					
	123409	1	.1	.01	1					
	144701	1	.1	.01	1					
05 31 64	122000	1	.1	.01	1	1 2028 4759	13.2	88	4	6
	122510	9	.6	.11	8					
	122600	1	.1	.01	1					
	122631	1	.1	.01	1					
	122701	1	.1	.01	1					
	123409	6	.4	.07	2					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	146867	1	.1	.01	1					
06 01 64	121110	1	.1	.01	1	1 2332 4759	13.5	158	4	6
	122000	1	.1	.01	1					
	122510	1	.1	.01	1					
	122608	1	.1	.01	1					
	123409	1	.1	.01	1					
	131108	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
06 01 64	131106	2	.1	.01	2	1 2332 4759	13.5	150	4	6
	146867	1	.1	.01	1					
06 02 64	121110	2	.1	.01	2	1 2605 4854	13.8	150	4	6
	122000	1	.1	.01	1					
	122510	6	.4	.04	2					
	122608	1	.1	.01	1					
	122701	7	.5	.04	7					
	123409	5	.3	.03	2					
	131100	1	.1	.01	1					
	131106	2	.1	.01	2					
06 03 64	121110	10	.8	.07	5	1 2457 5314	11.8	130	4	6
	122000	50	4.2	.38	7					
	122510	82	6.9	.63	13					
	122524	4	.3	.03	3					
	122608	1	.1	.01	1					
	122631	1	.1	.01	1					
	122701	6	.5	.04	6					
	123000	3	.2	.02	2					
	123409	3	.2	.02	2					
	131100	3	.2	.02	3					
	131106	1	.1	.01	1					
	131112	4	.3	.03	4					
	136107	3	.2	.02	3					
	146867	185	15.6	1.42	29					
06 04 64	180000	1	.1	.01	1	1 2442 5700	13.6	128	4	6
	121110	26	1.9	.20	6					
	122000	3	.2	.02	3					
	122501	1	.1	.01	1					
	122510	17	1.2	.13	11					
	122521	1	.1	.01	1					
	122524	8	.5	.06	7					
	122631	1	.1	.01	1					
	122701	18	1.3	.14	15					
	123409	7	.5	.05	5					
	131100	1	.1	.01	1					
	131106	13	.9	.10	7					
	131112	2	.1	.01	2					
	133213	1	.1	.01	1					
	146867	55	4.0	.42	23					
06 05 64	121110	3	.4	.04	1	1 2133 5729	6.4	73	4	6
	122510	151	23.5	2.06	24					
	122524	9	1.4	.12	7					
	122608	1	.1	.01	1					
	122631	1	.1	.01	1					
	122701	11	1.7	.15	9					
	131100	1	.1	.01	1					
	133213	102	15.9	1.39	24					
	133217	2	.3	.02	2					
	136107	6	.9	.08	4					
	146101	291	45.4	3.98	32					
	146110	2	.3	.02	2					
	146301	2	.3	.02	2					
	146867	795	124.2	10.89	42					
06 15 64	121110	1	.2	.02	1	1 2106 5742	4.2	44	5	6
	122510	45	10.7	1.02	25					
	122524	1	.2	.02	1					
	122701	1	.2	.02	1					
	131106	1	.2	.02	1					
	133213	5	1.1	.11	5					
	133217	1	.2	.02	1					
	146101	23	5.4	.52	9					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
06 15 64	146867	59	14.0	1.34	26	1 2106 5742	4.2	44	5	6
06 16 64	122000	1	.1	.01	1	1 1817 5700	13.2	120	5	6
	122510	135	10.2	1.12	34					
	122524	5	.3	.04	5					
	122608	4	.3	.03	2					
	122631	11	.8	.09	8					
	122701	11	.8	.09	11					
	123000	1	.1	.01	1					
	136107	1	.1	.01	1					
	146301	9	.6	.07	4					
	146867	160	12.1	1.33	8					
06 17 64	122000	15	1.1	.11	7	1 1430 5700	13.0	133	5	6
	122510	23	1.7	.17	10					
	122600	2	.1	.01	2					
	122601	5	.3	.03	5					
	122608	12	.9	.09	8					
	122631	25	1.9	.18	13					
	122701	3	.2	.02	3					
	123409	2	.1	.01	2					
	131100	2	.1	.01	1					
	131106	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	31	2.3	.23	4					
06 18 64	122000	4	.3	.03	3	1 1110 5636	12.6	116	5	6
	122510	38	3.0	.32	19					
	122524	2	.1	.01	1					
	122600	5	.3	.04	3					
	122608	12	.9	.10	11					
	122631	10	.7	.08	9					
	122701	2	.1	.01	2					
	131106	1	.1	.01	1					
	133206	1	.1	.01	1					
	146867	2	.1	.01	2					
06 19 64	122000	3	.2	.02	3	1 1102 5400	12.8	132	5	6
	122510	165	12.8	1.25	44					
	122524	1	.1	.01	1					
	122600	1	.1	.01	1					
	122601	1	.1	.01	1					
	122608	13	1.0	.09	9					
	122631	9	.7	.06	8					
	122701	1	.1	.01	1					
	144201	1	.1	.01	1					
	146301	2	.1	.01	2					
	146867	186	14.5	1.40	7					
06 20 64	122000	6	.4	.04	5	1 1439 5359	13.1	125	5	6
	122510	11	.8	.08	8					
	122524	1	.1	.01	1					
	122601	9	.6	.07	7					
	122608	5	.3	.04	5					
	122631	3	.2	.02	3					
	122701	2	.1	.01	2					
06 21 64	122000	1	.1	.01	1	1 1847 5358	13.3	135	5	6
	122510	44	3.3	.32	12					
	122600	2	.1	.01	2					
	122608	2	.1	.01	2					
	122631	2	.1	.01	2					
	122701	2	.1	.01	2					
	146301	4	.3	.02	4					
	146867	130	9.7	.96	5					
06 22 64	122000	4	.2	.03	4	1 2228 5400	13.5	126	5	6
	122510	38	2.8	.30	11					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
06 22 64	122631	2	.1	.01	2	1 2228 5400	13.5	126	5	6
	122701	4	.2	.03	4					
	123409	2	.1	.01	2					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	146301	2	.1	.01	2					
	146867	404	29.9	3.20	19					
06 23 64	122000	2	.1	.01	2	1 2328 5104	13.3	139	5	6
	122510	3	.2	.02	3					
	122524	1	.1	.01	1					
	122608	1	.1	.01	1					
	122631	14	1.0	.10	12					
	122701	7	.5	.05	6					
	123409	1	.1	.01	1					
	131100	1	.1	.01	1					
	131112	1	.1	.01	1					
	146867	6	.4	.04	3					
06 24 64	122000	3	.2	.02	3	1 1937 5101	13.3	127	5	6
	122510	4	.3	.03	4					
	122524	1	.1	.01	1					
	122631	4	.3	.03	4					
	122701	1	.1	.01	1					
	131100	3	.2	.02	2					
	131106	3	.2	.02	1					
	131112	1	.1	.01	1					
	144100	1	.1	.01	1					
	146867	10	.7	.07	3					
06 25 64	122000	257	19.6	1.83	12	1 1554 5104	13.1	140	5	6
	122510	12	.9	.08	11					
	122519	1	.1	.01	1					
	122524	1	.1	.01	1					
	122600	13	.9	.09	6					
	122601	14	1.0	.10	11					
	122608	14	1.0	.10	8					
	122631	8	.6	.05	8					
	122701	2	.1	.01	2					
	123409	1	.1	.01	1					
	131106	2	.1	.01	2					
	146867	358	27.3	2.55	4					
06 26 64	122000	45	3.5	.33	6	1 1137 5100	12.8	133	5	6
	122510	6	.4	.04	5					
	122524	3	.2	.02	3					
	122600	11	.8	.08	5					
	122601	9	.7	.05	8					
	122608	19	1.4	.14	17					
	122631	19	1.4	.14	17					
	131106	2	.1	.01	2					
	146000	1	.1	.01	1					
	146867	30	2.3	.22	3					
06 27 64	122000	7	.5	.06	7	1 1005 4803	12.7	109	5	6
	122510	17	1.3	.15	13					
	122600	2	.1	.01	2					
	122601	5	.3	.04	5					
	122608	15	1.1	.13	12					
	122631	24	1.8	.22	17					
	122701	1	.1	.01	1					
	146867	6	.4	.05	3					
06 28 64	122000	11	.8	.09	9	1 1357 4758	13.0	119	5	6
	122600	2	.1	.01	2					
	122601	1	.1	.01	1					
	122608	24	1.8	.20	18					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
06 28 64	122631	15	1.1	.12	13	1 1357 4758	13.0	119	5	6
	122701	1	.1	.01	1					
	131106	1	.1	.01	1					
	146867	2	.1	.01	1					
06 29 64	100000	1	.1	.01	1	1 1728 4757	13.2	123	5	6
	122000	9	.6	.07	6					
	122510	8	.6	.06	5					
	122600	4	.3	.03	3					
	122608	27	2.0	.21	18					
	122631	2	.1	.01	2					
06 30 64	122000	62	4.6	.55	12	1 2125 4758	13.4	111	5	6
	122510	14	1.0	.12	9					
	122600	3	.2	.02	1					
	122608	32	2.3	.28	22					
	122631	4	.2	.03	4					
	122701	1	.1	.01	1					
	131112	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	104	7.7	.93	2					
07 01 64	122000	1	.1	.01	1	1 2400 4755	13.5	71	5	6
	122510	11	.8	.15	6					
	122701	2	.1	.02	2					
	131106	1	.1	.01	1					
07 02 64	122000	5	.3	.03	5	1 2553 4914	13.9	165	5	6
	122510	5	.3	.03	5					
	122631	1	.1	.01	1					
	122701	5	.3	.03	4					
	131112	2	.1	.01	1					
07 03 64	122000	10	.7	.06	3	1 2458 5359	13.9	150	5	6
	122510	20	1.4	.13	10					
	122631	3	.2	.02	3					
	122701	3	.2	.02	3					
	123409	1	.1	.01	1					
	136107	2	.1	.01	2					
	146867	2	.1	.01	1					
07 04 64	122000	11	.8	.07	11	1 2331 5658	13.6	139	5	6
	122510	489	35.9	3.51	44					
	122601	1	.1	.01	1					
	122608	5	.3	.03	5					
	122631	21	1.5	.15	19					
	122701	1	.1	.01	1					
	131100	1	.1	.01	1					
	131106	3	.2	.02	2					
	131112	1	.1	.01	1					
	136107	3	.2	.02	2					
	144101	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	922	67.7	6.63	22					
07 13 64	122000	1	.1	.01	1	1 2053 5739	5.2	51	6	6
	122510	169	32.5	3.31	15					
	122608	3	.5	.05	1					
	122631	1	.1	.01	1					
	122701	29	5.5	.56	16					
	133213	11	2.1	.21	5					
	136107	1	.1	.01	1					
	146101	77	14.8	1.50	2					
	146301	1	.1	.01	1					
	146867	651	125.1	12.76	21					
07 14 64	122000	3	.2	.02	3	1 1853 5700	13.1	125	6	6
	122510	56	4.2	.44	25					
	122524	2	.1	.01	2					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
07 14 64	122608	19	1.4	.15	16	1 1853 5700	13.1	125	6	6
	122631	14	1.0	.11	10					
	122701	11	.8	.08	11					
	131100	1	.1	.01	1					
	136107	3	.2	.02	2					
	146301	2	.1	.01	1					
	146867	85	6.4	.68	11					
07 15 64	122000	66	5.1	.45	5	1 1425 5659	12.9	145	6	6
	122510	23	1.7	.15	9					
	122600	28	2.1	.19	7					
	122601	12	.9	.08	11					
	122608	18	1.3	.12	12					
	122631	5	.3	.03	5					
	146301	1	.1	.01	1					
	146867	37	2.8	.25	2					
07 16 64	122000	2	.1	.01	2	1 1104 5609	12.6	140	6	6
	122510	64	5.0	.45	11					
	122524	5	.3	.04	4					
	122600	4	.3	.02	4					
	122601	7	.5	.05	3					
	122608	22	1.7	.15	13					
	122631	13	1.0	.09	11					
	146301	1	.1	.01	1					
	146867	53	4.2	.37	3					
07 17 64	122000	5	.3	.03	3	1 1139 5400	12.8	127	6	6
	122510	47	3.6	.37	8					
	122601	1	.1	.01	1					
	122608	26	2.0	.20	7					
	122631	8	.6	.06	4					
	131106	2	.1	.01	2					
	146867	70	5.4	.55	1					
07 18 64	122000	4	.3	.02	2	1 1555 5400	13.0	137	6	6
	122510	22	1.6	.16	4					
	122600	1	.1	.01	1					
	122408	93	7.1	.67	25					
	122631	8	.6	.05	7					
	131106	2	.1	.01	2					
	146867	11	.8	.08	2					
07 19 64	122000	46	3.4	.38	5	1 1938 5403	13.2	118	6	6
	122510	52	3.9	.44	15					
	122524	3	.2	.02	2					
	122600	3	.2	.02	2					
	122601	1	.1	.01	1					
	122608	36	2.7	.30	11					
	122631	24	1.8	.20	12					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	131112	2	.1	.01	2					
	136107	1	.1	.01	1					
	141000	1	.1	.01	1					
	146301	2	.1	.01	1					
	146867	189	14.3	1.60	8					
07 20 64	122000	81	6.1	.66	7	1 2332 5355	13.1	121	6	6
	122510	145	11.0	1.19	16					
	122600	11	.8	.09	4					
	122608	1	.1	.01	1					
	122631	3	.2	.02	3					
	122701	1	.1	.01	1					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	136107	3	.2	.02	2					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
07 20 64	146301	5	.3	.04	2	1 2332 5355	13.1	121	6	6
	146867	658	50.2	5.43	11					
07 21 64	122000	16	1.2	.13	8	1 2231 5058	13.3	122	6	6
	122510	16	1.2	.13	7					
	122521	1	.1	.01	1					
	122600	2	.1	.01	2					
	122601	2	.1	.01	1					
	122608	20	1.5	.16	12					
	122631	7	.5	.05	6					
	122701	3	.2	.02	3					
	131106	2	.1	.01	2					
	136107	2	.1	.01	2					
	146867	136	10.2	1.11	9					
07 22 64	122510	17	1.2	.13	9	1 1837 5059	13.1	130	6	6
	122524	2	.1	.01	2					
	122600	11	.8	.08	5					
	122601	13	.9	.10	8					
	122608	104	7.9	.80	50					
	122631	3	.2	.02	3					
	131106	1	.1	.01	1					
	131112	2	.1	.01	1					
	133200	1	.1	.01	1					
	146301	5	.3	.03	4					
	146867	268	20.4	2.06	9					
07 23 64	122510	7	.5	.04	4	1 1427 5059	12.8	141	6	6
	122600	7	.5	.04	5					
	122601	1	.1	.01	1					
	122606	1	.1	.01	1					
	122608	34	2.6	.24	20					
	122631	4	.3	.02	4					
	123409	1	.1	.01	1					
	146867	83	6.4	.58	4					
07 24 64	160000	30	2.3	.21	1	1 1105 5003	12.6	138	6	6
	122000	4	.3	.02	2					
	122510	17	1.3	.12	15					
	122600	1	.1	.01	1					
	122601	1	.1	.01	1					
	122608	15	1.1	.10	9					
	122631	10	.7	.07	9					
	123409	1	.1	.01	1					
	146867	8	.6	.05	4					
07 25 64	122000	10	.7	.08	10	1 1140 4759	12.7	120	6	6
	122510	51	4.0	.42	11					
	122600	1	.1	.01	1					
	122601	3	.2	.02	3					
	122608	118	9.2	.98	31					
	122631	10	.7	.08	9					
	122701	1	.1	.01	1					
	146867	10	.7	.08	2					
07 26 64	122000	3	.2	.02	3	1 1543 4759	12.9	125	6	6
	122510	4	.3	.03	3					
	122521	1	.1	.01	1					
	122524	1	.1	.01	1					
	122608	10	.7	.08	9					
	122631	4	.3	.03	4					
	122633	1	.1	.01	1					
	146867	4	.3	.03	1					
07 27 64	122000	4	.3	.03	4	1 1940 4801	13.1	126	6	6
	122601	1	.1	.01	1					
	122608	30	2.2	.23	18					
	131106	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
07 27 64	146867	1	.1	.01	1	1 1940 4801	13.1	126	6	6
07 28 64	122000	10	.7	.06	8	1 2333 4757	13.3	144	6	6
	122600	13	.9	.09	4					
	122601	2	.1	.01	2					
	122608	47	3.5	.32	11					
	122633	2	.1	.01	1					
	131106	2	.1	.01	2					
	131112	1	.1	.01	1					
	146301	2	.1	.01	2					
	146867	68	5.1	.47	3					
07 29 64	122000	51	3.7	.32	4	1 2557 4908	13.6	159	6	6
	122608	5	.3	.03	3					
	122701	1	.1	.01	1					
	131106	3	.2	.01	3					
	131112	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	155	11.3	.97	4					
07 30 64	122000	5	.3	.05	3	1 2459 5259	13.5	89	6	6
	122631	1	.1	.01	1					
	122701	2	.1	.02	2					
	131100	1	.1	.01	1					
	131106	4	.2	.04	4					
	131112	1	.1	.01	1					
	133213	1	.1	.01	1					
	146867	5	.3	.05	1					
07 31 64	122000	12	.9	.08	6	1 2457 5700	13.3	142	6	6
	122510	12	.9	.08	6					
	122524	5	.3	.03	4					
	122631	1	.1	.01	1					
	122633	1	.1	.01	1					
	122701	1	.1	.01	1					
	131106	2	.1	.01	2					
	131112	1	.1	.01	1					
	136107	4	.3	.02	3					
	146301	3	.2	.02	2					
	146867	40	3.0	.28	4					
08 01 64	122000	2	.4	.02	1	1 2124 5728	5.0	68	6	6
	122510	89	17.8	1.30	49					
	122524	3	.6	.04	2					
	122701	6	1.2	.08	6					
	131106	2	.4	.02	2					
	131112	1	.2	.01	1					
	133213	5	1.0	.07	5					
	133217	2	.4	.02	1					
	146101	231	46.2	3.39	56					
	146867	27	5.4	.39	15					
09 01 64	122000	1	.1	.01	1	1 2050 5730	5.2	53	8	6
	122510	248	47.6	4.67	45					
	122701	2	.3	.03	2					
	131112	1	.1	.01	1					
	133213	35	6.7	.66	14					
	133217	1	.1	.01	1					
	136107	4	.7	.07	3					
	146101	361	69.4	6.81	30					
09 02 64	180000	1	.1	.01	1	1 1825 5659	12.5	94	8	6
	122000	5	.4	.05	5					
	122510	21	1.6	.22	15					
	122600	5	.4	.05	5					
	122601	2	.1	.02	2					
	122608	3	.2	.03	2					
	122609	2	.1	.02	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
09 02 64	122631	8	.6	.08	7	1 1825 5659	12.5	94	8	6
	122701	3	.2	.03	3					
	131100	1	.1	.01	1					
	131106	3	.2	.03	1					
	136107	1	.1	.01	1					
	146000	1	.1	.01	1					
	146301	1	.1	.01	1					
09 03 64	122000	6	.4	.06	2	1 1440 5659	12.4	95	8	6
	122500	1	.1	.01	1					
	122608	2	.1	.02	2					
	122629	1	.1	.01	1					
	122631	1	.1	.01	1					
	122701	1	.1	.01	1					
	131106	2	.1	.02	2					
	146000	20	1.6	.21	2					
	146867	16	1.2	.16	2					
09 04 64	007000	50	4.0	.41	1	1 1130 5700	12.2	120	8	6
	122000	8	.6	.06	7					
	122510	12	.9	.10	11					
	122521	3	.2	.02	2					
	122601	11	.9	.09	10					
	122608	7	.5	.05	6					
	122629	7	.5	.05	6					
	122631	1	.1	.01	1					
	122701	2	.1	.01	2					
	131106	1	.1	.01	1					
	141209	1	.1	.01	1					
	146867	4	.3	.03	2					
09 05 64	180000	1	.1	.01	1	1 1042 5358	12.3	126	8	6
	122000	7	.5	.05	7					
	122510	12	.9	.09	9					
	122521	1	.1	.01	1					
	122600	3	.2	.02	3					
	122601	9	.7	.07	7					
	122608	6	.4	.04	5					
	122629	7	.5	.05	4					
	122631	3	.2	.02	3					
	122701	2	.1	.01	1					
	146000	1	.1	.01	1					
09 06 64	180000	1	.1	.01	1	1 1444 5403	12.3	130	8	6
	122000	33	2.6	.25	13					
	122500	5	.4	.03	1					
	122510	30	2.4	.23	8					
	122519	1	.1	.01	1					
	122524	1	.1	.01	1					
	122600	8	.6	.06	8					
	122601	28	2.2	.21	8					
	122608	38	3.0	.29	15					
	122631	6	.4	.04	5					
	122633	1	.1	.01	1					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	136107	4	.3	.03	3					
	141209	1	.1	.01	1					
	146867	220	17.8	1.69	4					
09 07 64	122000	12	.9	.09	8	1 1849 5358	12.4	130	8	6
	122500	1	.1	.01	1					
	122510	1	.1	.01	1					
	122601	3	.2	.02	3					
	122608	13	1.0	.10	8					
	122631	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
09 07 64	136107	1	.1	.01	1	1 1849 5358	12.4	130	8	6
	146301	1	.1	.01	1					
	146067	16	1.2	.12	3					
09 08 64	122000	28	2.2	.22	4	1 2252 5400	12.4	122	8	6
	122510	1	.1	.01	1					
	122519	2	.1	.01	2					
	122600	12	.9	.09	5					
	131112	3	.2	.02	3					
	136107	1	.1	.01	1					
	144201	1	.1	.01	1					
	146067	20	1.6	.16	1					
09 09 64	122000	1	.1	.01	1	1 2300 5102	12.4	117	8	6
	122510	8	.6	.06	5					
	122519	1	.1	.01	1					
	122601	3	.2	.02	1					
	122608	31	2.5	.26	5					
	122631	2	.1	.01	1					
	122633	1	.1	.01	1					
	136107	1	.1	.01	1					
09 10 64	122000	3	.2	.02	2	1 1987 5059	12.3	135	8	6
	122510	3	.2	.02	2					
	122600	1	.1	.01	1					
	122601	1	.1	.01	1					
	122608	4	.3	.02	3					
	122631	2	.1	.01	2					
09 11 64	122000	43	3.4	.34	8	1 1917 5059	12.3	124	8	6
	122510	27	2.1	.21	3					
	122601	1	.1	.01	1					
	122608	58	4.7	.46	10					
	122629	2	.1	.01	1					
	122631	3	.2	.02	3					
	136107	2	.1	.01	1					
	146067	106	8.6	.85	4					
09 12 64	100000	1	.1	.01	1	1 1107 5059	12.1	122	8	6
	122000	150	12.3	1.22	27					
	122510	34	2.8	.27	13					
	122524	1	.1	.01	1					
	122600	4	.3	.03	2					
	122601	85	7.0	.69	30					
	122608	122	10.0	1.00	40					
	122631	6	.4	.04	6					
	122633	3	.2	.02	3					
	123409	17	1.4	.13	11					
	141000	1	.1	.01	1					
	144103	1	.1	.01	1					
	146067	125	10.3	1.02	13					
09 13 64	122000	9	.7	.07	8	1 1100 4800	12.2	119	8	6
	122510	10	.8	.08	9					
	122600	2	.1	.01	2					
	122601	2	.1	.01	2					
	122608	22	1.8	.18	12					
	122631	7	.5	.05	7					
	123409	2	.1	.01	2					
	146067	2	.1	.01	1					
09 14 64	122000	62	5.0	.50	16	1 1451 4759	12.3	122	8	6
	122510	18	1.4	.14	5					
	122519	2	.1	.01	2					
	122524	1	.1	.01	1					
	122600	3	.2	.02	2					
	122601	26	2.1	.21	10					
	122608	67	5.4	.54	21					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
09 14 64	122609	1	.1	.01	1	1 1451 4750	12.3	122	8	6
	122631	13	1.0	.10	11					
	122633	2	.1	.01	2					
	123409	1	.1	.01	1					
	131106	2	.1	.01	1					
	131112	1	.1	.01	1					
	146067	66	5.3	.54	4					
09 15 64	122000	20	1.6	.17	19	1 1029 4759	12.2	115	8	6
	122510	17	1.3	.14	8					
	122519	2	.1	.01	2					
	122600	1	.1	.01	1					
	122601	1	.1	.01	1					
	122608	22	1.8	.19	16					
	122631	6	.4	.05	6					
	122633	2	.1	.01	2					
	131106	7	.5	.06	7					
	146067	3	.2	.02	1					
09 16 64	122000	42	3.4	.34	32	1 2226 4757	12.3	121	8	6
	122510	6	.4	.04	6					
	122519	15	1.2	.12	13					
	122521	2	.1	.01	2					
	122608	18	1.4	.14	15					
	122631	3	.2	.02	3					
	123409	1	.1	.01	1					
	131106	3	.2	.02	3					
	141209	1	.1	.01	1					
	146067	4	.3	.03	1					
09 17 64	087007	1	.1	.01	1	1 2620 4800	12.3	135	8	6
	122000	10	.8	.07	9					
	122519	7	.5	.05	6					
	122524	2	.1	.01	2					
	122608	1	.1	.01	1					
	122609	1	.1	.01	1					
	122631	2	.1	.01	2					
	131106	2	.1	.01	1					
	131112	3	.2	.02	2					
	141209	1	.1	.01	1					
09 18 64	122000	26	2.0	.18	21	1 2459 5222	12.4	144	8	6
	122510	2	.1	.01	2					
	122519	4	.3	.02	4					
	122524	1	.1	.01	1					
	122608	2	.1	.01	2					
	122631	2	.1	.01	2					
	122633	1	.1	.01	1					
	131106	2	.1	.01	2					
	136107	2	.1	.01	2					
09 19 64	122000	28	2.2	.21	25	1 2440 5700	12.3	129	8	6
	122510	22	1.7	.17	14					
	122519	4	.3	.03	4					
	122524	13	1.0	.10	12					
	122601	3	.2	.02	3					
	122608	3	.2	.02	2					
	122631	6	.4	.04	5					
	122633	1	.1	.01	1					
	122701	1	.1	.01	1					
	131106	3	.2	.02	1					
	136107	1	.1	.01	1					
	144100	4	.3	.03	2					
	146067	4	.3	.03	2					
09 20 64	122000	31	5.3	.47	14	1 2131 5724	5.8	65	8	6
	122510	845	145.6	13.00	58					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
09 20 64	122519	92	15.8	1.41	27	1 2131 5724	5.8	65	8	6
	122524	4	.6	.06	3					
	122608	1	.1	.01	1					
	122631	20	3.4	.30	19					
	131112	1	.1	.01	1					
	133213	33	5.6	.50	22					
	133217	7	1.2	.10	6					
	136107	2	.3	.03	2					
	146101	115	19.8	1.76	37					
	146867	3	.5	.04	3					
10 01 64	122000	3	.6	.06	3	1 2100 5740	4.3	49	9	6
	122510	93	21.6	1.89	22					
	122519	17	3.9	.34	7					
	122631	2	.4	.04	2					
	122701	3	.6	.06	1					
	133213	51	11.8	1.04	7					
	133217	5	1.1	.10	3					
	136107	8	1.8	.16	3					
	146101	135	31.3	2.75	10					
	146867	3	.6	.06	3					
10 02 64	122000	13	1.0	.13	12	1 1809 5703	12.0	93	9	6
	122510	17	1.4	.18	15					
	122600	17	1.4	.18	9					
	122608	45	3.7	.48	33					
	122630	2	.1	.02	2					
	122631	38	3.1	.40	33					
	122701	1	.1	.01	1					
	131100	1	.1	.01	1					
	136107	1	.1	.01	1					
	141209	1	.1	.01	1					
	146101	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	13	1.0	.13	8					
10 03 64	122000	63	5.2	.49	7	1 1431 5701	12.0	128	9	6
	122519	8	.6	.06	8					
	122600	1	.1	.01	1					
	122601	1	.1	.01	1					
	122608	132	11.0	1.03	18					
	122631	124	10.3	.96	35					
	131100	1	.1	.01	1					
	131106	4	.3	.03	4					
	136107	3	.2	.02	2					
	141209	21	1.7	.16	7					
	141401	1	.1	.01	1					
	146000	2	.1	.01	1					
	146101	1	.1	.01	1					
	146867	489	40.7	3.82	10					
10 04 64	122000	53	4.4	.51	16	1 1112 5615	11.9	103	9	6
	122501	1	.1	.01	1					
	122519	84	7.0	.81	53					
	122600	2	.1	.01	2					
	122608	36	3.0	.34	29					
	122615	6	.5	.05	6					
	122631	40	3.3	.38	31					
	123000	1	.1	.01	1					
	131106	1	.1	.01	1					
	136107	1	.1	.01	1					
	141209	5	.4	.04	3					
	146867	121	10.1	1.17	8					
10 05 64	100000	1	.1	.01	1	1 1133 5356	12.0	120	9	6
	122000	91	7.5	.75	11					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
10 05 64	122510	1	.1	.01	1	1 1133 5356	12.0	120	9	6
	122519	56	4.6	.46	44					
	122608	359	29.9	2.99	49					
	122631	221	18.4	1.84	64					
	123409	1	.1	.01	1					
	131106	6	.5	.05	5					
	141209	3	.2	.02	2					
	144100	1	.1	.01	1					
	144201	1	.1	.01	1					
	146301	2	.1	.01	1					
	146867	849	70.7	7.07	22					
10 06 64	122000	22	1.8	.17	13	1 1542 5403	11.9	125	9	6
	122510	6	.5	.04	6					
	122519	93	7.8	.74	74					
	122600	2	.1	.01	2					
	122608	40	3.3	.32	20					
	122631	56	4.7	.44	40					
	122633	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	2	.1	.01	2					
	131106	4	.3	.03	4					
	141209	19	1.5	.15	5					
	146301	3	.2	.02	3					
	146867	66	5.5	.52	3					
10 07 64	122000	9	.7	.08	9	1 1935 5400	11.9	112	9	6
	122510	4	.3	.03	4					
	122519	11	.9	.09	11					
	122524	1	.1	.01	1					
	122606	1	.1	.01	1					
	122608	21	1.7	.18	20					
	122609	2	.1	.01	2					
	122615	1	.1	.01	1					
	122631	20	1.6	.17	19					
	122633	1	.1	.01	1					
	123409	4	.3	.03	4					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	133213	1	.1	.01	1					
	136107	1	.1	.01	1					
	141209	74	6.2	.66	15					
	146867	2	.1	.01	1					
10 08 64	100000	1	.1	.01	1	1 2320 5356	11.7	120	9	6
	122000	25	2.1	.20	11					
	122510	1	.1	.01	1					
	122519	10	.8	.08	10					
	122524	1	.1	.01	1					
	122608	3	.2	.02	3					
	122631	8	.6	.06	7					
	122633	2	.1	.01	2					
	123409	1	.1	.01	1					
	131106	4	.3	.03	4					
	136107	3	.2	.02	2					
	141209	16	1.3	.13	9					
	144100	1	.1	.01	1					
10 09 64	120000	1	.1	.01	1	1 2200 5100	11.8	116	9	6
	122000	25	2.1	.21	1					
	122519	24	2.0	.20	21					
	122608	40	3.3	.34	4					
	122631	37	3.1	.31	11					
	131106	4	.3	.03	4					
	136107	5	.4	.04	2					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
10 09 64	141209	11	.9	.09	11	1 2200 5100	11.8	116	9	6
	144201	1	.1	.01	1					
	146867	21	1.7	.18	2					
10 10 64	122000	48	4.0	.51	8	1 1759 5057	11.8	94	9	6
	122510	1	.1	.01	1					
	122519	9	.7	.09	8					
	122608	1	.1	.01	1					
	122631	6	.5	.06	6					
	131106	4	.3	.04	3					
	141209	5	.4	.05	3					
	146301	3	.2	.03	2					
	146867	125	10.5	1.32	1					
10 11 64	122000	39	3.2	.33	8	1 1420 5101	11.9	115	9	6
	122510	10	.8	.08	1					
	122519	3	.2	.02	3					
	122608	96	8.0	.83	10					
	122631	106	8.9	.92	36					
	123409	4	.3	.03	4					
	131116	2	.1	.01	2					
	133217	1	.1	.01	1					
	146301	3	.2	.02	3					
	146867	326	27.3	2.83	11					
10 12 64	122000	35	2.9	.29	11	1 1102 5006	11.8	117	9	6
	122501	1	.1	.01	1					
	122511	1	.1	.01	1					
	122519	14	1.1	.11	12					
	122524	1	.1	.01	1					
	122608	104	8.8	.86	42					
	122615	1	.1	.01	1					
	122631	66	5.5	.56	48					
	123409	2	.1	.01	2					
	131100	1	.1	.01	1					
	133217	1	.1	.01	1					
	141209	1	.1	.01	1					
	144201	1	.1	.01	1					
	146867	1	.1	.01	1					
10 13 64	122000	64	5.4	.52	14	1 1150 4757	11.8	123	9	6
	122501	1	.1	.01	1					
	122510	4	.3	.03	2					
	122519	62	5.2	.50	48					
	122524	2	.1	.01	2					
	122608	230	19.4	1.85	93					
	122624	12	1.0	.09	10					
	122631	61	5.1	.49	44					
	123409	4	.3	.03	4					
	131106	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	87	7.3	.70	5					
10 14 64	122000	67	5.6	.62	14	1 1556 4757	11.8	108	9	6
	122501	1	.1	.01	1					
	122519	5	.4	.04	5					
	122600	2	.1	.01	1					
	122608	84	7.1	.77	20					
	122409	1	.1	.01	1					
	122624	1	.1	.01	1					
	122631	91	7.7	.84	41					
	123409	2	.1	.01	2					
	131106	2	.1	.01	2					
	136107	1	.1	.01	1					
	144100	1	.1	.01	1					
	146301	8	.6	.07	3					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
10 14 64	146867	136	11.5	1.25	4	1 1556 4757	11.8	108	9	6
10 15 64	122000	5	.4	.04	4	1 1937 4758	11.7	111	9	6
	122519	3	.2	.02	3					
	122524	1	.1	.01	1					
	122608	4	.3	.03	4					
	122624	2	.1	.01	2					
	122631	41	3.5	.36	31					
	123409	4	.3	.03	4					
	131106	2	.1	.01	2					
	131112	1	.1	.01	1					
10 16 64	122000	7	.6	.05	7	1 2331 4759	11.6	120	9	6
	122519	5	.4	.04	5					
	122608	2	.1	.01	2					
	122609	1	.1	.01	1					
	122624	10	.8	.08	10					
	122631	49	4.2	.40	46					
	122642	1	.1	.01	1					
	123409	2	.1	.01	2					
	131106	2	.1	.01	2					
	141209	3	.2	.02	2					
	146301	1	.1	.01	1					
10 17 64	122000	3	.2	.02	3	1 2558 4905	11.7	131	9	6
	122519	2	.1	.01	1					
	122524	1	.1	.01	1					
	122624	1	.1	.01	1					
	122631	22	1.8	.16	19					
	123409	3	.2	.02	3					
	131106	1	.1	.01	1					
	146867	1	.1	.01	1					
10 18 64	122000	9	.7	.07	9	1 2500 5322	11.7	120	9	6
	122510	2	.1	.01	2					
	122519	16	1.3	.13	10					
	122524	1	.1	.01	1					
	122600	1	.1	.01	1					
	122624	22	1.8	.18	22					
	122631	14	1.1	.11	14					
	122633	1	.1	.01	1					
	122642	1	.1	.01	1					
	123409	13	1.1	.10	13					
	136107	5	.4	.04	4					
10 19 64	122000	12	1.0	.12	9	1 2442 5700	11.5	97	9	6
	122510	8	.6	.08	6					
	122519	1	.1	.01	1					
	122606	2	.1	.02	2					
	122608	4	.3	.04	2					
	122624	1	.1	.01	1					
	122631	16	1.3	.16	14					
	123000	1	.1	.01	1					
	123409	1	.1	.01	1					
	131112	1	.1	.01	1					
	133200	1	.1	.01	1					
	136107	4	.3	.04	2					
	145184	1	.1	.01	1					
	146301	2	.1	.02	1					
	146867	2	.1	.02	1					
10 20 64	122000	32	5.7	.47	6	1 2132 5724	5.6	67	9	6
	122510	61	10.8	.91	43					
	122519	2	.3	.02	2					
	122624	1	.1	.01	1					
	122631	11	1.9	.16	9					
	123409	2	.3	.02	2					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
10 20 64	131100	1	.1	.01	1	1 2132 5724	5.6	67	9	6
	133213	26	4.6	.38	19					
	133217	11	1.9	.16	5					
	136107	3	.5	.04	3					
	146101	1	.1	.01	1					
11 04 64	122510	33	15.0	1.50	20	1 2114 5749	2.2	22	10	6
	131106	1	.4	.04	1					
	131112	1	.4	.04	1					
	133213	22	10.0	1.00	13					
	133217	1	.4	.04	1					
	136107	1	.4	.04	1					
	144101	5	2.2	.22	3					
	146101	2	.9	.09	2					
11 05 64	122000	10	.8	.09	8	1 1841 5659	11.4	110	10	6
	122510	28	2.4	.25	8					
	122630	1	.1	.01	1					
	122631	43	3.7	.39	24					
	123409	3	.2	.02	3					
	131112	1	.1	.01	1					
	136107	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	36	3.1	.32	2					
11 06 64	122510	4	.3	.03	2	1 1455 5659	11.5	126	10	6
	122608	5	.4	.03	3					
	122631	8	.6	.06	7					
	136107	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	7	.6	.05	2					
11 07 64	122000	3	.2	.02	3	1 1118 5632	11.6	110	10	6
	122510	2	.1	.01	1					
	122608	47	4.0	.42	26					
	122631	31	2.6	.28	26					
	122633	1	.1	.01	1					
	123409	12	1.0	.10	12					
	131100	1	.1	.01	1					
	144100	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	46	3.9	.41	4					
11 08 64	122000	27	2.3	.22	7	1 1111 5358	11.7	120	10	6
	122510	41	3.5	.34	11					
	122519	7	.5	.05	5					
	122600	1	.1	.01	1					
	122608	40	3.4	.33	12					
	122609	1	.1	.01	1					
	122631	72	6.1	.60	35					
	[illegible]	15	1.2	.12	14					
	[illegible]	1	.1	.01	1					
	146867	94	8.0	.78	11					
11 09 64	122000	6	.5	.05	6	1 1455 5400	11.5	107	10	6
	122519	15	1.3	.14	12					
	122520	343	29.8	3.20	16					
	122600	1	.1	.01	1					
	122608	8	.6	.07	7					
	122631	33	2.8	.30	28					
	122633	2	.1	.01	2					
	123409	1	.1	.01	1					
	136107	2	.1	.01	1					
11 10 64	122000	5	.4	.04	3	1 1850 5357	11.3	116	10	6
	122520	400	35.3	3.44	65					
	122606	1	.1	.01	1					
	122608	5	.4	.04	5					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
11 10 64	122631	7	.6	.06	6	1 1850 5357	11.3	116	10	6
	122636	1	.1	.01	1					
	122642	1	.1	.01	1					
	131100	2	.1	.01	2					
	146867	2	.1	.01	2					
11 11 64	121110	1	.1	.01	1	1 2233 5356	11.1	104	10	6
	122000	1	.1	.01	1					
	122519	1	.1	.01	1					
	122520	7	.6	.06	2					
	122624	1	.1	.01	1					
	122631	2	.1	.01	2					
	123409	3	.2	.02	2					
	131106	2	.1	.01	2					
11 12 64	122000	1	.1	.01	1	1 2330 5109	11.0	95	10	6
	122519	7	.6	.07	7					
	122520	93	8.4	.97	22					
	131106	2	.1	.02	2					
	136107	1	.1	.01	1					
11 13 64	122000	1	.1	.01	1	1 2008 5097	11.2	105	10	6
	122519	1	.1	.01	1					
	122520	16	1.4	.15	6					
	122606	1	.1	.01	1					
	122631	3	.2	.02	3					
	123409	3	.2	.02	3					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
11 14 64	122000	32	2.8	.26	8	1 1624 5100	11.4	121	10	6
	122520	3	.2	.02	3					
	122608	10	.8	.08	6					
	122609	1	.1	.01	1					
	122630	1	.1	.01	1					
	122631	13	1.1	.10	10					
	122633	1	.1	.01	1					
	122636	2	.1	.01	1					
	123409	2	.1	.01	2					
	136107	1	.1	.01	1					
	146867	122	10.7	1.00	6					
11 15 64	122000	7	.6	.06	3	1 1235 5051	11.6	115	10	6
	122510	12	1.0	.10	6					
	122524	1	.1	.01	1					
	122600	1	.1	.01	1					
	122608	67	5.7	.58	39					
	122609	1	.1	.01	1					
	122615	1	.1	.01	1					
	122631	12	1.0	.10	8					
	122633	2	.1	.01	2					
	123409	10	.8	.08	10					
	146867	108	9.3	.93	8					
11 16 64	122000	4	.3	.04	3	1 1023 4824	11.5	94	10	6
	122510	11	.9	.11	8					
	122520	2	.1	.02	2					
	122608	82	7.1	.87	30					
	122609	1	.1	.01	1					
	122631	2	.1	.02	2					
	122633	1	.1	.01	1					
	123409	16	1.3	.17	15					
	146867	2	.1	.02	2					
11 17 64	122000	12	1.0	.09	3	1 1309 4801	11.5	121	10	6
	122510	10	.8	.08	10					
	122519	9	.7	.07	5					
	122524	2	.1	.01	2					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
11 17 64	122608	28	2.4	.23	22	1 1309 4801	11.5	121	10	6
	122631	8	.6	.06	5					
	123409	6	.5	.04	6					
	146301	11	.9	.09	6					
	146867	114	9.9	.94	6					
11 18 64	087007	2	.1	.01	1	1 1720 4758	11.3	103	10	6
	122000	3	.2	.02	3					
	122510	5	.4	.04	5					
	122519	5	.4	.04	3					
	122521	1	.1	.01	1					
	122606	1	.1	.01	1					
	122608	2	.1	.01	1					
	122631	11	.9	.10	10					
	123409	4	.3	.03	4					
	123423	2	.1	.01	2					
	131106	1	.1	.01	1					
	133213	1	.1	.01	1					
11 19 64	122000	4	.3	.03	4	1 2100 4759	11.0	113	10	6
	122510	1	.1	.01	1					
	122519	5	.4	.04	5					
	122631	12	1.0	.10	11					
	122633	1	.1	.01	1					
	122642	2	.1	.01	2					
	123409	7	.6	.06	7					
	123423	1	.1	.01	1					
	131106	2	.1	.01	2					
	131112	4	.3	.03	3					
11 20 64	121110	7	.6	.06	4	1 2458 4758	11.0	115	10	6
	122000	1	.1	.01	1					
	122510	1	.1	.01	1					
	122519	13	1.1	.11	12					
	122624	1	.1	.01	1					
	122631	1	.1	.01	1					
	123409	6	.5	.05	5					
	136107	1	.1	.01	1					
11 21 64	121110	6	.5	.05	4	1 2526 5007	10.9	116	10	6
	122000	4	.3	.03	4					
	122519	1	.1	.01	1					
	122524	1	.1	.01	1					
	123409	6	.5	.05	3					
	131106	1	.1	.01	1					
11 22 64	121110	37	3.4	.44	5	1 2501 5400	11.0	84	10	6
	122000	4	.3	.04	4					
	122510	9	.8	.11	8					
	122519	22	2.0	.26	14					
	122520	5	.4	.06	5					
	122521	2	.1	.02	2					
	122631	5	.4	.05	4					
	122633	1	.1	.01	1					
	123409	3	.2	.03	3					
	131106	1	.1	.01	1					
	131112	2	.1	.02	2					
	136107	4	.3	.04	3					
	146301	1	.1	.01	1					
11 23 64	121110	41	3.7	.35	5	1 2341 5700	10.9	117	10	6
	121111	1	.1	.01	1					
	122510	42	3.8	.35	20					
	122519	4	.3	.03	4					
	122520	1	.1	.01	1					
	122606	1	.1	.01	1					
	122608	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
11 23 64	122630	1	.1	.01	1	1 2341 5700	10.9	117	10	6
	122631	5	.4	.04	5					
	131100	1	.1	.01	1					
	131106	3	.2	.02	1					
	133213	1	.1	.01	1					
	136107	10	.9	.09	7					
	146301	1	.1	.01	1					
	146867	27	2.4	.23	2					
12 01 64	121110	5	1.2	.10	4	1 2101 5739	4.1	48	11	6
	122000	1	.2	.02	1					
	122510	14	3.4	.29	3					
	122631	1	.2	.02	1					
	131109	6	1.4	.12	2					
	131106	1	.2	.02	1					
	131112	1	.2	.02	1					
	133213	17	4.1	.35	4					
	133217	1	.2	.02	1					
	136107	1	.2	.02	1					
	144101	5	1.2	.10	3					
	145100	3	.7	.06	1					
	146101	107	26.0	2.22	5					
	146867	22	5.3	.45	2					
12 02 64	122000	2	.1	.01	2	1 1758 5659	11.2	109	11	6
	122510	2	.1	.01	2					
	123409	1	.1	.01	1					
	131112	2	.1	.01	2					
	136107	1	.1	.01	1					
12 03 64	122000	7	.6	.05	3	1 1418 5700	11.3	120	11	6
	122608	3	.2	.02	3					
	122609	1	.1	.01	1					
	123409	1	.1	.01	1					
	131106	1	.1	.01	1					
	146867	25	2.2	.20	1					
12 04 64	122000	2	.1	.01	2	1 1053 5542	11.4	110	11	6
	122510	2	.1	.01	2					
	122524	1	.1	.01	1					
	122608	7	.6	.06	6					
	122631	5	.4	.04	4					
	122633	1	.1	.01	1					
	122701	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	7	.6	.06	6					
	131106	1	.1	.01	1					
	146867	19	1.6	.17	5					
12 05 64	122000	2	.1	.01	2	1 1143 5359	11.5	103	11	6
	122510	3	.2	.02	3					
	122519	1	.1	.01	1					
	122520	1	.1	.01	1					
	122608	20	1.7	.19	9					
	122624	1	.1	.01	1					
	122631	3	.2	.02	3					
	133213	1	.1	.01	1					
	136107	4	.3	.03	2					
	144100	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	9	.7	.08	1					
12 06 64	122504	2	.1	.02	1	1 1511 5401	11.3	93	11	6
	122510	2	.1	.02	2					
	122520	1	.1	.01	1					
	122631	1	.1	.01	1					
	122642	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
12 06 64	123409	1	.1	.01	1	1 1511 5401	11.3	93	11	6
	131106	2	.1	.02	2					
	146301	3	.2	.03	2					
12 07 64	122000	3	.2	.02	2	1 1859 5400	11.0	114	11	6
	122510	5	.4	.04	3					
	122519	2	.1	.01	2					
	122520	7	.6	.06	7					
	122609	1	.1	.01	1					
	122631	1	.1	.01	1					
	122633	1	.1	.01	1					
	122636	1	.1	.01	1					
	122642	1	.1	.01	1					
	123409	3	.2	.02	3					
	123423	1	.1	.01	1					
	131100	1	.1	.01	1					
	131112	4	.3	.03	2					
	144100	1	.1	.01	1					
	146110	1	.1	.01	1					
	146301	3	.2	.02	1					
	146867	30	2.7	.26	1					
12 08 64	121110	28	2.5	.25	7	1 2307 5356	10.8	108	11	6
	122000	1	.1	.01	1					
	122510	15	1.3	.13	9					
	122519	1	.1	.01	1					
	122520	1	.1	.01	1					
	122524	1	.1	.01	1					
	122631	1	.1	.01	1					
	122633	1	.1	.01	1					
	133213	2	.1	.01	1					
12 09 64	121110	17	1.5	.18	13	1 2249 5055	10.8	93	11	6
	122000	2	.1	.02	2					
	122510	3	.2	.03	3					
	122631	1	.1	.01	1					
	123409	2	.1	.02	2					
	131112	2	.1	.02	2					
12 10 64	100000	1	.1	.01	1	1 1901 5100	11.0	113	11	6
	122000	3	.2	.02	2					
	122510	4	.3	.03	3					
	122601	1	.1	.01	1					
	122630	1	.1	.01	1					
	122631	1	.1	.01	1					
	122642	1	.1	.01	1					
	131106	1	.1	.01	1					
	133213	1	.1	.01	1					
	146867	2	.1	.01	1					
12 11 64	100000	1	.1	.01	1	1 1511 5059	11.3	104	11	6
	122000	2	.1	.01	2					
	122510	2	.1	.01	1					
	122608	1	.1	.01	1					
	122609	2	.1	.01	1					
	122631	1	.1	.01	1					
	122642	1	.1	.01	1					
	123409	6	.5	.05	6					
	131100	1	.1	.01	1					
	131112	1	.1	.01	1					
	146867	200	17.6	1.92	1					
12 12 64	087000	100	8.7	1.12	1	1 1131 5059	11.4	89	11	6
	100000	2	.1	.02	2					
	122000	7	.6	.07	7					
	122510	5	.4	.05	4					
	122520	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
12 12 64	122608	18	1.5	.20	8	1 1131 5059	11.4	89	11	6
	122609	2	.1	.02	2					
	122631	2	.1	.02	2					
	122633	1	.1	.01	1					
	123409	4	.3	.04	4					
	146867	101	8.8	1.13	4					
12 13 64	122000	13	1.1	.11	4	1 1804 4758	11.5	118	11	6
	122510	31	2.6	.28	7					
	122524	1	.1	.01	1					
	122601	1	.1	.01	1					
	122608	20	1.7	.18	18					
	122609	1	.1	.01	1					
	123409	5	.4	.04	4					
	146867	46	4.0	.41	4					
12 14 64	122000	13	1.1	.11	10	1 1411 4759	11.3	116	11	6
	122501	1	.1	.01	1					
	122510	11	.9	.09	9					
	122520	1	.1	.01	1					
	122606	1	.1	.01	1					
	122608	81	7.1	.68	33					
	122609	2	.1	.01	2					
	122631	1	.1	.01	1					
	122642	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	5	.4	.04	5					
	131100	2	.1	.01	1					
	133213	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	35	3.0	.29	7					
12 15 64	122000	7	.6	.06	7	1 1816 4802	11.1	109	11	6
	122520	1	.1	.01	1					
	122608	8	.7	.07	6					
	122609	1	.1	.01	1					
	122642	1	.1	.01	1					
	123409	1	.1	.01	1					
12 16 64	121110	2	.1	.01	2	1 2214 4758	10.8	122	11	6
	122000	2	.1	.01	2					
	122600	2	.1	.01	2					
	123000	2	.1	.01	1					
	123409	5	.4	.04	5					
	131100	1	.1	.01	1					
12 17 64	121110	11	1.0	.10	5	1 2620 4800	10.6	110	11	6
	122624	1	.1	.01	1					
	122631	1	.1	.01	1					
	123409	9	.8	.08	8					
12 18 64	121110	120	11.2	1.04	17	1 2504 5109	10.7	115	11	6
	122510	1	.1	.01	1					
	122520	2	.1	.01	2					
	122608	2	.1	.01	2					
	122633	2	.1	.01	2					
	123409	3	.3	.02	3					
	131112	1	.1	.01	1					
	136107	1	.1	.01	1					
12 19 64	121110	42	3.9	.39	11	1 2459 5695	10.7	107	11	6
	122000	6	.5	.05	6					
	122510	7	.6	.06	6					
	~~100004~~	~~1~~	~~.1~~	~~.01~~	~~1~~					
	122608	2	.1	.01	2					
	122609	3	.2	.02	3					
	122630	2	.1	.01	1					
	122633	3	.2	.02	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
12 19 64	123000	2	.1	.01	2	1 2459 5655	10.7	107	11	6
	123409	2	.1	.01	2					
	131100	2	.1	.01	2					
	131112	6	.5	.05	5					
	133213	3	.2	.02	3					
	146000	1	.1	.01	1					
12 20 64	121110	57	8.7	.83	10	1 2136 5722	6.5	68	11	6
	122000	4	.6	.05	4					
	122510	3	.4	.04	3					
	122520	1	.1	.01	1					
	122521	1	.1	.01	1					
	122608	3	.4	.04	3					
	133213	52	8.0	.76	8					
	136107	2	.3	.02	2					
	144101	15	2.3	.22	14					
	146101	2	.3	.02	2					
	146867	81	12.4	1.19	3					
01 05 65	122510	3	.6	.05	2	1 2059 5739	4.7	52	12	6
	122600	2	.4	.03	2					
	122630	1	.2	.01	1					
	131106	1	.2	.01	1					
	133213	8	1.7	.15	5					
	133217	4	.8	.07	1					
	144100	1	.2	.01	1					
	144101	7	1.4	.13	5					
	145100	3	.6	.05	2					
	146101	25	5.3	.48	1					
	146301	2	.4	.03	1					
	146867	52	11.0	1.00	2					
01 06 65	122000	15	1.3	.17	3	1 1830 5701	11.1	85	12	6
	122500	1	.1	.01	1					
	122510	5	.4	.05	2					
	122608	4	.3	.04	2					
	122609	1	.1	.01	1					
	122630	2	.1	.02	1					
	122633	4	.3	.04	3					
	123000	1	.1	.01	1					
	123409	37	3.3	.43	20					
	131112	2	.1	.02	2					
	146101	1	.1	.01	1					
	146301	8	.7	.09	5					
	146867	404	36.3	4.75	8					
01 07 65	122000	2	.1	.01	2	1 1456 5700	11.3	123	12	6
	122510	3	.2	.02	3					
	122608	3	.2	.02	3					
	122609	1	.1	.01	1					
	122633	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	1	.1	.01	1					
	133206	1	.1	.01	1					
01 08 65	122000	2	.1	.02	2	1 1122 5649	11.4	88	12	6
	122510	1	.1	.01	1					
	122524	2	.1	.02	1					
	122600	1	.1	.01	1					
	122608	2	.1	.02	2					
	122629	1	.1	.01	1					
	122633	2	.1	.02	2					
	123000	2	.1	.02	2					
	123409	1	.1	.01	1					
	131100	3	.2	.03	1					
	146867	5	.4	.05	3					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
01 09 65	100000	1	.1	.01	1	1 1101 5359	11.5	117	12	6
	122000	11	.9	.09	4					
	122510	7	.6	.05	5					
	122608	3	.2	.02	3					
	122636	1	.1	.01	1					
	123000	1	.1	.01	1					
	123409	1	.1	.01	1					
	131106	3	.2	.02	2					
	146301	1	.1	.01	1					
	146867	125	10.8	1.06	1					
01 10 65	122000	8	.7	.06	2	1 1457 5405	11.3	122	12	6
	122510	5	.4	.04	4					
	122608	5	.4	.04	4					
	122631	1	.1	.01	1					
	122633	2	.1	.01	2					
	123000	3	.2	.02	2					
	123409	3	.2	.02	3					
	131100	1	.1	.01	1					
	133206	1	.1	.01	1					
	136107	2	.1	.01	2					
	146301	3	.2	.02	2					
	146867	165	14.6	1.35	4					
01 11 65	100000	1	.1	.01	1	1 1980 5400	11.1	118	12	6
	122000	12	1.0	.10	2					
	122510	18	1.6	.15	6					
	122600	1	.1	.01	1					
	122608	2	.1	.01	1					
	122609	1	.1	.01	1					
	122633	1	.1	.01	1					
	123409	3	.2	.02	3					
	131112	2	.1	.01	2					
	146000	100	9.0	.84	1					
	146301	5	.4	.04	3					
	146867	336	30.2	2.84	8					
01 12 65	100000	1	.1	.01	1	1 2315 5392	10.8	120	12	6
	121110	4	.3	.03	3					
	122000	11	1.0	.09	7					
	122510	5	.4	.04	2					
	122608	2	.1	.01	1					
	122609	1	.1	.01	1					
	122633	1	.1	.01	1					
	123409	3	.2	.02	2					
	131112	2	.1	.01	2					
	136107	1	.1	.01	1					
	146301	2	.1	.01	2					
	146867	128	11.8	1.06	7					
01 13 65	121110	1	.1	.01	1	1 2231 5857	10.9	102	12	6
	122000	3	.2	.02	2					
	122520	2	.1	.01	2					
	122601	2	.1	.01	2					
	122608	3	.2	.02	2					
	122642	1	.1	.01	1					
	123409	2	.1	.01	2					
01 14 65	122000	2	.1	.01	1	1 1038 5105	11.1	122	12	6
	122510	2	.1	.01	2					
	122600	1	.1	.01	1					
	122608	4	.3	.03	2					
	122609	1	.1	.01	1					
	122633	1	.1	.01	1					
	122647	1	.1	.01	1					
	123000	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
01 14 65	123409	6	.5	.04	5	1 1838 5105	11.1	122	12	6
01 15 65	122608	3	.2	.03	3	1 1516 5103	11.3	90	12	6
	123409	3	.2	.03	2					
	131112	1	.1	.01	1					
	133206	1	.1	.01	1					
	146867	1	.1	.01	1					
01 16 65	122000	4	.3	.04	3	1 1130 5056	11.4	98	12	6
	122501	1	.1	.01	1					
	122510	1	.1	.01	1					
	122608	8	.7	.08	4					
	123409	1	.1	.01	1					
	131106	1	.1	.01	1					
	136107	3	.2	.03	2					
	146000	181	15.8	1.84	3					
	146301	1	.1	.01	1					
	146867	480	42.1	4.89	3					
01 17 65	122000	1	.1	.01	1	1 1055 4803	11.5	108	12	6
	122608	3	.2	.02	3					
	122633	1	.1	.01	1					
	123409	2	.1	.01	2					
	131106	1	.1	.01	1					
	136107	2	.1	.01	1					
	146000	3	.2	.02	1					
	146301	1	.1	.01	1					
	146867	1	.1	.01	1					
01 18 65	122000	1	.1	.01	1	1 1446 4802	11.4	118	12	6
	122630	1	.1	.01	1					
	122633	2	.1	.01	2					
	123409	5	.4	.04	5					
	146867	3	.2	.02	2					
01 19 65	100000	1	.1	.01	1	1 1851 4757	11.2	118	12	6
	123409	4	.3	.03	3					
	131112	1	.1	.01	1					
01 20 65	100007	1	.1	.01	1	1 2238 4756	10.9	99	12	6
	121110	39	3.5	.39	9					
	122000	1	.1	.01	1					
	122500	1	.1	.01	1					
	122633	1	.1	.01	1					
	123409	8	.7	.08	6					
	131100	1	.1	.01	1					
	131106	2	.1	.02	1					
	136107	1	.1	.01	1					
	146867	1	.1	.01	1					
01 21 65	121110	66	6.1	.59	8	1 2621 4811	10.8	112	12	6
	122600	1	.1	.01	1					
	122608	1	.1	.01	1					
	123409	2	.1	.02	2					
01 22 65	007007	3	.2	.03	1	1 2459 5154	11.0	118	12	6
	121110	207	18.8	1.75	10					
	122524	1	.1	.01	1					
	122601	1	.1	.01	1					
	122631	1	.1	.01	1					
01 23 65	121110	140	12.7	1.28	15	1 2457 5639	11.0	109	12	6
	121112	1	.1	.01	1					
	122500	1	.1	.01	1					
01 24 65	121110	42	4.7	.48	8	1 2159 5703	8.8	86	12	6
	122000	1	.1	.01	1					
	122510	1	.1	.01	1					
	122631	1	.1	.01	1					
	122701	1	.1	.01	1					
	131112	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
01 24 65	133213	17	1.9	.19	9	1 2159 5703	8.8	86	12	6
	133217	4	.4	.04	3					
	136107	10	1.1	.11	3					
	144100	3	.3	.03	1					
	144101	4	.4	.04	3					
	146000	17	1.9	.19	3					
	146101	50	5.6	.58	5					
	146110	6	.6	.06	1					
	146867	372	42.2	4.32	23					
02 08 65	007007	8	1.4	.13	4	1 2101 5740	5.5	60	13	6
	100000	30	5.4	.50	1					
	121110	3	.5	.05	2					
	131100	1	.1	.01	1					
	133200	1	.1	.01	1					
	133213	84	15.2	1.40	27					
	133217	8	1.4	.13	5					
	136107	1	.1	.01	1					
	144101	1	.1	.01	1					
	146000	3	.5	.05	1					
	146101	7	1.2	.11	1					
	146867	144	26.1	2.40	10					
02 09 65	142101	1	.1	.01	1	1 1737 5659	11.5	84	13	6
	146101	11	.9	.13	1					
	146301	7	.6	.08	3					
	146867	58	5.0	.69	6					
02 10 65	123409	3	.2	.02	3	1 1424 5656	11.6	127	13	6
	131106	1	.1	.01	1					
	131112	3	.2	.02	3					
	133206	1	.1	.01	1					
	136107	1	.1	.01	1					
	146301	3	.2	.02	2					
	146867	40	3.4	.31	3					
02 11 65	100000	1	.1	.01	1	1 1055 5549	11.6	115	13	6
	122609	1	.1	.01	1					
	123409	3	.2	.02	2					
	133206	1	.1	.01	1					
	136107	2	.1	.01	2					
	146301	1	.1	.01	1					
02 12 65	122000	1	.1	.01	1	1 1134 5402	11.7	121	13	6
	122606	2	.1	.01	1					
	122633	1	.1	.01	1					
	123409	3	.2	.02	3					
	146301	1	.1	.01	1					
	146867	80	6.8	.66	7					
02 13 65	122000	2	.1	.01	2	1 1537 5400	11.6	120	13	6
	122510	1	.1	.01	1					
	123409	3	.2	.02	3					
	133213	1	.1	.01	1					
	133217	1	.1	.01	1					
	146867	88	7.5	.73	9					
02 14 65	007007	1	.1	.01	1	1 1924 5357	11.5	113	13	6
	100000	2	.1	.01	1					
	121110	1	.1	.01	1					
	122000	1	.1	.01	1					
	123409	9	.7	.07	8					
	131100	2	.1	.01	1					
	131112	1	.1	.01	1					
	146867	77	6.6	.68	9					
02 15 65	121110	32	2.8	.27	7	1 2327 5357	11.3	118	13	6
	122000	2	.1	.01	2					
	123409	4	.3	.03	4					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
02 15 65	136107	2	.1	.01	2	1 2327 5357	11.3	118	13	6
	143000	1	.1	.01	1					
	144101	1	.1	.01	1					
	146000	2	.1	.01	1					
	146301	2	.1	.01	1					
	146867	94	8.3	.79	7					
02 16 65	121110	8	.6	.07	4	1 2203 5057	11.5	111	13	6
	122519	1	.1	.01	1					
	123409	10	.8	.09	7					
	131100	1	.1	.01	1					
	136107	2	.1	.01	2					
	143000	2	.1	.01	1					
	146867	54	4.6	.48	2					
02 17 65	121110	10	.8	.10	4	1 1808 5100	11.6	96	13	6
	122000	2	.1	.02	2					
	122642	1	.1	.01	1					
	123409	9	.7	.09	8					
	131112	3	.2	.03	3					
	146301	1	.1	.01	1					
	146867	53	4.5	.55	4					
02 18 65	121110	57	4.8	.46	8	1 1429 5101	11.7	122	13	6
	122000	1	.1	.01	1					
	122510	2	.1	.01	2					
	122701	1	.1	.01	1					
	123409	20	1.7	.16	18					
	146009	1	.1	.01	1					
	146867	37	3.1	.30	8					
02 19 65	121110	11	.9	.12	5	1 1118 5037	11.7	86	13	6
	122000	6	.5	.06	4					
	123409	8	.6	.09	8					
	133206	1	.1	.01	1					
	146867	93	7.9	1.08	4					
02 20 65	122000	13	1.1	.10	7	1 1118 4808	11.8	124	13	6
	122510	4	.3	.03	4					
	122521	2	.1	.01	2					
	122524	1	.1	.01	1					
	122608	1	.1	.01	1					
	123409	8	.6	.06	8					
	133206	1	.1	.01	1					
	146301	3	.2	.02	3					
	146867	482	40.8	3.88	24					
02 21 65	122000	2	.1	.01	2	1 1503 4801	11.8	109	13	6
	123409	1	.1	.01	1					
	131106	1	.1	.01	1					
02 22 65	121110	1	.1	.01	1	1 1900 4802	11.7	109	13	6
	131112	1	.1	.01	1					
	136107	1	.1	.01	1					
	143000	1	.1	.01	1					
02 23 65	121110	12	1.0	.12	7	1 2244 4759	11.6	98	13	6
	122101	1	.1	.01	1					
02 24 65	121110	61	5.2	.51	10	1 2626 4803	11.6	118	13	6
	131112	1	.1	.01	1					
	143000	1	.1	.01	1					
02 25 65	121110	105	8.9	.83	9	1 2501 5208	11.7	126	13	6
	121111	4	.3	.03	4					
	143000	1	.1	.01	1					
02 26 65	121110	80	6.8	.74	10	1 2458 5659	11.6	108	13	6
	121111	3	.2	.02	2					
	123409	1	.1	.01	1					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
02 26 65	136107	2	.1	.01	2	1 2458 5659	11.6	108	13	6
	146867	3	.2	.02	2					
02 27 65	121110	36	4.3	.48	6	1 2155 5705	8.2	74	13	6
	121111	1	.1	.01	1					
	133213	20	2.4	.27	16					
	133217	3	.3	.04	2					
	136107	4	.4	.05	3					
	143080	2	.2	.02	1					
	144101	1	.1	.01	1					
	146000	33	4.0	.44	2					
	146101	148	18.0	2.00	16					
	146867	499	60.8	6.74	70					
03 08 65	007007	2	.9	.08	1	1 2114 5754	2.2	25	14	6
	121110	3	1.3	.12	2					
	133213	107	48.6	4.28	9					
	133217	8	3.6	.32	5					
	144100	9	4.0	.36	4					
	146101	151	68.6	6.04	7					
	146867	173	78.6	6.92	6					
03 09 65	007007	1	.1	.01	1	1 1820 5701	11.9	112	14	6
	100000	1	.1	.01	1					
	122000	8	.6	.07	3					
	122510	15	1.2	.13	6					
	123409	3	.2	.02	2					
	131106	1	.1	.01	1					
	136107	1	.1	.01	1					
	146301	4	.3	.03	4					
	146867	99	8.3	.88	9					
03 10 65	100000	1	.1	.01	1	1 1426 5701	12.0	130	14	6
	122000	1	.1	.01	1					
	122510	2	.1	.01	2					
	122519	1	.1	.01	1					
	123409	1	.1	.01	1					
	136107	2	.1	.01	2					
	146301	2	.1	.01	1					
	146867	35	2.9	.26	3					
03 11 65	010000	1	.1	.01	1	1 1126 5700	12.0	75	14	6
	122608	1	.1	.01	1					
	146867	4	.3	.05	2					
03 12 65	122000	1	.1	.01	1	1 1049 5359	12.0	105	14	6
	122510	1	.1	.01	1					
	122608	1	.1	.01	1					
	123409	1	.1	.01	1					
	133217	1	.1	.01	1					
	143000	3	.2	.02	2					
03 13 65	122000	16	1.3	.14	3	1 1428 5357	12.0	114	14	6
	122510	6	.5	.05	6					
	122518	1	.1	.01	1					
	122608	1	.1	.01	1					
	123409	2	.1	.01	2					
	131106	3	.2	.02	3					
	131112	1	.1	.01	1					
	143000	1	.1	.01	1					
	144100	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	184	15.3	1.61	20					
03 14 65	122080	3	.2	.03	2	1 1807 5402	12.0	92	14	6
	122510	49	4.0	.53	15					
	122519	3	.2	.03	2					
	122600	1	.1	.01	1					
	123409	2	.1	.02	2					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
03 14 65	131100	1	.1	.01	1	1 1807 5402	12.0	92	14	6
	131106	2	.1	.02	2					
	143000	8	.6	.08	3					
	146301	9	.7	.09	3					
	146867	245	20.4	2.66	13					
03 15 65	121110	17	1.4	.14	5	1 2158 5400	12.0	119	14	6
	122000	79	6.5	.66	10					
	122510	27	2.2	.22	5					
	122519	8	.6	.06	6					
	123409	8	.6	.06	5					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	136107	4	.3	.03	3					
	143000	12	1.0	.10	5					
	146301	4	.3	.03	1					
	146867	443	36.9	3.72	15					
03 16 65	121110	42	3.5	.34	7	1 2330 5115	11.9	123	14	6
	121111	2	.1	.01	2					
	122000	1	.1	.01	1					
	122510	4	.3	.03	4					
	123409	3	.2	.02	3					
	131100	1	.1	.01	1					
	136107	2	.1	.01	2					
	143000	7	.5	.05	6					
	146867	6	.5	.04	3					
03 17 65	121110	24	1.9	.21	4	1 1959 5058	12.1	112	14	6
	121111	1	.1	.01	1					
	122000	2	.1	.01	2					
	122510	3	.2	.02	3					
	122608	1	.1	.01	1					
	123409	3	.2	.02	3					
	131106	1	.1	.01	1					
	136107	1	.1	.01	1					
	143000	4	.3	.03	3					
	146867	4	.3	.03	2					
03 18 65	121110	8	.6	.06	3	1 1559 5103	12.1	132	14	6
	122000	1	.1	.01	1					
	122510	21	1.7	.15	16					
	122519	1	.1	.01	1					
	122608	1	.1	.01	1					
	123409	3	.2	.02	3					
	143000	6	.4	.04	5					
	146867	4	.3	.03	2					
03 19 65	122000	1	.1	.01	1	1 1209 5101	12.1	89	14	6
	122519	33	2.7	.37	25					
	122608	5	.4	.05	5					
	123409	4	.3	.04	3					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	143000	2	.1	.02	2					
03 20 65	122000	73	6.0	.65	9	1 1014 4822	12.0	112	14	6
	122510	8	.6	.07	7					
	122519	119	9.9	1.06	95					
	122521	1	.1	.01	1					
	122608	11	.9	.09	6					
	123409	6	.5	.05	5					
	133217	1	.1	.01	1					
	146867	150	12.5	1.33	3					
03 21 65	122000	1	.1	.01	1	1 1316 4800	12.1	121	14	6
	122510	29	2.3	.23	5					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
03 21 65	122519	65	5.3	.53	55	1 1316 4800	12.1	121	14	6
	122608	15	1.2	.12	5					
	123409	11	.9	.09	11					
	131100	2	.1	.01	2					
	133217	2	.1	.01	2					
	143000	2	.1	.01	2					
	146301	1	.1	.01	1					
	146867	86	7.1	.71	4					
03 22 65	100000	1	.1	.01	1	1 1714 4801	12.1	126	14	6
	122000	5	.4	.03	4					
	122510	8	.6	.06	6					
	122519	8	.6	.06	7					
	122608	3	.2	.02	3					
	123409	1	.1	.01	1					
	146867	7	.5	.05	1					
03 23 65	122000	3	.2	.02	3	1 2112 4754	12.2	121	14	6
	122510	1	.1	.01	1					
	122519	5	.4	.04	4					
	123409	6	.4	.04	5					
	131106	1	.1	.01	1					
	136107	1	.1	.01	1					
	143000	2	.1	.01	1					
03 24 65	121110	19	1.5	.14	5	1 2503 4806	12.2	130	14	6
	121111	1	.1	.01	1					
	122000	3	.2	.02	3					
	122510	3	.2	.02	3					
	122519	2	.1	.01	2					
	123409	11	.9	.08	11					
03 25 65	121110	26	2.0	.25	5	1 2510 5043	12.4	104	14	6
	122000	5	.4	.04	2					
	122510	1	.1	.01	1					
	122519	18	1.4	.17	14					
	122520	1	.1	.01	1					
	123409	3	.2	.02	3					
	143000	3	.2	.02	3					
03 26 65	121110	13	1.0	.10	3	1 2456 5434	12.4	119	14	6
	121111	1	.1	.01	1					
	122000	2	.1	.01	2					
	122510	7	.5	.05	3					
	122519	52	4.1	.43	35					
	122608	1	.1	.01	1					
	122609	1	.1	.01	1					
	123409	5	.4	.04	3					
	136107	1	.1	.01	1					
	146867	17	1.3	.14	7					
03 27 65	121110	6	.4	.05	2	1 2330 5708	12.1	111	14	6
	121111	6	.4	.05	4					
	122000	47	3.8	.42	13					
	122510	251	20.7	2.26	24					
	122519	71	5.8	.63	31					
	122636	2	.1	.01	2					
	123409	8	.6	.07	8					
	131106	3	.2	.02	2					
	133206	3	.2	.02	2					
	133213	7	.5	.06	3					
	136107	7	.5	.06	7					
	143000	2	.1	.01	2					
	144100	3	.2	.02	1					
	146101	26	2.1	.23	2					
	146301	2	.1	.01	2					
	146867	884	73.8	7.96	31					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
04 11 65	180000	1	.1	.01	1	1 2125 5843	9.8	114	15	6
	121110	3	.3	.02	3					
	122000	6	.6	.05	5					
	122500	2	.2	.01	2					
	122510	95	9.6	.83	43					
	122519	80	8.1	.70	49					
	122521	2	.2	.01	2					
	122524	3	.3	.02	2					
	122701	2	.2	.01	2					
	123000	5	.5	.04	5					
	123409	8	.8	.07	6					
	131112	3	.3	.02	3					
	133213	15	1.5	.13	11					
	136107	1	.1	.01	1					
	144101	36	3.6	.31	15					
	146000	1	.1	.01	1					
	146100	4	.4	.03	1					
	146101	219	22.3	1.92	28					
	146201	3	.3	.02	2					
	146301	1	.1	.01	1					
	146867	118	12.0	1.03	14					
04 12 65	121110	2	.1	.01	2	1 1833 5658	12.5	112	15	6
	122000	1	.1	.01	1					
	122510	21	1.6	.18	17					
	122519	178	14.2	1.58	82					
	122600	1	.1	.01	1					
	122624	1	.1	.01	1					
	122701	7	.5	.06	7					
	123409	8	.6	.07	7					
	133213	1	.1	.01	1					
	136107	2	.1	.01	2					
	146101	2	.1	.01	1					
	146301	6	.4	.05	1					
	146867	22	1.7	.19	14					
04 13 65	180000	6	.4	.04	5	1 1438 5700	12.5	124	15	6
	122000	11	.8	.08	9					
	122510	5	.4	.04	5					
	122518	1	.1	.01	1					
	122519	35	2.8	.28	30					
	122701	12	.9	.09	11					
	123409	12	.9	.09	10					
	131106	1	.1	.01	1					
	144101	3	.2	.02	3					
04 14 65	122000	4	.3	.04	4	1 1129 5654	12.4	87	15	6
	122510	59	4.7	.67	28					
	122519	43	3.4	.49	32					
	122701	24	1.9	.27	20					
	123409	21	1.6	.24	17					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	144101	1	.1	.01	1					
	146867	75	6.0	.86	8					
04 15 65	087000	12	.9	.09	1	1 1102 5404	12.4	124	15	6
	180000	2	.1	.01	1					
	122000	15	1.2	.12	8					
	122510	42	3.3	.33	14					
	122519	20	1.6	.16	16					
	122521	1	.1	.01	1					
	122524	6	.4	.04	3					
	122701	1	.1	.01	1					
	123409	10	.8	.08	9					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
04 15 65	131112	2	.1	.01	2	1 1102 5404	12.4	124	15	6
	133206	1	.1	.01	1					
	144100	3	.2	.02	3					
	144101	5	.4	.04	3					
	146867	184	14.8	1.48	14					
04 16 65	180000	4	.3	.03	4	1 1459 5359	12.5	125	15	6
	122000	10	.8	.08	7					
	122510	55	4.4	.44	20					
	122519	31	2.4	.24	21					
	122521	1	.1	.01	1					
	122524	1	.1	.01	1					
	122624	1	.1	.01	1					
	122701	9	.7	.07	8					
	123409	22	1.7	.17	19					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	136107	2	.1	.01	2					
	144101	10	.8	.08	8					
	146000	1	.1	.01	1					
	146101	5	.4	.04	1					
	146301	2	.1	.01	2					
	146867	240	19.2	1.92	26					
04 17 65	122000	84	6.6	.66	11	1 1902 5400	12.6	127	15	6
	122510	65	5.1	.51	15					
	122519	17	1.3	.13	14					
	122524	3	.2	.02	2					
	122624	2	.1	.01	2					
	122701	16	1.2	.12	14					
	123409	28	2.2	.22	10					
	131106	2	.1	.01	1					
	131112	1	.1	.01	1					
	136107	4	.3	.03	3					
	143000	1	.1	.01	1					
	146000	2	.1	.01	2					
	146101	15	1.1	.11	1					
	146301	14	1.1	.11	7					
	146867	455	36.1	3.58	20					
04 18 65	087007	11	.8	.07	2	1 2319 5358	12.7	140	15	6
	121110	13	1.0	.09	7					
	121111	2	.1	.01	2					
	122000	21	1.6	.15	7					
	122510	9	.7	.06	6					
	122519	10	.7	.07	9					
	122524	2	.1	.01	2					
	122624	5	.3	.03	5					
	122701	2	.1	.01	2					
	123409	5	.3	.03	4					
	143000	1	.1	.01	1					
	144100	2	.1	.01	2					
	144101	2	.1	.01	2					
	146000	2	.1	.01	2					
	146867	92	7.2	.65	8					
04 19 65	121110	9	.7	.06	5	1 2210 5101	12.8	137	15	6
	121111	1	.1	.01	1					
	122510	1	.1	.01	1					
	122519	6	.4	.04	6					
	122524	1	.1	.01	1					
	122642	1	.1	.01	1					
	122701	1	.1	.01	1					
	123409	18	1.4	.13	15					
	131106	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
04 19 65	136107	5	.3	.03	4	1 2210 5101	12.8	137	15	6
	144100	3	.2	.02	2					
	144101	4	.3	.02	4					
	146000	1	.1	.01	1					
	146867	11	.8	.08	2					
04 20 65	100000	1	.1	.01	1	1 1806 5101	12.6	104	15	6
	121110	2	.1	.01	2					
	122000	2	.1	.01	2					
	122510	4	.3	.03	2					
	122519	10	.7	.09	9					
	122524	4	.3	.03	3					
	122624	1	.1	.01	1					
	122633	1	.1	.01	1					
	122701	6	.4	.05	5					
	123409	7	.5	.06	6					
	131100	3	.2	.02	2					
	136107	1	.1	.01	1					
	144100	1	.1	.01	1					
	146000	1	.1	.01	1					
	146867	33	2.6	.31	5					
04 21 65	122000	11	.8	.08	8	1 1431 5105	12.5	125	15	6
	122510	10	.8	.08	6					
	122519	5	.4	.04	4					
	122524	4	.3	.03	3					
	122608	1	.1	.01	1					
	122701	1	.1	.01	1					
	123409	5	.4	.04	4					
	144101	1	.1	.01	1					
	146000	1	.1	.01	1					
	146835	1	.1	.01	1					
	146867	27	2.1	.21	11					
04 22 65	100000	1	.1	.01	1	1 1119 5039	12.4	93	15	6
	122000	3	.2	.03	3					
	122510	3	.2	.03	2					
	122519	7	.5	.07	6					
	122524	1	.1	.01	1					
	122606	1	.1	.01	1					
	122608	2	.1	.02	2					
	122701	4	.3	.04	3					
	123409	9	.7	.09	5					
	131100	1	.1	.01	1					
	133206	2	.1	.02	2					
	144100	1	.1	.01	1					
	146000	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	42	3.3	.45	5					
04 23 65	[illegible]	21	1.6	.19	12	1 1058 4809	12.5	108	15	6
	122501	1	.1	.01	1					
	122510	3	.2	.02	3					
	122519	3	.2	.02	3					
	122606	1	.1	.01	1					
	122608	16	1.2	.14	14					
	122701	1	.1	.01	1					
	123409	13	1.0	.12	9					
	131106	1	.1	.01	1					
	133206	1	.1	.01	1					
	146867	145	11.6	1.34	10					
04 24 65	100000	3	.2	.02	1	1 1436 4758	12.6	135	15	6
	122000	2	.1	.01	2					
	122510	4	.3	.02	4					
	122519	2	.1	.01	2					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
04 24 65	122524	1	.1	.01	1	1 1436 4758	12.6	135	15	6
	122608	2	.1	.01	2					
	122631	1	.1	.01	1					
	123409	10	.7	.07	9					
	131106	1	.1	.01	1					
	146867	42	3.3	.31	5					
04 25 65	122000	2	.1	.01	2	1 1852 4759	12.8	141	15	6
	122501	1	.1	.01	1					
	122510	1	.1	.01	1					
	122519	1	.1	.01	1					
	123409	12	.9	.08	10					
	131100	1	.1	.01	1					
	131108	1	.1	.01	1					
	131112	1	.1	.01	1					
	133206	1	.1	.01	1					
	133213	1	.1	.01	1					
	143000	1	.1	.01	1					
	144100	1	.1	.01	1					
	146000	1	.1	.01	1					
04 26 65	122000	1	.1	.01	1	1 2302 4759	12.9	135	15	6
	122519	2	.1	.01	1					
	122701	3	.2	.02	3					
	123000	1	.1	.01	1					
	123409	11	.8	.08	10					
	131106	2	.1	.01	1					
	144100	1	.1	.01	1					
	146835	8	.6	.05	4					
	146867	2	.1	.01	2					
04 27 65	100000	2	.1	.01	2	1 2609 4844	13.1	153	15	6
	121110	28	2.1	.18	7					
	121111	3	.2	.01	3					
	122000	2	.1	.01	2					
	122519	8	.6	.05	8					
	122701	4	.3	.02	3					
	123409	45	3.4	.29	38					
	131106	7	.5	.04	4					
	146000	1	.1	.01	1					
	146835	7	.5	.04	5					
04 28 65	121110	16	1.2	.11	7	1 2500 5253	13.2	143	15	6
	122000	2	.1	.01	2					
	122630	1	.1	.01	1					
	123409	18	1.3	.12	16					
	131112	1	.1	.01	1					
	146835	5	.3	.03	3					
04 29 65	100000	1	.1	.01	1	1 2436 5700	13.1	125	15	6
	121110	8	.6	.06	7					
	122000	3	.2	.02	3					
	122510	1	.1	.01	1					
	122519	18	1.3	.14	12					
	122606	1	.1	.01	1					
	123409	32	2.4	.25	20					
	131106	1	.1	.01	1					
	136107	2	.1	.01	2					
	143000	1	.1	.01	1					
	144101	1	.1	.01	1					
	146835	6	.4	.04	3					
	146867	1	.1	.01	1					
04 30 65	121110	1	.1	.01	1	1 2131 5723	6.4	67	15	6
	122000	5	.7	.07	3					
	122510	144	22.5	2.14	42					
	122519	28	4.3	.41	17					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
04 30 65	122701	3	.4	.04	3	1 2131 5723	6.4	67	15	6
	123000	1	.1	.01	1					
	123409	1	.1	.01	1					
	133213	30	4.6	.44	22					
	133217	5	.7	.07	1					
	136107	9	1.4	.13	8					
	146000	1	.1	.01	1					
	146101	175	27.3	2.61	44					
	146867	96	15.0	1.43	47					
05 12 65	180000	1	.1	.01	1	1 2104 5743	6.0	60	16	6
	121110	2	.3	.03	2					
	122000	3	.5	.05	2					
	122510	101	16.8	1.68	35					
	122519	8	1.3	.13	6					
	122701	20	3.3	.33	17					
	133213	60	10.0	1.00	22					
	133217	1	.1	.01	1					
	136107	1	.1	.01	1					
	146000	318	53.0	5.30	5					
	146101	233	38.8	3.88	17					
	146835	2	.3	.03	1					
	146867	110	18.3	1.83	19					
05 13 65	180000	3	.2	.02	1	1 1744 5659	13.0	115	16	6
	122000	8	.6	.06	5					
	122510	19	1.4	.16	15					
	122519	81	6.2	.70	44					
	122524	8	.6	.06	8					
	122631	1	.1	.01	1					
	122701	14	1.0	.12	14					
	123409	10	.7	.08	9					
	131112	1	.1	.01	1					
	136107	10	.7	.08	6					
	144101	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	230	17.6	2.00	18					
05 14 65	007000	15	1.1	.11	1	1 1414 5702	12.8	130	16	6
	180000	1	.1	.01	1					
	122000	8	.6	.06	8					
	122510	1	.1	.01	1					
	122519	18	1.4	.13	7					
	122609	1	.1	.01	1					
	122631	15	1.1	.11	9					
	122701	2	.1	.01	2					
	123409	1	.1	.01	1					
	131106	2	.1	.01	2					
	131112	2	.1	.01	2					
	136107	1	.1	.01	1					
	144100	1	.1	.01	1					
	146867	14	1.0	.10	7					
05 15 65	122000	10	.7	.07	8	1 1103 5556	12.7	131	16	6
	122510	2	.1	.01	2					
	122519	8	.6	.06	8					
	122608	2	.1	.01	2					
	122631	42	3.3	.32	33					
	122701	6	.4	.04	5					
	123409	3	.2	.02	3					
	131100	1	.1	.01	1					
	144101	1	.1	.01	1					
	146000	1	.1	.01	1					
05 16 65	180000	1	.1	.01	1	1 1135 5359	12.7	130	16	6
	122000	10	.7	.07	6					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
05 16 65	122510	1	.1	.01	1	1 1135 5359	12.7	130	16	6
	122519	10	.7	.07	8					
	122608	1	.1	.01	1					
	122624	1	.1	.01	1					
	122631	37	2.9	.28	28					
	122701	4	.3	.03	4					
	131100	1	.1	.01	1					
	133206	1	.1	.01	1					
	146835	1	.1	.01	1					
	146867	5	.3	.03	2					
05 17 65	122000	5	.3	.03	4	1 1537 5400	12.9	134	16	6
	122510	28	2.1	.20	14					
	122519	2	.1	.01	2					
	122606	1	.1	.01	1					
	122631	3	.2	.02	2					
	122701	3	.2	.02	3					
	131112	2	.1	.01	2					
	136107	1	.1	.01	1					
05 18 65	007007	1	.1	.01	1	1 1938 5403	13.1	132	16	6
	180000	1	.1	.01	1					
	122000	35	2.6	.26	18					
	122510	30	2.2	.22	9					
	122519	28	2.1	.21	21					
	122524	1	.1	.01	1					
	122606	3	.2	.02	3					
	122701	11	.8	.08	10					
	123409	2	.1	.01	2					
	131100	2	.1	.01	1					
	131106	2	.1	.01	2					
	131112	1	.1	.01	1					
	136107	4	.3	.03	3					
	146301	5	.3	.03	3					
	146867	574	43.8	4.34	26					
05 19 65	180000	2	.1	.01	2	1 2328 5341	13.2	136	16	6
	122000	38	2.8	.27	6					
	122510	23	1.7	.16	8					
	122519	15	1.1	.11	14					
	122524	8	.6	.05	7					
	122701	6	.4	.04	4					
	131100	2	.1	.01	2					
	131112	1	.1	.01	1					
	136107	5	.3	.03	3					
	146101	1	.1	.01	1					
	146301	5	.3	.03	2					
	146867	476	36.0	3.50	18					
05 20 65	122510	1	.1	.01	1	1 2201 5100	13.3	129	16	6
	122519	29	2.1	.22	22					
	122524	1	.1	.01	1					
	122701	2	.1	.01	2					
	123409	1	.1	.01	1					
	136107	3	.2	.02	2					
	146835	1	.1	.01	1					
	146867	8	.6	.06	3					
05 21 65	122000	1	.1	.01	1	1 1803 5056	13.0	113	16	6
	122510	6	.4	.05	5					
	122519	11	.8	.09	9					
	122633	1	.1	.01	1					
	122701	1	.1	.01	1					
	123409	2	.1	.01	2					
	131112	1	.1	.01	1					
	144100	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
05 21 65	144101	2	.1	.01	2	1 1803 5056	13.0	113	16	6
05 22 65	007007	21	1.6	.16	2	1 1422 5059	12.9	131	16	6
	180000	2	.1	.01	1					
	122000	6	.4	.04	6					
	122510	3	.2	.02	3					
	122519	4	.3	.03	3					
	122608	14	1.0	.10	13					
	122609	1	.1	.01	1					
	122631	2	.1	.01	2					
	122701	3	.2	.02	3					
	123409	3	.2	.02	3					
	131100	1	.1	.01	1					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	144201	1	.1	.01	1					
	146867	4	.3	.03	2					
05 23 65	180000	1	.1	.01	1	1 1117 5034	12.6	95	16	6
	122000	18	1.4	.18	17					
	122510	16	1.2	.16	8					
	122524	8	.6	.08	8					
	122608	31	2.4	.32	23					
	122609	3	.2	.03	3					
	122631	12	.9	.12	12					
	122701	2	.1	.02	2					
	123409	3	.2	.03	3					
	131106	1	.1	.01	1					
	133206	1	.1	.01	1					
	144103	1	.1	.01	1					
	146301	1	.1	.01	1					
	146867	8	.6	.08	1					
05 24 65	122000	17	1.3	.14	16	1 1105 4758	12.7	118	16	6
	122510	34	2.6	.28	27					
	122524	6	.4	.05	6					
	122601	1	.1	.01	1					
	122606	1	.1	.01	1					
	122608	85	6.6	.72	60					
	122609	2	.1	.01	2					
	122631	31	2.4	.26	28					
	122701	2	.1	.01	2					
	123409	4	.3	.03	3					
	131106	5	.3	.04	5					
	133206	3	.2	.02	2					
05 25 65	122000	5	.3	.03	5	1 1446 4759	12.9	128	16	6
	122510	5	.3	.03	4					
	122608	25	1.9	.19	21					
	122609	2	.1	.01	2					
	122631	1	.1	.01	1					
	122701	2	.1	.01	2					
05 26 65	122000	38	2.9	.38	14	1 1803 4759	13.1	99	16	6
	122510	6	.4	.06	5					
	122519	5	.3	.05	5					
	122606	2	.1	.02	2					
	122608	103	7.8	1.04	26					
	122609	3	.2	.03	3					
	122631	2	.1	.02	2					
	122701	1	.1	.01	1					
	131112	2	.1	.02	2					
	146867	5	.3	.05	1					
05 27 65	007007	1	.1	.01	1	1 2204 4801	13.3	144	16	6
	122519	3	.2	.02	3					
	122701	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
05 27 65	123409	1	.1	.01	1	1 2204 4801	13.3	144	16	6
	131106	1	.1	.01	1					
05 28 65	121110	5	.3	.03	4	1 2618 4800	13.7	131	16	6
	122000	1	.1	.01	1					
	122519	2	.1	.01	2					
	122524	6	.4	.04	5					
05 29 65	007007	1	.1	.01	1	1 2457 5118	13.7	117	16	6
	180000	1	.1	.01	1					
	122510	1	.1	.01	1					
	122519	3	.2	.02	3					
	122606	2	.1	.01	2					
	122633	1	.1	.01	1					
	122701	1	.1	.01	1					
	123409	1	.1	.01	1					
	131112	2	.1	.01	2					
	136107	2	.1	.01	2					
	142201	1	.1	.01	1					
	146835	1	.1	.01	1					
05 30 65	180000	2	.1	.01	2	1 2459 5613	13.5	154	16	6
	122000	49	3.6	.31	18					
	122510	119	8.8	.77	17					
	122519	3	.2	.01	3					
	122524	7	.5	.04	5					
	122606	8	.5	.05	7					
	122630	1	.1	.01	1					
	122633	1	.1	.01	1					
	122701	4	.2	.02	4					
	131106	1	.1	.01	1					
	136107	3	.2	.01	3					
	144103	1	.1	.01	1					
	146101	2	.1	.01	1					
	146835	1	.1	.01	1					
	146867	785	58.1	5.09	23					
05 31 65	180000	1	.1	.01	1	1 2155 5704	9.8	104	16	6
	122000	22	2.2	.21	18					
	122510	458	46.7	4.40	36					
	122519	1	.1	.01	1					
	122524	1	.1	.01	1					
	122701	12	1.2	.11	8					
	123409	1	.1	.01	1					
	131112	1	.1	.01	1					
	133213	35	3.5	.33	16					
	133217	2	.2	.01	2					
	136107	18	1.8	.17	14					
	146000	1	.1	.01	1					
	146101	1150	117.3	11.05	46					
	146301	1	.1	.01	1					
	146867	2779	283.5	26.72	73					
06 10 65	122510	141	31.3	2.38	26	1 2057 5736	4.5	59	17	6
	122701	6	1.3	.10	6					
	131106	2	.4	.03	2					
	133200	1	.2	.01	1					
	133213	221	49.1	3.74	10					
	133217	2	.4	.03	2					
	136107	7	1.5	.11	7					
	146000	20	4.4	.33	1					
	146101	39	8.6	.66	8					
	146867	161	35.7	2.72	17					
06 11 65	122510	98	7.4	1.07	23	1 1802 5659	13.2	91	17	6
	122524	4	.3	.04	4					
	122600	3	.2	.03	3					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
06 11 65	122631	2	.1	.02	2	1 1802 5659	13.2	91	17	6
	122633	1	.1	.01	1					
	122653	1	.1	.01	1					
	122701	15	1.1	.16	14					
	131106	5	.3	.05	3					
	131112	2	.1	.02	2					
	136107	9	.6	.09	6					
	146000	2	.1	.02	1					
	146301	4	.3	.04	2					
	146867	118	8.9	1.29	10					
06 12 65	122000	2	.1	.01	2	1 1619 5659	13.1	136	17	6
	122510	158	12.0	1.16	14					
	122524	1	.1	.01	1					
	122600	3	.2	.02	3					
	122609	1	.1	.01	1					
	122631	19	1.4	.13	13					
	122633	4	.3	.02	2					
	122701	5	.3	.03	5					
	131100	3	.2	.02	1					
	131106	4	.3	.02	4					
	131112	2	.1	.01	2					
	136107	3	.2	.02	2					
	146301	1	.1	.01	1					
	146867	25	1.9	.18	3					
06 13 65	122000	10	.7	.09	5	1 1227 5700	12.9	110	17	6
	122510	37	2.9	.33	18					
	122524	2	.1	.01	2					
	122600	16	1.2	.14	15					
	122606	1	.1	.01	1					
	122608	3	.2	.02	3					
	122609	6	.4	.05	6					
	122631	11	.8	.10	9					
	122636	1	.1	.01	1					
	122653	2	.1	.01	2					
	122701	2	.1	.01	2					
	133206	1	.1	.01	1					
	146867	1	.1	.01	1					
06 14 65	007000	35	2.7	.30	1	1 1010 5426	12.7	115	17	6
	122000	37	2.9	.32	11					
	122510	70	5.5	.60	26					
	122524	8	.6	.06	5					
	122600	31	2.4	.26	14					
	122608	72	5.6	.62	38					
	122609	1	.1	.01	1					
	122631	13	1.0	.11	13					
	122633	1	.1	.01	1					
	122636	1	.1	.01	1					
	122653	1	.1	.01	1					
	122701	1	.1	.01	1					
	133206	1	.1	.01	1					
	146301	4	.3	.03	3					
	146867	91	7.1	.79	3					
06 15 65	122000	7	.5	.06	5	1 1255 5400	12.9	114	17	6
	122510	38	2.9	.33	16					
	122524	1	.1	.01	1					
	122600	26	2.0	.22	9					
	122608	46	3.5	.40	22					
	122609	3	.2	.02	3					
	122631	2	.1	.01	2					
	122633	1	.1	.01	1					
	133206	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
06 16 65	122000	9	.6	.07	7	1 1632 5400	13.1	125	17	6
	122600	4	.3	.03	4					
	122606	2	.1	.01	2					
	122608	2	.1	.01	2					
	122631	1	.1	.01	1					
	122701	1	.1	.01	1					
	131106	3	.2	.02	3					
	131112	2	.1	.01	2					
	146867	1	.1	.01	1					
06 17 65	122000	1	.1	.01	1	1 2031 5402	13.4	143	17	6
	122510	35	2.6	.24	18					
	122600	3	.2	.02	2					
	122606	1	.1	.01	1					
	122701	2	.1	.01	2					
	131106	1	.1	.01	1					
	131112	2	.1	.01	2					
	136107	5	.3	.03	3					
	146301	3	.2	.02	2					
	146867	251	18.7	1.75	22					
06 18 65	122000	3	.2	.02	3	1 2329 5301	13.4	133	17	6
	122510	5	.3	.03	4					
	122600	1	.1	.01	1					
	122606	1	.1	.01	1					
	122631	2	.1	.01	2					
	122701	5	.3	.03	5					
	123409	1	.1	.01	1					
	131112	1	.1	.01	1					
	136107	7	.5	.05	4					
	146867	171	12.7	1.28	17					
06 19 65	007000	2	.1	.05	1	1 2200 5056	13.5	35	17	6
	122000	5	.3	.14	5					
	122510	3	.2	.08	1					
	122600	3	.2	.08	3					
	122631	2	.1	.05	2					
	122701	1	.1	.02	1					
	131100	1	.1	.02	1					
	131106	1	.1	.02	1					
	136107	2	.1	.05	1					
	146867	2	.1	.05	2					
06 20 65	122000	7	.5	.05	7	1 1943 5102	13.3	132	17	6
	122510	5	.3	.03	3					
	122600	3	.2	.02	3					
	122606	1	.1	.01	1					
	122608	3	.2	.02	2					
	122631	9	.6	.06	7					
	122701	4	.3	.03	4					
	136107	4	.3	.03	3					
06 21 65	121110	1	.1	.01	1	1 1600 5052	13.1	144	17	6
	122000	15	1.1	.10	11					
	122510	5	.3	.03	5					
	122600	7	.5	.04	4					
	122608	36	2.7	.25	14					
	122633	1	.1	.01	1					
	122701	6	.4	.04	6					
	131106	4	.3	.02	4					
	131112	2	.1	.01	2					
	146867	17	1.2	.11	2					
06 22 65	122000	1	.1	.00	1	1 1300 5108	12.9	8	17	6
	122510	3	.2	.00	2					
	122600	9	.6	.00	9					
	122608	3	.2	.00	3					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
06 22 65	122631	2	.1	.02	2	1 1300 5100	12.9	0	17	6
	122701	1	.1	.01	1					
	131106	2	.1	.02	2					
	131112	1	.1	.02	1					
	133206	1	.1	.01	1					
	146867	1	.1	.01	1					
06 23 65	122000	39	3.0	.37	15	1 1113 5028	12.7	103	17	6
	122510	10	.7	.09	8					
	122524	1	.1	.01	1					
	122600	40	3.1	.38	22					
	122608	119	9.3	1.15	51					
	122631	11	.8	.10	7					
	122636	2	.1	.01	2					
	122701	2	.1	.01	2					
	146867	1	.1	.01	1					
06 24 65	122000	45	3.5	.43	26	1 1044 4800	12.8	104	17	6
	122510	64	5.0	.61	34					
	122524	1	.1	.01	1					
	122600	73	5.7	.70	35					
	122608	166	12.9	1.59	47					
	122631	13	1.0	.12	12					
	131106	3	.2	.02	3					
	131112	1	.1	.01	1					
	133206	1	.1	.01	1					
	146867	96	7.5	.92	6					
06 25 65	122000	88	6.7	.64	19	1 1428 4757	13.0	137	17	6
	122510	6	.4	.04	5					
	122524	1	.1	.01	1					
	122600	60	4.6	.43	18					
	122608	135	10.2	.97	48					
	122631	10	.7	.07	10					
	131100	1	.1	.01	1					
	131112	1	.1	.01	1					
06 26 65	122000	13	.9	.13	7	1 1828 4800	13.3	98	17	6
	122510	1	.1	.01	1					
	122600	7	.5	.07	3					
	122608	77	5.7	.78	21					
	122609	1	.1	.01	1					
	122631	4	.3	.04	4					
	131106	2	.1	.02	2					
06 27 65	122000	50	3.7	.37	13	1 2117 4751	13.4	134	17	6
	122510	8	.5	.05	6					
	122600	5	.3	.03	3					
	122608	24	1.7	.17	14					
	122631	10	.7	.07	10					
	122701	1	.1	.01	1					
	131106	1	.1	.01	1					
	131112	1	.1	.01	1					
	133206	1	.1	.01	1					
	136107	1	.1	.01	1					
	146301	2	.1	.01	1					
06 28 65	122000	8	.5	.05	8	1 2514 4756	13.7	141	17	6
	122608	6	.4	.04	5					
	122631	1	.1	.01	1					
	122653	2	.1	.01	2					
	131106	2	.1	.01	2					
	131112	1	.1	.01	1					
	136107	1	.1	.01	1					
	144101	1	.1	.01	1					
06 29 65	121110	1	.1	.01	1	1 2513 5030	13.9	109	17	6
	122000	1	.1	.01	1					

DATE	IDENTIFICATION	QUANTITY	PER HOUR	PER MILE	INCIDENTS	NOON LOCATION	HOURS	MILES	CRUISE	SHIP
06 29 65	122701	12	.8	.11	8	1 2513 5030	13.9	109	17	6
	131106	2	.1	.01	2					
06 30 65	122000	2	.1	.01	2	1 2502 5407	13.8	143	17	6
	122510	11	.7	.07	6					
	122600	2	.1	.01	1					
	122631	6	.4	.04	4					
	122701	13	.9	.09	13					
	131100	1	.1	.01	1					
	131112	3	.2	.02	2					
	136107	6	.4	.04	5					
	146301	2	.1	.01	1					
	146867	101	7.3	.70	7					
07 01 65	122000	3	.2	.02	1	1 2339 5651	13.6	129	17	6
	122510	145	10.6	1.12	34					
	122524	5	.3	.03	5					
	122600	6	.4	.04	4					
	122631	9	.6	.06	8					
	122701	18	1.3	.13	17					
	131106	2	.1	.01	2					
	131112	3	.2	.02	3					
	136107	12	.8	.09	7					
	146101	16	1.1	.12	3					
	146301	2	.1	.01	1					
	146867	1215	89.3	9.41	77					
07 02 65	122510	212	235.5	53.00	4	1 2114 5744	.9	4	17	6
	133217	1	1.1	.25	1					
	136107	23	25.5	5.75	3					
	146301	1	1.1	.25	1					
	146867	218	242.2	54.50	5					

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