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SEABIRDS SEEN IN THE NORTHERN TASMAN SEA IN WINTER

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SUMMARY

The distribution of birds in the northern Tasman Sea was observed during August and September 1967 from r.v. *Argo*. Subantarctic species (*Diomedea exulans*, *D. melanophris* and *Daption capensis*) ranged further north in the western than in the eastern Tasman Sea, probably because western waters have a higher phosphate content and hence contain more food.

New northernmost sightings were recorded for *Pachyptila* sp., *Pterodroma macroptera*, *Pelecanoides* sp. and *Procellaria cinereus*.

INTRODUCTION

As New Zealand Oceanographic Institute representative, I participated in a Scripps Institution of Oceanography geological cruise (*Nova* Expedition; r.v. *Argo*) in the Tasman Sea during August and September 1967. *Argo* left Noumea on 5 August, docked at Brisbane 23–26 August, and arrived at Auckland on 12 September (Fig. 1). Weather permitting, for a few minutes of each daylight hour, I noted the species and numbers of seabirds near the ship. Identifiable birds were seen on 20 days (Table 1), none on 7 days (11–16 and 19 August), and bad weather prevented observation on 3 days (30 August, 1 and 3 September).

Daily details of weather, position, etc. (Table 2), came from scientific records and the ship's log. Actual positions support the northernmost sightings, but noon positions suffice for the others.

PREVIOUS WORK

Fleming (1950) compiled several logs of bird sightings from the southwest Pacific to give a useful outline of the northern limits of Subantarctic species (those nesting between 40° and 60° S). Little is known, however, of birds in the northern Tasman Sea, the area between New Zealand, New Caledonia and Queensland, Australia, (see Fig. 1). A few observations in Australian coastal waters by Amiett (1958) and Laird (1951, 1956) show that *Diomedea exulans* and *Diomedea melanophris* range further north there in winter than they do in the South Pacific east of New Zealand. Crossings of the Tasman in December (Gibson 1960) and March (Falla, in Fleming 1950) outline the summer distributional limits of Subantarctic species, but, because there appear to be no winter observations published, my records for August and September should be of interest.

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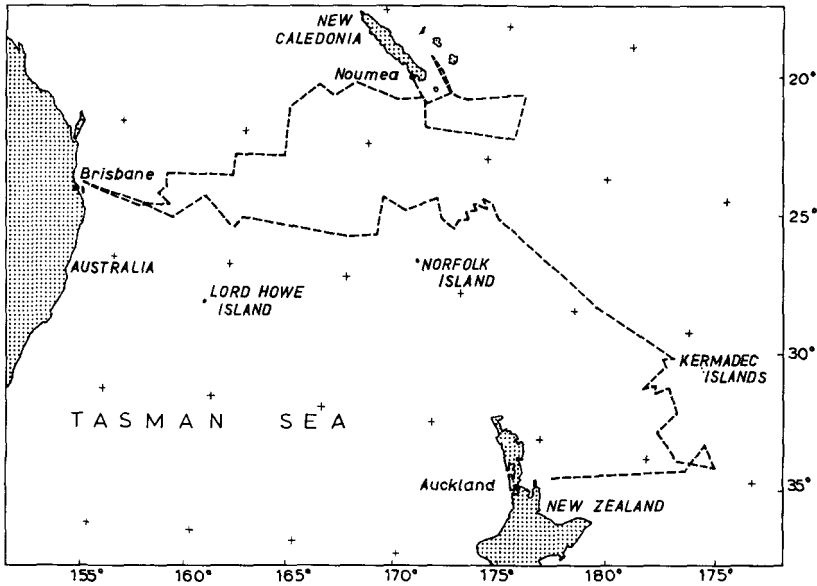


FIG. 1—Track of r.v. *Argo*, August–September 1967

OBSERVED DISTRIBUTION OF SPECIES

Diomelea exulans Wandering Albatross (Fig. 2)

This species ranges farthest north from June to October, sometimes beyond the Tropic of Capricorn (23° S). On the *Nova* expedition, *D. exulans* was seen on all but two of the days on which observations were made. The northernmost sighting was at $23^{\circ} 10' S$, off the coast of New Caledonia, a juvenile, the only bird seen on 17 and 18 August.

During the west–east traverse (26 August–5 September) of the Tasman between 27 – 29° S and 154 – 175° E, *D. exulans* followed the ship in ever-increasing numbers (see Table 1); the largest number seen at once was 15 on 9 September east of New Zealand at 34° S, ($179^{\circ} 50' W$). Northernmost of the September sightings was that at $27^{\circ} 35' S$ (169° E) on 2 September.

The only other record from this region is that of Warner (1947) who found a carcass on a beach near Nooumea, New Caledonia, in August 1944. Neither Falla (in Fleming 1950) nor Gibson (1960) saw any *D. exulans* in this region in March and December. In Australian coastal waters Amiett (1958) and Laird (1956) each record one sighting at $19^{\circ} 43' S$ and $19^{\circ} 34' S$ respectively; Amiett observed *D. exulans* regularly reaching 20 – 21° S in August and September. East of New Zealand Fleming (1950) records a northernmost sighting at $29^{\circ} 20' S$ and Harrison (1962) another at $28^{\circ} 52' S$.

My notes show that the northernmost sightings (north of 26° S) were of juvenile birds in plumage phase C and/or D of Fleming (1950). To the southward, immature phase E and F became dominant. Occasionally phase G, with the striking white spots on the upper wing was recorded. Near New Zealand, at approximately 34° S, phase H (adult) was observed (Tables 1 and 2; maturity criteria based on Fleming).

Diomedea melanophris Black-browed Mollymawk (Fig. 2)

My northernmost sighting in August was of an immature bird at 26° 42' S (159° 15' E); the first adult birds were seen on 7 September at 31° 50' S (179° 45' W). The species was seen regularly 6–11 September between longitudes 176° E and 178° W, south of 30° S.

Amiott (1958) records *D. melanophris* in Australian waters as far north as 24° 07' S in July and August and Warner (1947) found a carcass on a New Caledonian beach. Gibson (1960) and Falla (*in*

TABLE 1—Maximum number of each sea bird species at any one time in each day from r.v. *Argo* in the northern Tasman Sea; maxima were usually at different times of day (— = species not seen)

Date	<i>Diomedea exulans</i> (adult)	<i>D. exulans</i> (immature)	<i>D. exulans</i> (juvenile)	<i>D. melanophris</i>	<i>Phoebastria palpebrata</i>	<i>Macronectes giganteus</i>	<i>Daption capensis</i>	<i>Pachyptila</i> sp.	<i>Procellaria cinerea</i>	<i>Puffinus bulleri</i>	<i>Pterodroma macroptera</i>	<i>Pterodroma neglecta</i>	<i>Fregata grallaria</i>	<i>Pelecanoides</i> sp.	<i>Sterna fuscata</i>
17 August 1967	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
18 August 1967	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
20 August 1967	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—
21 August 1967	—	2	2	1	—	1	—	—	—	—	—	—	—	—	—
22 August 1967	—	7	3	—	—	—	1	—	—	—	2	—	—	—	—
23 August 1967	—	2	—	—	—	—	—	—	—	—	2	—	—	—	—
26 August 1967	—	—	—	2	—	—	—	—	—	—	—	—	—	—	2
27 August 1967	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
28 August 1967	—	1	—	1	—	—	1	—	—	—	1	—	—	—	—
29 August 1967	—	3	1	—	—	—	1	—	—	—	—	—	1	—	—
31 August 1967	—	2	2	—	—	—	2	—	—	—	—	—	—	—	—
2 September 1967	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—
4 September 1967	—	2	2	—	—	—	1	—	—	—	—	—	—	—	—
5 September 1967	—	2	2	—	—	—	10	—	—	—	8	—	—	—	—
6 September 1967	—	6	4	1	1	—	6	1	—	—	6	—	—	—	—
7 September 1967	—	9	4	1	—	—	5	—	1	—	3	—	—	—	—
8 September 1967	—	4	3	2	—	—	5	—	—	—	2	—	—	—	—
9 September 1967	—	10	5	1	—	—	5	6	—	1	6	2	—	—	—
10 September 1967	1	5	3	2	—	—	2	7	—	1	1	4	—	—	4
11 September 1967	2	4	2	2	—	—	2	3	6	—	1	2	—	—	—

TABLE 2—Noon position, temperature, and weather for each day on which birds were seen from r.v. *Argo* (— = no observations)

Date	Noon Position		Sea	Temperature (°C)		Air (wet)	Speed (knots)	Wind		Pressure (millibars)
	Lat. (°S)	Long. (°E)		Air (dry)	Direction					
17 August 1967	23 05	167 12 E	22.5	22.2	20.0	17	SE		1016.2	
18 August 1967	23 10	165 17 E	22.6	23.1	20.5	18	E		1011.8	
20 August 1967	25 53	161 28 E	21.5	20.2	17.0	21	ESE		1003.7	
21 August 1967	26 42	159 15 E	20.8	19.4	17.2	8	NNW		999.0	
22 August 1967	27 45	157 10 E	20.2	—	—	34	W		1008.5	
23 August 1967	27 00	153 40 E	21.7	20.7	18.3	14	SE		1013.9	
26 August 1967	27 48	155 20 E	20.1	19.4	14.8	11	NNW		1013.5	
27 August 1967	27 45	156 10 E	19.9	17.8	18.0	30	NNW		1012.5	
28 August 1967	28 00	158 25 E	19.7	18.3	12.2	16	SW		1016.3	
28 August 1967	28 10	160 35 E	19.6	18.3	13.2	12	SSW	Light airs	1014.9	
31 August 1967	28 30	165 35 E	19.2	17.8	11.8	6	SW		1009.5	
2 September 1967	27 35	169 00 E	20.0	18.3	13.9	34	WSW		1001.4	
4 September 1967	26 53	172 05 E	20.3	18.9	15.5	19	SW		1010.8	
5 September 1967	27 45	174 15 E	19.8	18.3	14.7	19	WSW		1018.3	
6 September 1967	30 00	176 45 E	17.8	16.9	11.1	10	W		1025.4	
7 September 1967	31 35	179 15 E	18.4	16.9	12.0	6	NE		1026.7	
8 September 1967	31 55	180 00	17.1	18.0	14.0	10	N		1015.2	
9 September 1967	34 00	179 50 W	16.4	15.9	15.0	24	NNE		1001.7	
10 September 1967	34 00	178 00 W	14.7	15.0	13.9	19	NNE		1001.7	
11 September 1967	36 10	179 00 E	14.6	13.3	9.4	28	WSW		1006.4	

Fleming 1950) did not observe this species during their north Tasman crossings in summer. The northernmost record east of New Zealand (Myers and Falla 1925) is at 33° 32' S (153° 04' W) and Edgar *et al.* (1965) recorded it at approximately 33° S (178° E) in November.

Phoebetria palpebrata Light-mantled Sooty Albatross

One Sooty Albatross followed the ship closely for 2 hours on 6 September at 30° S (177° E). Although reported before at 30° S from the Kermadec Islands by Sorensen (1964), this species generally does not venture north of 40° S (Falla, Sibson and Turbott 1966). Neither Gibson (1960) nor Laird (1951, 1956) saw it in the Tasman. Fleming's (1950) northernmost sighting east of New Zealand was at 39° S (159° W) but Harrison (1962) notes that this bird may reach 33° S.

Macronectes giganteus Giant Petrel (Fig. 2)

Of the few Giant Petrels sighted one was seen on 21 August at 26° 43' S (158° 30' E) and the next on 8 September at 32° 30' S (179° 40' E). I did not see more than one of these birds at a time until south of 34° S.

Giant Petrels are supposedly common south of 30° S (Harrison 1962, and Falla, Sibson and Turbott 1966). I suggest that this species is less than common around 30° S because there is no record from the Kermadecs (Sorensen 1964) or from other Tasman crossings by Falla (*in* Fleming 1950) and Gibson (1960). One other northern sighting in the Tasman was made in September 1954 by Laird (1956), and the northernmost record is at 25° 30' S (115° W; Falla, *in* Fleming 1950).

Daption capensis Cape Pigeon

Cape Pigeons commonly followed the ship; up to five birds were seen nearly every day between latitudes 27° and 29° S and longitudes 156° E and 178° W. My northernmost sightings were both at 27° 30' S; 156° 40' E on 22 August, and at 174° E on 5 September.

Although Falla, Sibson and Turbott (1966) state that *D. capensis* ranges as far north as 25° S, Sorensen's (1964) record at the Kermadec Ids (30° S) in August and Laird's (1956) mid-Tasman records of numbers at 31° 39' S (166° 41' E) and a single at 29° 04' S (160° 35' E) in September seem to be the northernmost records in the literature. East of New Zealand, Fleming's (1950) northernmost sighting was at 31° S (144° W) in July, and Cape Pigeons sometimes reach 3° 05' S near the Galapagos Islands in May (Harrison 1962). As with other Subantarctic species, *D. capensis* was not recorded north of 26° S during Tasman crossings in September by Falla (*in* Fleming 1950) or in December by Gibson (1960).

Pachyptila spp. Prions

On 6 September, approximately 420 miles north of Auckland at 29° 55' S (176° 45' E), one prion flitted back and forth for an hour within 10–20 yards of the stern of the ship. No more were observed

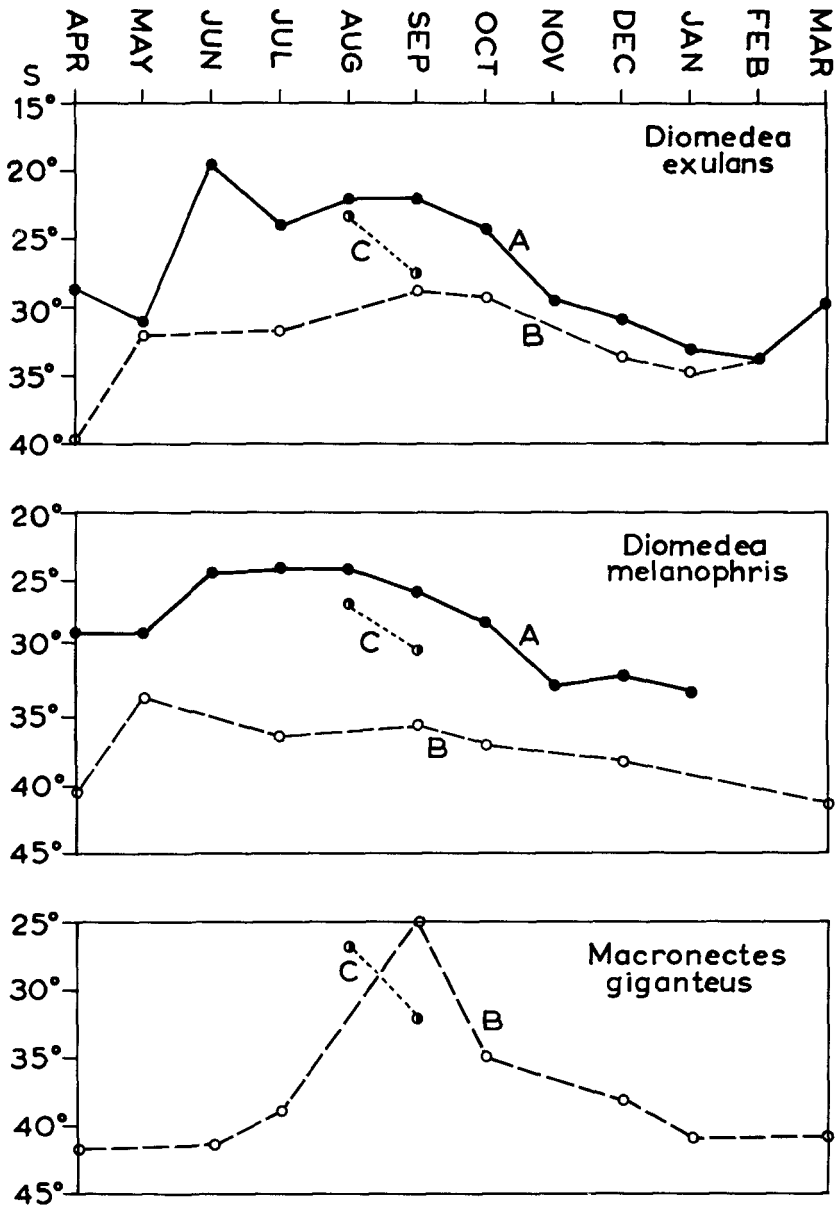


FIG. 2.—Northern distributional limits of Subantarctic species. A—Modified from Amblett 1958 for western Tasman; B—Modified from Harrison 1962, and Fleming 1950 for South Pacific; C—Present data for central Tasman

until 11 September when a flock of six was seen approximately 250 miles east of Auckland at $35^{\circ} 55' S$ ($179^{\circ} 55' E$). Most northern prion sightings have been of the Fairy Prion *Pachyptila turtur*, (Alexander 1955), and probably my sightings were also of this species. Prions have a general northern limit of $35^{\circ} S$ (Alexander 1955) but Sorensen (1964) records beach-wrecked prions at the Kermadecs ($30^{\circ} S$). Laird (1956) saw a flock near North Cape ($34^{\circ} 19' S$) in September. East of New Zealand they apparently range further north to $37^{\circ} 30' S$ in May and July (Fleming 1950) and to $34^{\circ} 46' S$ in September (Harrison 1962).

Procellaria cinereus Grey Petrel

Solitary Grey Petrels were first seen on 7 September at approximately $32^{\circ} 25' S$ ($178^{\circ} 50' E$) and several times between this latitude and $34^{\circ} S$ and as far east as $178^{\circ} W$. On each occasion the bird came to within 10 yards of the ship and sometimes settled with other birds when garbage was thrown overboard. Although south of Harrison's sightings at $30^{\circ} S$ (1962), this appears to be the first positive identification of *P. cinereus* so far due north of New Zealand.

East of New Zealand Grey Petrels have not been recorded north of $40^{\circ} S$ by Fleming (1950) nor observed in the north Tasman (Laird 1956 and Gibson 1960) or at the Kermadecs (Sorensen 1964).

Puffinus bulleri Buller's Shearwater

Single Buller's Shearwaters were seen on 9, 10 and 11 September between $34-36^{\circ} S$ ($178^{\circ} E$ to $178^{\circ} W$); the northernmost sighting was at $33^{\circ} 30' S$ ($179^{\circ} 45' W$) on 9 September. This common Pacific petrel (Alexander 1955) reaches the North Pacific in the southern winter (Falla, Sibson and Turbott 1966).

Pterodroma macroptera Grey-faced Petrel

Either singly or in small groups, this petrel came close to the ship three times in August at $27-28^{\circ} S$ and daily after 5 September, when I made my northernmost sighting at $27^{\circ} 30' S$ ($174^{\circ} E$). This noticeably pale-faced species was most often seen passing, but sometimes followed the ship closely with albatrosses and other petrels.

Northern records for *P. macroptera* are at $31^{\circ} S$ ($144^{\circ} W$) in July (Fleming 1950), at the Kermadecs, $30^{\circ} S$, in July and August (Sorensen 1964) and at $35^{\circ} 05' S$ ($162^{\circ} 32' W$) in September (Harrison 1962). Neither Laird (1956) in September nor Gibson (1960) in December recorded this petrel on their Tasman crossings. My observations appear to be the most northern record for this bird in the Tasman region.

Pterodroma neglecta Kermadec Petrel

Although common near the Kermadec Islands (Sorensen 1964), I saw this bird only once some 250 miles to the south at $34^{\circ} 15' S$ ($179^{\circ} 30' W$) on 9 September. It ranges between Lord Howe Island and Mexico.

***Fregetta grallaria* White-bellied Storm Petrel**

One flitted around the stern for some minutes on 29 August at 28° 19' S (160° 40' E) some 200 miles north of its nearest breeding ground, Lord Howe Island.

***Pelecanoides* sp. Diving Petrel**

At 34° S (178° W) on 10 September, a small flock of about six diving petrels darted rapidly to and fro among the wave crests within 20 yards of the ship. Although identifications at sea are difficult, Bourne (1968) shows that *P. urinatrix* is the species most likely to occur here. This observation would seem to establish a northern limit for these birds which have not previously been recorded on cruises north of New Zealand (Fleming 1950; Laird 1951, 1956; Gibson 1960; Sorensen 1964). According to Alexander (1955) this petrel is common between South America and New Zealand, ranging north to 35° S.

***Sterna fuscata* Sooty Tern**

I saw *S. fuscata* twice near the Australian coast east of 155° E and between 27–28° S. A common tropical and sub-tropical seabird, Gibson (1960) previously recorded it on sea voyages in this area.

DISCUSSION

Variations in oceanographic conditions are probably important in determining the ranges of the birds of the Southern Oceans. Because of scanty data on both, previous workers were unable to study the effects of environment on seabird distribution in these waters. An attempt is made here to briefly review what is now known about the environment.

The Tropical Convergence crosses the north Tasman between New Zealand and New Caledonia (Wyrski 1960); beyond it, temperatures may increase quite rapidly northwards (Fig. 3). The Convergence lies generally near or north of 30° S where sea temperatures during August and September are 19.5–21°C. Over most of the region, zonation of temperature is approximately east-west (Sverdrup, Johnson, and Fleming 1942).

Off the Australian coast and covering much of the western Tasman is warm surface water, brought by current from north of the Tropical Convergence, which is a tongue of the South Equatorial water mass (Wyrski 1960, Rochford 1959). In the eastern Tasman, the surface water is dominantly an extension of the West Central South Pacific mass. The phosphate content of these masses is interesting because it indicates their nutrient value. The western Tasman part of the Equatorial water mass is phosphate-rich, and contains >20 µg/l phosphate. Conversely, the part of the South Pacific water mass between New Zealand and New Caledonia is relatively poor in phosphate, containing <10 µg/l. These two water masses, one on each side of the Tasman, one rich and one poor in nutrients probably explain the pattern of bird distribution recorded.

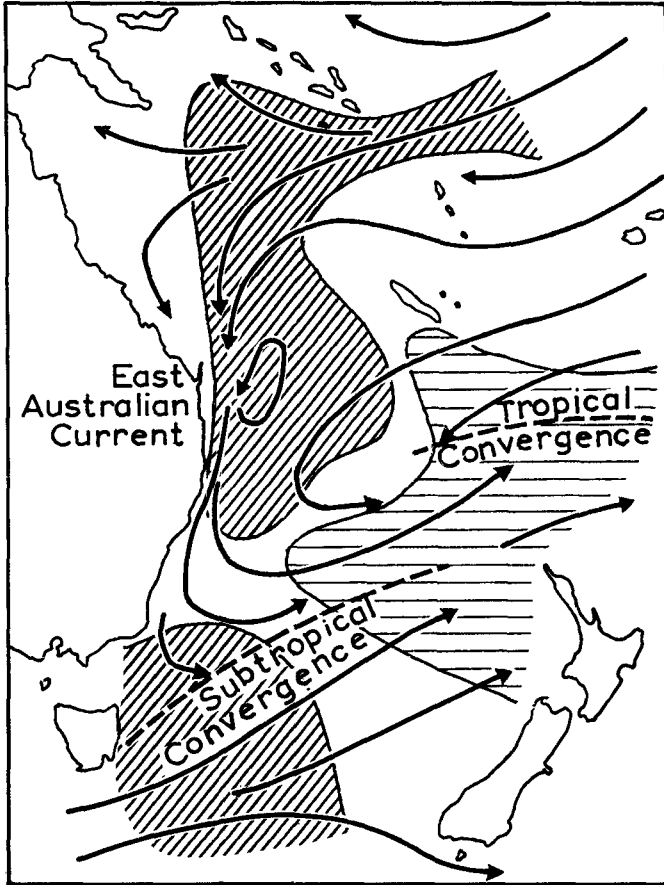


FIG. 3—Tasman Sea: distribution of surface currents, convergences and phosphate rich surface water. Phosphate rich ($> 20 \mu\text{g/l}$) south equatorial and subantarctic water masses shaded obliquely; horizontal shading indicates phosphate poor ($< 10 \mu\text{g/l}$) west central south Pacific water masses. Modified from Rochford (1959) and Wyrтки (1960)

In the phosphate-poor water of the eastern Tasman between New Zealand and New Caledonia, most birds seem to be distributed south of the Tropical Convergence. (In warmer waters north of the Convergence only one Wandering Albatross was seen on this voyage.) Because values for phosphate at the surface are moderate, probably the amount of food available is less than in Subantarctic waters, where phosphate values $>30 \mu\text{g}/\text{l}$ are common (Rochford 1959).

In the western Tasman, Wandering and Black-browed Albatrosses extend much further north into waters where the surface temperature was $21\text{--}23^\circ\text{C}$. As noted by Amiett (1958) and Laird (1956) they extend north in winter to approximately 19°S . I submit that the presence of rich feeding in the highly phosphatic Equatorial water near the Australian coast explains these extended ranges (*cf.* Fig. 3). Thus, when food remains abundant beyond their normal distributional limits (such as temperature/latitude), birds may perhaps disregard the limits. This is only a simplistic generalisation, and obviously much more work on both bird distribution and regional oceanography is needed to test it. Evidently, no single oceanographic parameter controls the varying distribution of birds in this or any other region.

CONCLUSIONS

My observations confirm that in winter the albatrosses *Diomedea exulans* and *D. melanophris* commonly range further north in the Tasman region than in the South Pacific east of New Zealand and that they range furthest north near the Australian coast. In the eastern Tasman their limit appears to be south of 27°S ; birds seen off New Caledonia and beach-wrecks there may well have arrived via the Australian coast. *D. exulans* ranges further north than *D. melanophris* and Amiett's (1958) observation that younger birds of both species range further north than adults is confirmed.

Of the common Subantarctic petrels, *Daption capensis* ranges further north in the Tasman than in the South Pacific east of New Zealand. *Marconectes giganteus* is less common than expected north of 32°S . My sightings of Prions, Grey and Grey-faced Petrels, and Diving Petrels were the northernmost so far recorded.

In the moderately phosphatic waters of the eastern Tasman, the Tropical Convergence between New Zealand and New Caledonia bars many species from ranging further north, but in the richer waters of the western Tasman the increase in phosphate content correlates with a northward extension of range of some albatrosses into almost tropical regions.

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