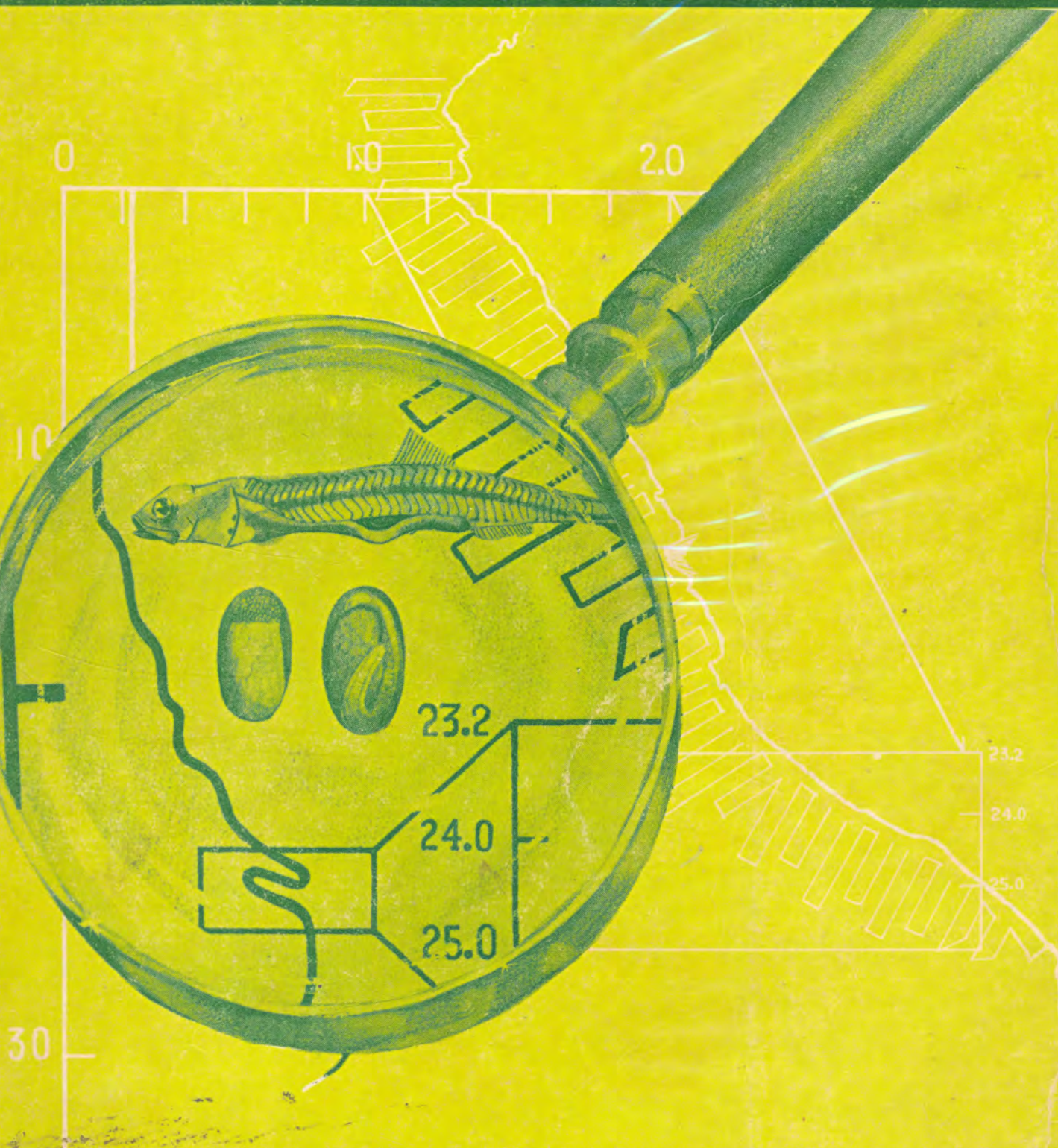




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**INVESTIGACION COOPERATIVA DE LA ANCHOVETA  
Y SU ECOSISTEMA - ICANE - ENTRE PERU Y CANADA  
CALLAO 1981 PERU**

## SEABIRDS IN NORTHERN PERUVIAN WATERS, NOVEMBER-DECEMBER 1977.

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### ABSTRACT

This paper describes quantitative observations on seabird distributions off northern Peru, between 03°00'S-12°05'S, collected during the cruise of CSS BAFFIN in Nov.- Dec. 1977. The species seen appeared to form two groups: a large one in or near the coastal upwelling zone, made up mainly of species which feed by plunging after their prey or pursuing it under water; and a smaller one in the warmer waters offshore, consisting of species (mainly Hydrobatidae) which feed only at the surface.

Of the three principal guano-producing species, *Sula variegata*, *Pelecanus (occidentalis) thagus* and *Phalacrocorax bougainvillii*, *S. variegata* was the commonest. *P. bougainvillii*, the commonest guano-bird prior to the 1972 El Niño phenomenon, was extremely scarce except near its colony on Islas Guañapes (08°32'S 78°59'W).

Quantitative distribution maps are presented for the three guano-birds, and for *Sula neboxii*, *Diomedea irrorata*, *Pelecanoides garnoti*, *Puffinus griseus*, *Puffinus (carneipes) creatopus* and *P. (c.) carneipes*, *Oceanodroma markhami*, *O. hornbyi* and *O. tethys*, and *Oceanites gracilis*, along with notes on the distributions of other species.

The commonest seabird, after *Sula variegata*, was the non-breeding *Puffinus griseus*. An apparent immigration of this species into the survey area in November 1977 is documented, as is an apparent post-breeding dispersal of *Oceanodroma markhami*. A very large flock of over 1000 *Diomedea irrorata* was thought to represent a significant fraction of the total world population of that species.

Observations between 03°00'S and Panamá are summarised for comparative purposes. The typically pan-tropical seabird species found there contrast with the avifauna of the Peruvian upwelling.

### RESUMEN

Se describe la distribución cuantitativa de las aves marinas frente a la costa del norte del Perú, entre 03°00'S y 12°05'S, observada durante el crucero del CSS BAFFIN en Nov.— Dic. 1977. Fue aparente la existencia de un grupo mayor en o cerca de la zona de afloramiento, constituido principalmente por especies que se alimentan zambulléndose y persiguiendo su presa bajo el agua; y uno mas pequeño en aguas mas calientes y alejadas de la costa, consistente de especies que se alimentan solo en la superficie (principalmente Hydrobatidae).

De las tres especies principales productoras de guano, *Sula variegata*, *Pelecanus (occidentalis) thagus* y *Phalacrocorax bougainvillii*, la más común fue *S. variegata*. El ave guanera más común antes de "El Niño" de 1972, *P. bougainvillii*, fue muy rara excepto en las cercanías de su colonia de Islas Guañape (08°32'S 78°59'W).

Se presenta mapas de la distribución cuantitativa de las tres principales especies y también de *Sula neboxii*, *Diomedea irrorata*, *Pelecanoides garnoti*, *Puffinus griseus*, *Puffinus (carneipes) creatopus* y *P. (c.) carneipes*, *Oceanodroma markhami*, *O. hornbyi* y *O. tethys*, y *Oceanites gracilis*, junto con notas sobre la distribución de otras especies.

La especie más común después de *S. variegata* fue *Puffinus griseus*. Se ha documentado una aparente inmigración de esta especie en el área explorada en noviembre de 1977 así como también una dispersión post-reproducción de *Oceanodroma markhami*. Una bandada de más de 1,000 *Diomedea irrorata* que se considera una gran parte de la población total mundial fue observada.

Se da un resumen de las observaciones entre Panamá y los 03°00'S con fines comparativos. Las especies típicamente pan-tropicales en ese sector contrastan con la avifauna propia del afloramiento peruano.

## INTRODUCTION

The primary objective of the cruise of CSS BAFFIN to Perú in November-December 1977 was to investigate aspects of the biology of the Anchoveta *Engraulis ringens*, in a continuation of attempts to understand the catastrophic decline in the population of this fish which has taken place since the El Niño phenomenon of 1972. Before the large-scale anchoveta fishery began in the early 1960s the principal marine resource of Perú was the harvesting of guano from coastal seabird colonies -an industry which on a large scale dates back to the mid 19th. century, and on a smaller scale to pre-Columbian times (e.g. Murphy 1936). Anchovetas are the guano-birds' main food, and the birds' numbers have always declined dramatically along with the decline in the fish population after an El Niño phenomenon. But this has been accentuated since 1972. In that year the total guano-bird population stood at over 6 million pairs, but by 1977 it had dropped to under a million- possibly the lowest level ever recorded (Tovar and Galarza, 1977; H. Tovar and J. Valdivia, pers. comm.) It therefore seemed appropriate for a marine ornithologist to take part in the cruise, in order to investigate the distributions of the guano-birds and other seabirds at sea, as a preliminary to a more complete understanding of the birds' pelagic ecology. This paper describes these distributions off the coast between 03°00'S and Callao (12°05'S 77°08'W) with particular reference to the cruise's main area of operations just south of Chimbote; (09°04'S 78°34'W) the period covered is from 2 Nov.-4 Dec. 1977. Some preliminary interpretations of these distributions have been attempted, but more detailed correlations must wait until other physical and biological oceanographic data collected during the cruise become available.

A slightly expanded version of this paper, along with a complete record of seabird and also marine mammal, sea-turtle and flying-fish observations made between Panamá and Callao during the cruise, has been deposited with Instituto del Mar del Perú, Callao (IMARPE) and with the Canadian Wildlife Service, 6 specimens of stormpetrels collected on the ship have been deposited with the National Museum of Natural Science Ottawa, Canada.

## METHODS

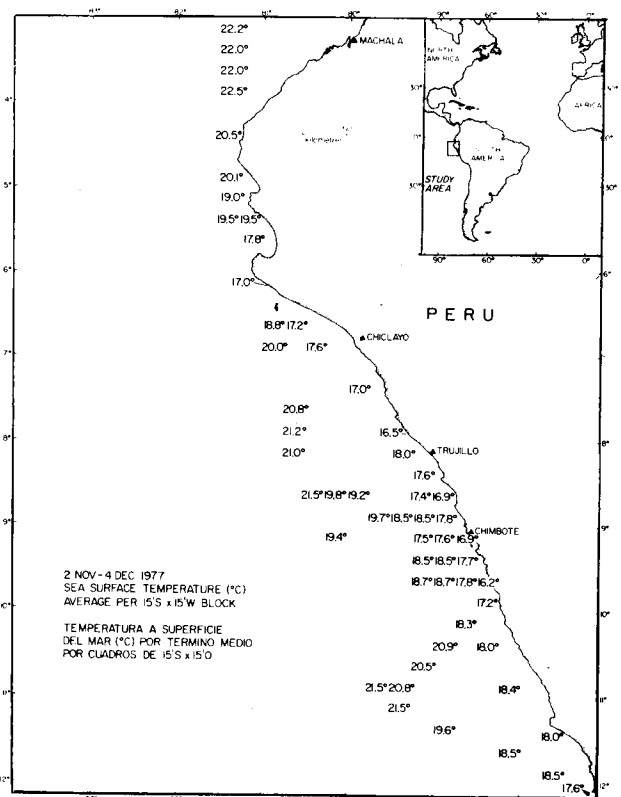
Quantitative seabird observations were made from the flying-bridge of BAFFIN, c. 15 m above sea level, with the help of 7 x 35 binoculars. The basic unit of observation, following standard practice (Brown et al. 1975b) was a watch period of 10 minutes in length, made while the ship was steaming at over 4 kt (c. 2 m/s). (When the ship was stationary or moving at slower speeds counts were

often inflated by birds which sat on the water beside the ship, or even on the ship itself.) All birds seen around the ship during the watch were counted, with particular emphasis on those within an arc of 180° in front of the ship. The bird guides of Alexander (1963), Blake (1977), and Koepcke (1970) were used as aids to identification, though I was already familiar with most of the seabird species through previous work off Chile (Brown et al., 1975a.)

The data for the commoner species are summarised in map form (Figs. 2-6). These show the average numbers seen per 10 minute watch in each 15'S x 15'W 'block' visited during the cruise. (Note that '0' indicates an absence of birds; a blank indicates that the 'block' in question was not visited.) The averages are almost all based on 5 watches or less. The only averages based on 10 or more watches are those for the 'blocks' 09°15'S x 78°30'W and x 78°45'W, and 09°30'S x 78°30'W and x 79°00'W (22, 59, 10 and 10 watches, respectively), and 10°00'S x 78°30'W (10 watches). 'Averages' based on only a single watch are placed in parentheses.

Sea surface temperatures (°C; see Fig. 1, Table 1) were taken from the ship's deck log. They were measured with a standard mercury thermometer and meteorological bucket. Fig. 1 plots the temperatures in each 15'S x 15'W 'block'; when more

Fig. 1. Surface temperatures (°C) per 15'S x 15'W off northern Perú, 2 Nov.- 4 Dec. 1977.



than one temperature was recorded from a 'block' an average is plotted.

## SEABIRD DISTRIBUTIONS

### a. seabirds and surface temperatures

Fig. 1 shows that surface temperatures were lowest in the zone of upwelled water close to the coast, and higher at the edge of the warm tropical waters offshore to the west and north of the survey area. Table 1 shows the average numbers of the commoner seabird species at different surface temperatures. The table suggests that there are two groupings—perhaps communities—of seabird species: those in cool, coastal and in warm, offshore waters:

#### Cool

*Puffinus griseus*\*\*  
*Pelecanoides garnoti*\*\*  
*Sula variegata*\*  
*Sula neboxii*\*  
*Pelecanus (occidentalis) thagus*\*  
*Phalacrocorax bougainvillii*\*\*  
*Phalacrocorax gaimardi*\*\*  
*Stercorarius* spp.  
*Larus dominicanus*  
*Larus pipixcan*  
*Larus pipixcan*  
*Xema sabini*  
*Creagrus furcatus*  
*Chlidonias niger*\*  
*Larosterna inca*\*

#### Warm

*Diomedea irrorata*  
*Puffinus creatopus*  
*Oceanites oceanicus*  
*Oceanites gracilis*  
*Oceanodroma markhami*  
*Oceanodroma hornbyi*

As is characteristic of highly productive areas (Ainley, 1977; see also Ashmole, 1971), there is a large number of species in the cool water zone, and many of them hunt either by plunging into the water on their prey from above (\*), or pursuing it underwater (\*\*). By contrast the warmer, less productive offshore waters have very few species—the majority of them the very small storm-petrels of the genera *Oceanodroma* and *Oceanites*—and all feed right at the surface, without submerging.

Two species do not seem to fit in with this very simple classification. *Phalaropus* spp. distributions are bimodal, with peaks at 17°C and 19°C. This may reflect differences in the preferences of the two species in the genus. In upwelling systems elsewhere *Phalaropus lobatus* appears to be a coastal species, staying close to the actual area of upwelling (e.g. Bailey 1966), while *Phalaropus fulicarius* tends to occur along the 'front' at the outer edge of the upwelling system, where the 19°-21° isotherms come very close together (e.g. Brown, 1979). The distribution of *Oceanodroma tethys* suggests that it might also prefer the waters along the 'front'.

### b. the guano-birds

Three seabirds are of economic importance to the Peruvian guano industry (Murphy, 1936): the Piquero or Peruvian Booby *Sula variegata*, the Guanay Cormorant *Phalacrocorax bougainvillii* and

Table 1. Distributions of the commoner seabird species with relation to surface water temperatures. The figures show the average numbers of birds per 10-minute watch; 'n' indicates the number of watches on which each average is based.

SPECIES	MEAN N° OF BIRDS/10 MIN. AT GIVEN TEMPERATURE (°C)						
	16°	17°	18°	19°	20°	21°	22°
n	11	49	94	72	8	24	32
<i>Diomedea irrorata</i>	0.3	0.5	0.4	0.9	0.7	0.7	0.9
<i>Puffinus creatopus</i>	0.1	0	0	<0.1	0	0.1	0.8
<i>Puffinus griseus</i>	17.6	20.0	4.6	7.2	0.5	0.1	0.1
<i>Pelecanoides garnoti</i>	0	0.4	0.6	<0.1	0	0	0
<i>Oceanites oceanicus</i>	0	0	0	0.1	0.5	0	0
<i>Oceanites gracilis</i>	0	<0.1	<0.1	0.1	0.3	0.3	0.3
<i>Oceanodroma tethys</i>	0	0	<0.1	6.1	0.1	0.5	0.1
<i>Oceanodroma markhami</i>	0.2	<0.1	1.1	3.4	4.7	3.5	4.8
<i>Oceanodroma hornbyi</i>	0	0	0	0.4	0	0.4	0.1
<i>Sula variegata</i>	32.9	58.5	14.9	9.5	0.5	0.2	0
<i>Sula neboxii</i>	3.3	3.4	0.5	1.0	<0.1	0.3	0.8
<i>Pelecanus thagus</i>	0.8	7.1	1.5	5.9	0	0	0
<i>Phalacrocorax bougainvillii</i>	0	1.2	0.2	0.1	0	0	0
<i>Phalacrocorax gaimardi</i>	0	0.1	<0.1	<0.1	0	0	0
<i>Phalaropus</i> spp.	2.2	63.8	3.0	10.5	1.6	0.5	2.3
<i>Stercorarius</i> spp.	0.6	3.4	0.3	0.5	0	0	<0.1
<i>Larus dominicanus</i>	0.1	0.4	0.3	0.5	0	0	0
<i>Larus pipixcan</i>	3.3	14.1	1.3	0.7	0	0	0
<i>Xema sabini</i>	0.7	1.9	0.5	0.5	0	0	0
<i>Creagrus furcatus</i>	0.3	<0.1	<0.1	0	0	<0.1	0
<i>Chlidonias niger</i>	0.1	0.6	0.1	1.3	0	0	<0.1
<i>Larosterna inca</i>	0.3	1.1	3.8	0.3	0	0	0



3 sightings of single birds on 3 Dec. at c. 08°15'S 80°30'W.

Cape Pigeon

*Daption capense*

Paloma del Cabo

A single bird on 7 Nov. at c. 09°10'S 78°40'W (J Valdivia, pers. comm.)

Shoemaker

*Procellaria aequinoctialis*

Petrel negro

7 birds were seen on 29 Nov. at 10°22'S 79°59'W

Pink-footed Shearwater *Puffinus (Carneipes) creatopus*

Pardela blanca chilena

Seen in small numbers, mainly in the warmer waters north of 60°S (Fig. 5)

Flesh-footed Shearwater *Puffinus (Carneipes) carneipes*

A single bird at 03°50'S 81°22'W and 2 at 04°19'S 81°26'W, all on 2 Nov. (Fig. 5)

Sooty Shearwater

*Puffinus griseus*

Pardela común

Sooty Shearwaters breed in southern Chile, the Falkland Islands, Tasmania and New Zealand (e.g. Murphy, 1936; Palmer, 1962). But, although non-breeding visitors to Peruvian waters, they were extremely abundant there—especially in the upwelling zone near the coast (Fig. 5). Table 1 suggests that they were second only to Piqueros in numbers. Since they are known to feed on Northern Anchovies *Engraulis mordax* (e.g. Wiens and Scott, 1975). It is likely that they compete to some extent with the guanobirds for the Anchoveta as a food resource. Table 2 suggests that Sooty Shearwaters became common off Chimbote during the third week of November.

Wilson's Storm-Petrel

*Oceanites oceanicus*

Golondrina de tempestad común

Scarce. A total of 5 birds on 6 Nov., between 08°55'S 79°44'W and 09°05'S 80°00'W, 2 on 22 Nov. at c. 09°24'S 78°57'W, and 1 on 23 Nov. at 09°17'S 78°45'W.

Elliott's Storm-Petrel

*Oceanites gracilis*

Golondrina de tempestad chica

Seen in small numbers; apparently commonest in the warmer waters offshore (Fig. 6). 2 specimens were collected.

Galápagos Storm-Petrel

*Oceanodroma tethys*

Golondrina de tempestad peruana

Fairly common in the warmer waters offshore (Fig. 6). 1 specimen was collected.

Markham's Storm-Petrel

*Oceanodroma markhami*

Golondrina de tempestad negra

This large, black species was the commonest storm-petrel seen off Perú. (Note, however, that the average numbers shown in Fig. 6 and Table 1 are inflated by the birds' tendency to follow the ship and thus to be included in more than one 10-minute watch.) 3 specimens were collected. Table 2 shows a sharp increase in numbers in the waters south of Chimbote in the last week of November. This, along with the capture of a bird with nestling down still on the crown of its head on 10 Nov. at 09°15'S 78°50'W, suggests a post-breeding dispersal from the species' as yet undiscovered breeding grounds somewhere along the Peruvian coast. The timing agrees with reports of juveniles collected in Lima-Callao in November and December (Koepeke, 1970). On the other hand, the large numbers seen farther north at c.

Fig. 4. Distribution of the Peruvian Diving-Petrel *Pelecanoides garnoti* and the Waved Albatross *Diomedea irrorata*.

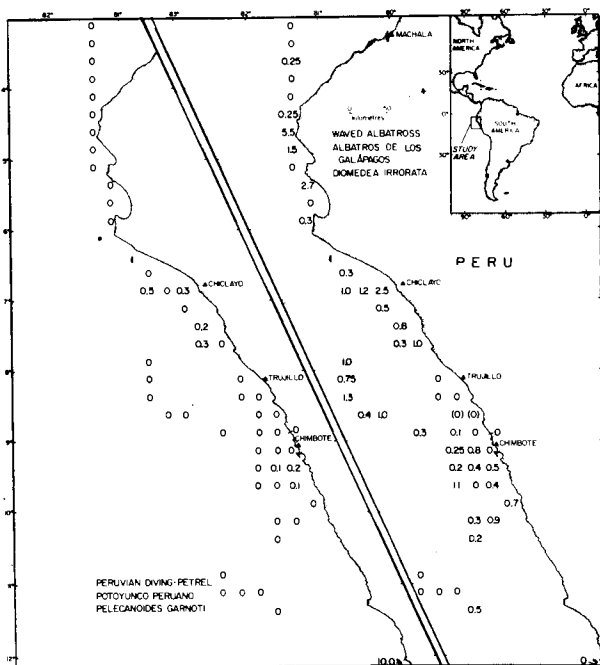


Fig. 5. Distribution of the Sooty, Pink-footed and Flesh-footed Shearwaters *Puffinus griseus*, *P. (carneipes) creatopus* and *P. (c.) carneipes*.

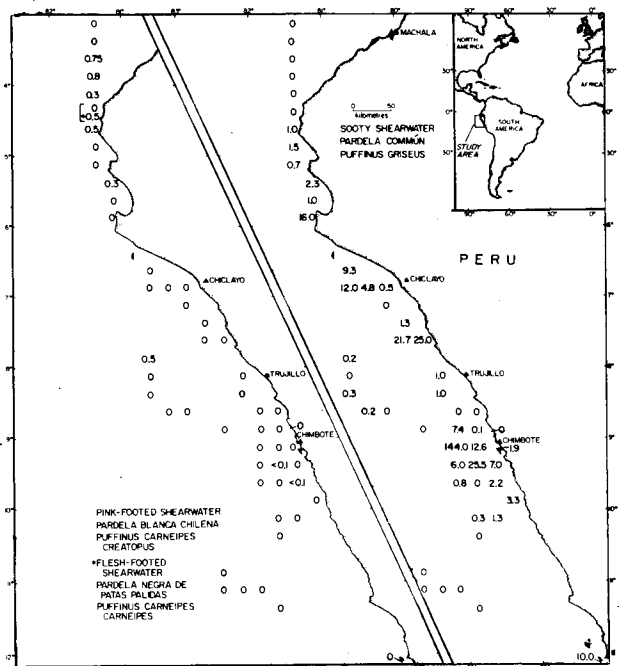


Fig. 6. Distribution of the Galapagos, Markham's and Hornby's Storm-Petrels *Oceanodroma tethys*, *O. markhami* and *O. hornbyi*, and of Elliott's Storm-Petrel *Oceanites gracilis*.

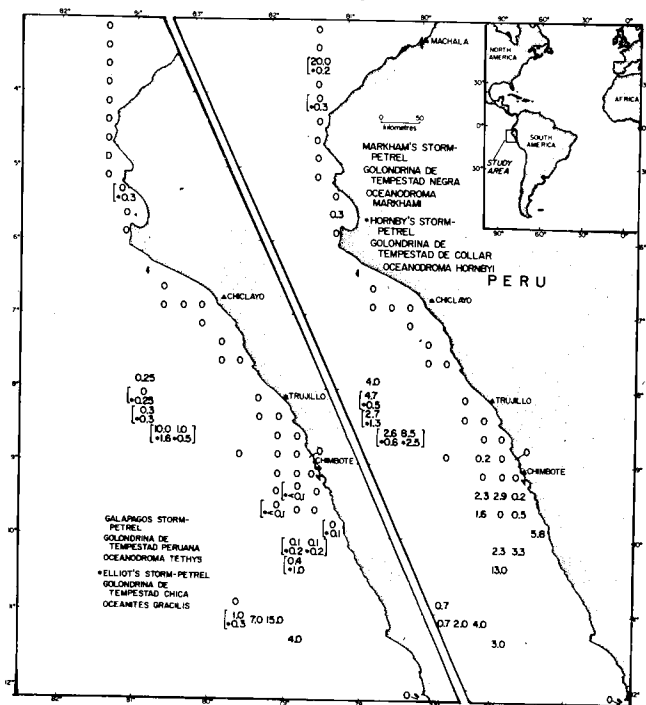


Table 2. Changes in the numbers of *Puffinus griseus* and *Oceanodroma markhami* in the waters off Chimbote during the period 5-23 Nov. 1977. 'Average' refers to the average number of birds seen per 10-minute watch; 'n' indicates the number of watches on which each average is based. The averages for *P. griseus* refer to the area 09°00' - 09°59'S, 78°30' - 78°59'W, and for *O. markhami* to 08°00' - 10°14'S, 78°00' - 79°14'W. In both cases the area limits were set on the basis of the species' distributions as shown in Figs. 5 and 6. Note that *O. markhami* individuals tended to follow the ship for long periods and so may have been included in more than one 10-minute count; the averages for this species are therefore probably exaggerated.

Date:	MEAN N° BIRDS SEEN/10 MIN. WATCH			
	<i>Puffinus griseus</i>		<i>Oceanodroma markhami</i>	
	Average:	n:	Average:	n:
5 Nov.	0	3	0	3
7	1.3	15	0	15
8	1.2	6	0	6
11	0	4	0	4
14	11.0	3	0	3
15	22.2	10	0	10
16	19.3	3	0	3
17	100.9	8	0	2
18	9.8	6	0	6
19	2.2	6	0	6
20	2.0	3	0.7	3
21	2.8	10	0	10
22	6.4	12	7.4	12
23	2.0	7	1.4	14

03°45'S (Fig. 6) were observed as early as 2 Nov.

Hornby's Storm-Petrel *Oceanodroma hornbyi*

Seen in small numbers in the warmer waters offshore, and to the north of the Peruvian upwelling (Fig. 6)

Peruvian Diving-Petrel *Pelecanoides garnoti*

Seen in small numbers close to the coast (Fig. 4).

Red-billed Tropic-bird *Phaethon aethereus*

A total of 6 birds seen on 2 Nov. between 03°20'S 81°22'W and 04°13'S 81°25'W; there were also single birds at 08°58'S 79°47'W (6 Nov.), 09°29'S 78°59'W (9 Nov.) and 11°09'S 79°19'W (28 Nov.).

Brown Booby *Sula leucogaster*

2 distant sulids, probably of this species, were seen at 04°08'S 81°24'W on 2 Nov.

Neotropic Cormorant *Phalacrocorax olivaceus*

Seen in small numbers in Chimbote and Callao harbours.

Red-legged Cormorant *Phalacrocorax gaimardi*

Quite common in Chimbote harbour and Bahía Samanco; very small numbers offshore of these areas, and also close to Islas Guañapes.

Frigate-birds *Fregata* spp.

On 2 Nov. an unidentified frigate-bird was seen at 03°07'S 81°22'W, and 2 female Great Frigate-birds *F. minor* at 03°58'S 81°23'W. An unidentified frigate-bird was seen on 4 Dec. at 06°40'S 80°53'W.

Red Phalarope *Phalaropus fulicarius*

Northern Phalarope *Phalaropus (Lobipes) lobatus*

Both species were present but it was usually impossible to separate them because of the similarity of their winter plumages. The largest concentrations were close to land: over 4000 at c. 06°55'S 80°10'W on 3 Nov., and over 1000 (mostly Northern) at c. 05°00'S 81°23'W on 4 Dec. Numbers were small elsewhere. They were not seen south of 10°18'S.

Skua *Catharacta skua*

Single birds seen at 09°12'S 79°52'W (3 Nov.), 09°19'S 78°35'W (11 Nov.), 09°16'S 78°42'W (21 Nov.) and 09°59'S 78°30'W (1 Dec.).

Pomarine Jaeger *Stercorarius pomarinus*

Parasitic Jaeger *Stercorarius parasiticus*

Jaegers were commonly seen, usually in ones and twos, all through the cruise area. Specific identifications were often not possible; however a total of 35 definite and 2 probable Pomarines, and 2 definite and 8 probable Parasitics were identified.

Grey Gull *Larus modestus*

Seen in small numbers in Chimbote and Callao harbours and in Bahía Samanco, and also in adjacent coastal waters.

Golondrina de tempestad de collar

Potoyunco peruano

Ave del Trópico

Cushuri

Chuita

Falaropo pico grueso

Falaropo pico fino

Salteador grande

Salteador pomarina

Salteador parásito

Garuma

- Simeon Gull *Larus belcheri* Simeón  
Seen in Chimbote and Callao harbours. The only other records were of 2 at 06°45'S 80°33'W (3 Nov.) and 1 at 09°34'S 73°58'W (8 Nov.).
- Dominican Gull *Larus dominicanus* Gaviota dominicana  
Common in Chimbote and Callao harbours, and seen in small numbers in the inshore waters over most of the cruise area. The northernmost record was a single bird at 04°56'S 81°23'W (4 Dec.)
- Grey-headed Gull *Larus cirrocephalus* Gaviota capucho gris  
Andean Gull *Larus serranus* Tiulla  
Seen only, in small numbers, in Chimbote harbour.
- Franklin's Gull *Larus pipixcan* Gaviota de Franklin  
Abundant in Callao harbour, and present in smaller numbers in Chimbote harbour and Bahía Samanco. Commonly seen—often in large flocks—in inshore waters. Such birds were almost always flying south, presumably en route from North America to wintering grounds which extend as far south as 45°S (e.g. Brown et al., 1975a). The largest such movement, involving over 400 birds, occurred south of Chimbote on the afternoon of 11 Nov. There were over 100 birds close inshore at 05°50'S 81°05'W on 4 Dec.; these did not appear to be migrating.
- Sabine's Gull *Xema sabini* Gaviota de Sabine  
Seen frequently, usually in ones and twos, in the cruise area north of 10°S. They were commonest at c. 05°50'S 81°05'W on 4 Dec., when at least 100 birds were counted.
- Swallow-tailed Gull *Creagrus furcatus* Gaviota de las Galápagos  
8 at 09°00'S 78°31'W and 1 at 08°56'S 78°46'W (5 Nov.); 2 at 09°50'S 78°35'W (21 Nov.); 2 at c. 10°00'S 78°30'W (1 Dec.); 1 at 08°16'S 80°29'W (3 Dec.). The birds seen on 5 Nov. were juveniles; the others were either juveniles or adults in non-breeding plumage.
- Black Tern *Chlidonias niger* Gaviotín negro  
Seen only north of 09°22'S. The largest concentrations were at 08°52'S 79°09'W (90 on 16 Nov.) and at c. 05°50'S 81°05'W (at least 20 on 4 Dec.). All birds seen were in winter plumage.
- South American Tern *Sterna hirundinacea* Terreclé  
Common Tern *Sterna hirundo* Gaviotín común  
Arctic Tern *Sterna paradisaea* Gaviotín ártico  
Common and Arctic Terns were seen close to land throughout the cruise area. Both species were present, but it was usually impossible to separate them in the field. All birds were in winter plumage. A possible South American Tern was seen in Callao harbour on 24 Nov.
- Peruvian Tern *Sterna lorata* Churi-churi  
1 at 09°15'S 78°53'W (7 Nov.), c. 13 at 09°34'S 78°38'W (8 Nov.), 1 at 08°06'S 79°21'W (10 Nov.), 10 at 09°18'S 78°46'W (15 Nov.) and 74 at 09°20'S 78°47'W (21 Nov.). Undoubtedly commoner than these records suggest, but I had difficulty in distinguishing them from Black Terns in winter plumage.
- Elegant Tern *Sterna elegans* Gaviotín elegante  
Seen in Chimbote harbour and in adjacent coastal waters between 09°13'S and 09°57'S. There was also a single bird at 04°52'S 81°23'W on 4 Dec. The species was first seen on 15 Nov.; this suggests a migration into the cruise area in the last half of November.
- Sandwich Tern *Sterna sandvicensis*  
1 adult in winter plumage at 09°19'S 78°51'W on 20 Nov.
- Inca Tern *Larosterna inca* Zarcillo  
Common in Chimbote and Callao harbours, Bahía Samanco and adjacent waters. It was unusual to see them more than c. 10 km from land, but whenever BAFFIN was stopped on station close to shore flocks of 30 or more Inca Terns would arrive and settle on the ship's bows. Over 90% of these birds were adults.

#### d. seabirds north of 03°00'S

North of 03°00'S and away from the area influenced by the Peru Current the temperature of the surface water increased abruptly, to 25°C at the Equator and 27°-28° between there and Panamá. Seabird numbers were low and many of the species were those typical of the pan-tropical zone (marked \* below; see Murphy, 1936; Palmer, 1962), and very unlike the avifauna of the Peruvian upwelling. Observations north of 03°00'S, between 30 Oct.—2 Nov. and 4-8 Dec., can be summarised as follows:

- i. birds seen off Isla La Plata (01°18'S 81°05'W) on 5 Dec., and apparently breeding there.

*Masked Booby	<i>Sula dactylatra</i>	Piquero blanco
Blue-footed Booby	<i>Sula nebouxii</i>	Camamay
Magnificent Frigate-bird	<i>Fregata magnificens</i>	Ave-fregata

- ii. birds seen off Panamá 30 Oct. (O) and 8 Dec. (D).

O Manx Shearwater	<i>Puffinus puffinus</i>	a single bird
OD Brown Pelican	<i>Pelecanus occidentalis</i>	Pelicano common



O	Blue-footed Booby	<i>Sula nebouxii</i>	Camamay	fairly common
OD	*Brown Booby	<i>Sula leucogaster</i>		common
O	Black Storm-Petrel	<i>Oceanodroma melania</i>		common
O	Double-crested Cormorant	<i>Phalacrocorax auritus</i>		fairly common
OD	Magnificent Frigate-bird	<i>Fregata magnificens</i>	Ave-fregata	common
D	Laughing Gull	<i>Larus atricilla</i>	Gaviota centro-americana	common
OD	Black Tern iii. other records.	<i>Chlidonias niger</i>	Gaviotín negra	common
	Pink-footed Shearwater	<i>Puffinus (carneipes) creatopus</i>	Pardela blanca chilena	
	Wedge-tailed Shearwater	<i>Puffinus pacificus</i>		
	Sooty Shearwater	<i>Puffinus griseus</i>	Pardela común	

Single *Puffinus (carneipes) creatopus* were seen at 00°28'N 80°55'W (1 Nov.) and 02°03'S 81°17'W (5 Dec.), and there were 6 birds on 7 Dec. between 05°58'N 79°53'W and 06°22'N 79°43'W. A single *P. pacificus* was seen at 07°11'N 79°40'W (7 Dec.) and a *P. griseus* at 01°18'S 81°09'W (5 Dec.)

Galápagos Storm-Petrel	<i>Oceanodroma tethys</i>	Golondrina de tempestad peruana
Harcourt's Storm-Petrel	<i>Oceanodroma castro</i>	
Leach's Storm-Petrel	<i>Oceanodroma leucorhoa</i>	
Markham's Storm-Petrel	<i>Oceanodroma markhami</i>	Golondrina de tempestad negra
Black Storm-Petrel	<i>Oceanodroma melania</i>	

*Oceanodroma tethys* occurred in small numbers off northwest Ecuador (c. 02°00' - 04°00'N, 80°00' - 80°30'W); it seemed commoner in early December than in early November. 2 *O. castro* were seen with a flock of *O. tethys* at 02°06'N 80°33'W (6 Dec.) c. 5 possible *O. leucorhoa* were seen at 07°11'N 79°40'W on 7 Dec.

*O. markhami* and *O. melania* were separated in the field by their flight characteristics: the former by its gliding flight and shallow wingbeat, and the latter by a very deep wingbeat with little gliding. *O. markhami* was seen north to 03°16'N 80°21'W in December, but was not seen at all north of 03°00'S in November. Conversely 2 *O. melania* were seen at 00°41'N 80°52'W on 1 Nov., and 5 more large black storm-petrels, possibly of this species, were seen south to 00°39'N that day; none was seen there in December. It is possible that there was a movement of *O. markhami* into *O. melania* out of the waters northwest of Ecuador in December. On 7 Dec. there were c. 6 *O. melania* at 07°00' - 07°11'N 79°40'W, off Punta Mala, Panamá.

\*Red-billed Tropic-bird *Phaethon aethereus* Ave del Trópico  
Single birds at 03°41'N 80°20'W (31 Oct.) and 00°39'N 80°53'W (1 Nov.), and an unidentified tropic-bird at 00°41'N 80°52'W (1 Nov.).

*Masked Booby	<i>Sula dactylatra</i>	Piquero blanco
*Brown Booby	<i>Sula leucogaster</i>	
*Red-footed Booby	<i>Sula sula</i>	

Small numbers of *S. dactylatra* were seen between 02°00' - 07°00'N, in December only. Small numbers of *S. leucogaster* were seen south to 05°00'N 80°06'W (31 Oct.) and to 06°45'N 79°43'W (7 Dec.); several had the greyish heads characteristic of males of the Panamanian-Colombian subspecies *S. l. etesiaca* (Murphy 1936). *S. sula* was seen only on 31 Oct. (3 birds between 04°23'N 80°10'W and 04°11'N 80°13'W) and 1 Nov. (12 birds between 00°41'N 80°52'W and 00°21'N 80°55'W); all were in the white plumage phase.

Magnificent Frigate-bird *Fregata magnificens* Ave-fregata  
Small numbers seen south of Panamá to 00°26'N 80°55'W (1 Nov.) and 01°24'S 81°10'W (5 Dec.).

Red Phalarope *Phalaropus fulicarius* Falaropo pico grueso

10 phalaropes were seen off Panamá on 30 Oct., 1 at 02°03'S 81°17'W and 3 at 01°09'S 81°08'W on 5 Dec., and 1 at 02°04'N 80°33'W on 6 Dec.; none were seen in this area in November. The few birds which could be identified were

*P. fulicarius*.  
Pomarine Jaeger *Stercorarius pomarinus* Salteador pomarina

There was a bird at 06°22'N 79°43'W and 3 at 07°11'N 79°40'W (7 Dec.). Single unidentified jaegers were seen at 05°00'N 80°06'W (31 Oct.), 01°26'S 81°10'W (5 Dec.) and 07°04'N 79°41'W (7 Dec.)

Sabine's Gull *Xema sabini* Gaviota de Sabine

Single birds seen at 04°11'N 80°13'W (31 Oct.) and 07°11'N 79°40'W (7 Dec.), and a total of 11 between 01°52'S 81°12'W and 01°21'S 81°10'W on 5 Dec.

Black Tern	<i>Chlidonias nigra</i>	Gaviotín negra
Common Tern	<i>Sterna hirundo</i>	Gaviotín común
Arctic Tern	<i>Sterna paradisaea</i>	Gaviotín artico
*Bridled Tern	<i>Sterna anaethetus</i>	
Sandwich Tern	<i>Sterna sandvicensis</i>	
*White Tern	<i>Gygis alba</i>	

A total of 4 *Chlidonias niger* were seen between 02°01'S 81°17'W and 01°24'S 81°10'W on 5 Dec. Birds which were either *Sterna hirundo* or *S. paradisaea* were seen at 00°41'N 80°52'W (1 Nov.: 1 bird), between 02°09'S 81°17'W and 01°36'S 81°11'W (5 Dec.: 6 birds) and off Panamá (8 Dec.: 1 bird). 6 *Sterna anaethetus* and 4 *Gygis alba* were seen between 04°39' - 04°24'N 80°10'W (31 Oct.). A possible *Sterna sandvicensis* was seen at 05°11'N 80°05'W (31 Oct.).

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#### REFERENCES

- AINLEY, D. 1977. Feeding methods in seabirds: a comparison of polar and tropical nesting communities in the eastern Pacific Ocean. in *Adaptations within Antarctic Ecosystems*; edited by G.A. Llano. Smithsonian Inst., Washington, D.C. pp. 669-685.
- ALEXANDER, W. 1963. *Birds of the Ocean*. G.P. Putnam's Sons, New York.
- ASHMOLE, N. 1971. Seabird ecology and the marine environment. in *Avian Biology*; edited by D.S. Farner and J.R. King, vol. 1. Academic Press, New York and London. pp. 223-286.
- BAILEY, R. 1966. The sea birds of the southeast coast of Arabia. *Ibis* 108:224-264.
- BLAKE, R. 1977. *Manual of Neotropical Birds*, vol. 1. Univ. Chicago Press, Chicago.
- BROWN, R. 1979. Seabirds of the Senegal upwelling and adjacent waters. *Ibis* 121:283-292.
- F. COOKE, P. KINNEAR and E. MILLS. 1975. Summer seabird distributions in Drake Passage, the Chilean fjords and off southern South America. *Ibis* 117:339-356.
- D. NETTLESHIP, P. GERMAIN., C. TULL and T. DAVIS. 1975. *Atlas of Eastern Canadian Seabirds*. Canadian Wildlife Service, Ottawa.
- HARRIS, M. 1977. Comparative ecology of seabirds in the Galapagos Archipelago. in *Evolutionary Ecology*; edited by B. Stonehouse and C.M. Perrins. Macmillan Press, London and Basingstoke: pp. 65-76.
- KOEPCKE, M. 1970. *The Birds of the Department of Lima, Peru*. Livingston, Wynnewood, PA.
- MUPHY, R. 1936. *Oceanic Birds of South America*. *Amer. Mus. Nat. Hist.*, New York.
- NETTLESHIP, D., and A. GASTON. 1978. Patterns of pelagic distribution of seabirds in western Lancaster Sound and Barrow Strait, Northwest Territories in August and September 1976. Canadian Wildlife Service, Occasional Paper N° 39, Ottawa.
- PALMER, R. (ed.). 1962. *Handbook of North American Birds*. Vol. 1 Yale Univ. Press, New Haven.
- TOVAR, S. and M. GALARZA. 1977. Fluctuación mensual de poblaciones de aves guaneras durante 'El Niño' de 1972. *Inst. Mar Perú Callao*: typescript report.
- WIENS, J. and J. SCOTT. 1975. Model estimation of energy flow in Oregon coastal seabird populations. *Condor* 77:439-452.