153.5°E and another 2 next day at 28.5°N 161°E. These records are rather far south, although there are records from the Vulcano and Bonin Islands.

Sabine's Gull *Xema sabini*

Sabine's Gulls were seen along the South American coast as well as the Central American coast. The most southerly observation was recorded on 5 Dec 75 at 20°11′S, 740 miles NW of Valparaiso. More than 200 were counted at 220 miles SSW of Guayaquil and on 4 Mar 81 we observed 14 which were in moult, in the harbour of Acajutla.

Swallow-tailed Gull *Creagrus furcatus*

Sailing from Callao to Matarani on 14 Mar 81, noon position 13°06′S 76°53′W, we counted 1,346 Swallow-tailed Gulls, of which 1,310 were recorded between Isla San Gallan and Isla Viejas.

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THE APPEARANCE AND CLASSIFICATION OF THE *COOKILARIA* PETRELS

By Dr W. R. P. Bourne

A group of small, more or less migratory, grey and white petrels with a dark "inverted W" on the back which replace each other at different seasons in different parts of the Pacific have long been a by-word for difficulty of classification and identification. Since they were discovered during Cook's voyages two hundred years ago they have first been referred to a single variable species *Pterodroma cookii*, then to a separate subgenus *Cookilaria* including about a dozen species and races, and finally shown by Sir Charles Fleming to include two parallel radiations of similar species of much the same size (Table 1) which differ in their anatomy (*Emu*

41: 69-80). Since P. Meeth has now supplied photographs of several of them, it may be useful to show a series illustrating the comparative appearance of the back and underparts, which have been prepared by Andy Lucas.

The *hypoleuca* superspecies

The simplest situation appears to be found in three heavily-built forms with pink legs and feet but dark tips to the toes sometimes treated as races of the Bonin Petrel *Pterodroma hypoleuca,* although they appear sufficiently distinct to rank as separate species. They differ from the remainder on anatomical grounds, notably the more solid structure of the skull, in which they resemble the larger capped petrels of the *Pterodroma hasitata-cahow-phaeopygia-externa-baraui* group, differing from them mainly in being adapted to take smaller foods.

They are represented here by the Black-winged Petrel *P. nigripennis* (Figs. 1a and b). It will be seen that compared with the

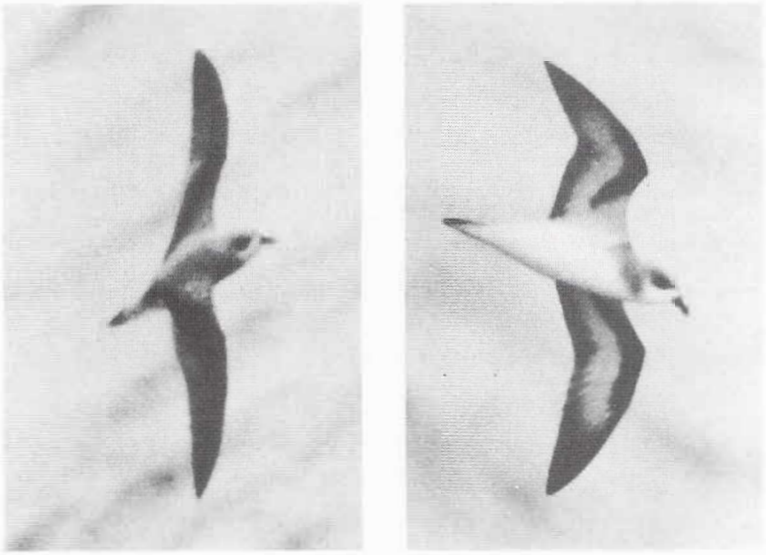

Figure 1a and b. Upper and lower sides of the Black-winged Petrel *Pterodroma nigripennis.* Note heavy build and darker ear-coverts and leading edge of underwing. Taken by P. Meeth in south-west Pacific.

other forms shown it has a comparatively solid body and broader wings with more contrasting dark ear coverts, and a dark bar along the front edge of the underwing. It breeds in the local summer in the area north of New Zealand, where it has recently expanded to colonise the Chatham Islands and eastern Australia, and disperses north across the equator in the winter. It is replaced over cooler surface water in the same part of the South Pacific by the rare

Chatham Petrel *P. axillaris*, which has greyer upperparts and a more extensive dark bar across the underwing extending into the armpit, and in the North Pacific by the numerous Bonin Petrel *P. hypoleuca*, which has a darker back with pale feather edges and a longer tail, and continues to nest at the same time on coral islands in the local winter.

The subgenus *Cookilaria*

The remaining forms belonging to the main *Cookilaria* assemblage appear to involve an earlier, but now more advanced, development of the same stock distinguished by their small size and lighter build, notably of the skull, and bluish legs and feet with the dark pigment restricted to the outer margins and toenails. They include a number of forms breeding in the South Pacific and sometimes undertaking long movements to the north and east, while fossil bones have also recently been discovered at Aldabra in the Indian Ocean. They show a similar variation of the upperparts to the previous group, becoming darker from south to north, but where the distribution of the two groups overlaps they have whiter underwings (Figs. 2-4a and b), so that one form is sometimes known as the White-winged Petrel.

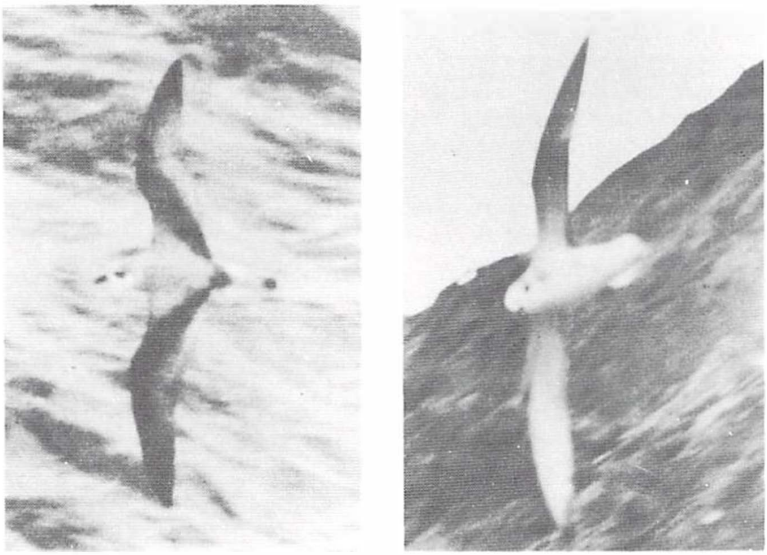

Figure 2a. Upper side of Cook's Petrel *Pterodroma cookii*. Note pale grey crown and back. Taken by P. Meeth east of New Zealand. Figure 2b, underside of similar Defilippe's Petrel *P. defilippiana*. Note extremely white underwing and proportionately short wing but long tail. Taken by W. R. Millie at San Ambrosio Island.

The most southerly forms occurring over cool water are very similar in their general appearance above to the Chatham Petrel, with grey backs, but have almost pure white underwings (Figs. 2a and b). Cook's Petrel *P. cookii* itself breeds on large islands which it visits by night off New Zealand, and undertakes immense movements east to South America and north to the Aleutians, where what appear to be young birds were described as a race *P. c. orientalis*. A more sedentary population breeding earlier in the spring on small islands which it visits by day at the Juan Fernandez and Desventuradas Islands off Chile has also traditionally been treated as a race of Cook's Petrel, but since despite the similarity of its markings it differs in having a more massive bill and proportionately short wing and long tail as well as its habits it is treated as a distinct species Defilippe's Petrel *P. defilippiana* by C. Jouanin and J. Mougin in the latest edition of Volume 1 of Peters' *Birds of the World*.

The other forms become increasingly dark on the head, back and anterior edge of the underwing over warmer surface water, extreme individuals becoming entirely dark, and the normal range of variation is shown in Figures 3 and 4. Pycroft's and Stejneger's Petrels *pycrofti* and *longirostris* (Fig. 3) breed close to members of

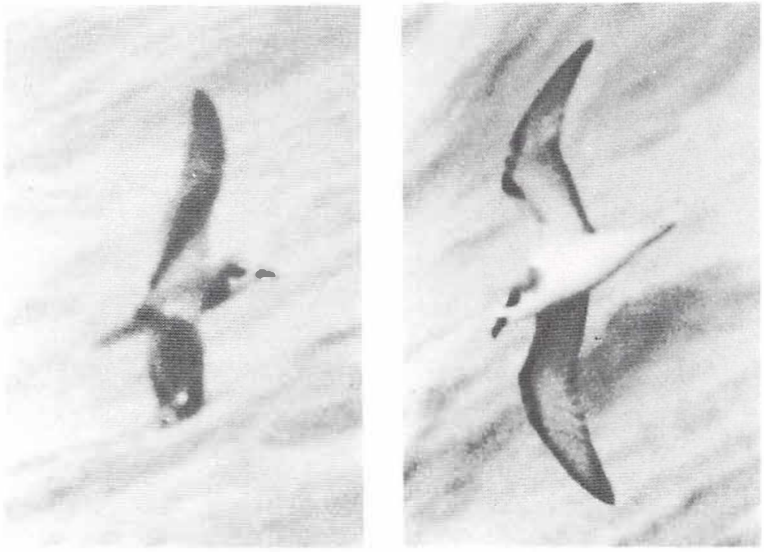

Figure 3a and b. Upper and lower sides of Stejneger's Petrel *Pterodroma longirostris*. Note increasingly dark crown and leading edge of underwing. Taken by P. Meeth in S.E. Pacific. White mark on wing may be due to moulted primary ?

the preceding *cookii* group on islands off New Zealand and Juan Fernandez respectively, but appear to feed over warmer surface water and migrate to lower latitudes of the North Pacific, and are sometimes treated as a species under the second name. The New Caledonian and Gould's Petrels *caledonica* and *leucoptera* show more dark markings, breed around New Caledonia and off eastern Australia respectively, appear to winter in the eastern tropical Pacific, and are also sometimes treated as a species under the

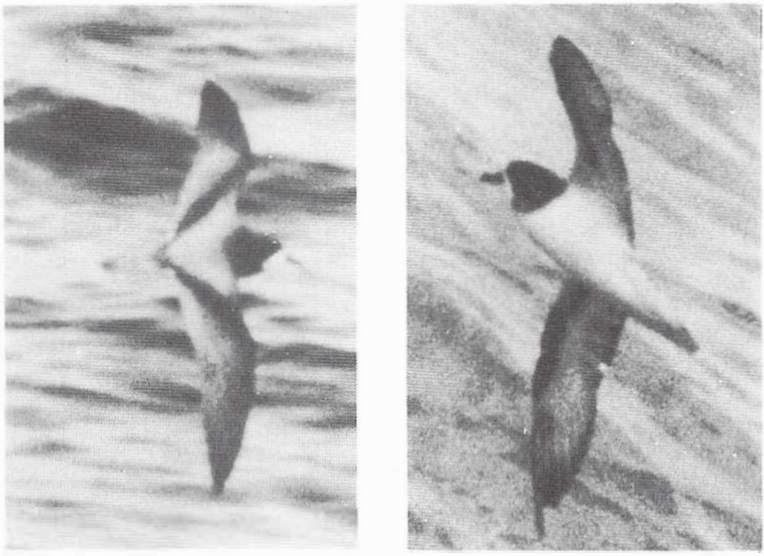

Figure 4a and b. Upper and lower side of Gould's Petrel *Pterodroma leucoptera*. Note greater amount of dark on head, neck, and anterior border of underwing. 4a taken by P. Gould and 4b by P. Meeth in east tropical Pacific; 4b is growing an outer primary and a secondary.

second name (M. J. Imber and J. A. F. Jenkins, *Notornis* 28:149-160). Finally a series of variable and still inadequately-studied dark populations which appear to be sedentary in the tropical west Pacific are also sometimes treated as a further species, the Collared Petrel *P. brevipes*.

Considerations affecting classification

The classification of all these birds presents considerable difficulties which have seldom been discussed clearly by the various people who have expressed opinions on the matter. Certain points seem clear. In the first place, the members of the main *hypoleuca* and *Cookilaria* series certainly appear to show considerable anatomical differences, especially in the skulls (all of which I have now seen), so that there seems no doubt that they are distinct,

though it seems possible that they may interact, with the result that they show divergence in such characters as the markings of the underwing and bill form.

Secondly, a pair of forms in each group which have commonly been treated as races of the same species, namely *hypoleuca* and *nigripennis* in the first case, and *cookii* and *defilippiana* in the second, also differ in both their habits and proportions (Table 1), so that they are also possibly best treated as distinct species.

Thirdly, three pairs of closely-related forms appear to breed close to each other without mixing, indicating that they are genetically distinct, including *axillaris* and *nigripennis* in the Chatham Islands, *cookii* and *pycrofti* off northern New Zealand, and *defilippiana* and *longirostris* in the Juan Fernandez group, which suggests that they should also be treated as distinct species.

Taking these considerations together, the three members of the *hypoleuca* group, the Bonin, Black-winged and Chatham Petrels *P. hypoleuca, P. nigripennis* and *P. axillaris*, and the two rather distinct southern Cookilarias, Cook's and Defilippe's Petrels *P. cookii* and *P. defilippiana*, are all clearly good species because they either show marked differences in appearance, structure and habits from their nearest allies, or occur alongside them without interbreeding.

On the other hand, the other half-dozen forms in the *Cookilaria* group show a more continuous range of variation in their appearance and habits from the pale, migratory forms usually treated as one species Stejneger's Petrel *P. longirostris* with a race *pycrofti* through the darker form usually treated as a second species Gould's Petrel *P. leucoptera* with a race *caledonica* recently described from New Caledonia to the small, melanistic Collared Petrel *P. brevipes* of the tropical west Pacific possibly also represented by a larger undescribed form in the Solomons which is often also treated as a species, though it seems doubtful if it is easy to draw such distinctions here, and possible that it might be better to follow earlier authors such as R. C. Murphy (*Amer. Mus. Novit.* 370) who treated them all as races of the "White-winged Petrel" *P. leucoptera*, in the way set out in Table 1.

TABLE 1. AVERAGE DIMENSIONS OF *HYPOLEUCA* AND *COOKILARIA* PETRELS

	No.	*Wing*	*Tail*	*Culmen*	*Tarsus*	*Toe*
Hypoleuca group:						
Chatham Petrel *P. axillaris*	15	214	97	24.1	30.5	37.4
Black-winged Petrel *P. nigripennis*	35	219	105	24.2	30.1	34.2
Bonin Petrel *P. hypoleuca*	22	228	116	25.1	29.3	35.4
Subgenus *Cookilaria*:						
Defilippe's Petrel *P. defilippiana*	22	231	104	29.2	30.2	33.7
Cook's Petrel *P. cookii*	30	234	92	26.7	30.5	37.8
White-winged Petrels *P. leucoptera ?*						
Stejneger's Petrel *longirostris*	10	219	100	24.8	27.8	34.4
Collared Petrel *brevipes*	33	216	98	23.6	26.9	32.9
Pycroft's Petrel *pycrofti*	10	215	92	23.7	29.4	34.3
New Caledonian Petrel *caledonica*	6	226	94	25.7	30.2	35.7
Gould's Petrel *leucoptera*	15	225	96	24.7	29.5	35.5
Makivas, San Cristobal, Solomons	1	230+	98	26	30	38