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THE “*PEALEA*” PHENOMENON AND OTHER NOTES ON STORM PETRELS¹

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The long-legged storm petrels of the genera *Garrodia*, *Pelagodroma*, *Fregetta*, and *Nesofregetta* sometimes show spotting or streaking as variations from the normal plumage pattern. Similar phenomena are not wanting among other members of the Order Procellariiformes. Thus the white phase of the giant fulmar (*Macronectes giganteus*) usually has a liberal sprinkling of feathers with dark terminal blotches. A more or less kindred case is that of a gadfly petrel (*Pterodroma arminjoniana*), of which an aberrant example described and figured as “*Pterodroma chionophara*” (Murphy, 1914, p. 12, pl. 2) has “a white mantle, flecked with spots like ermine-tails.”

Geneticists who work with laboratory animals are familiar with “spotting genes,” which, in the mouse, are estimated to number from four to 10. Individually, these have a very small hereditary influence, but in combination with one another, or with certain minor genes known as modifiers, they may produce a cumulative effect. Analyses of genes producing spotting in mice, guinea pigs, and other vertebrate organisms have been worked out to a significant, even if still incomplete, extent.

SPOTTING AND STRIPING IN THE LONG-LEGGED STORM PETRELS

Among the wholly or partly white-breasted storm petrels of the long-legged group, the development of feathers with dark shafts or dark terminal blotches is not uncommon. Murphy and Irving (1951, p. 10) have reported the condition in three among

¹ BIRDS COLLECTED DURING THE WHITNEY SOUTH SEA EXPEDITION, No. 62.

36 examples of *Pelagodroma marina maoriana* collected between New Zealand and the Chatham Islands. In the largest member of this group of petrels, namely, *Nesofregetta albigularis*, specimens with ventral streaking are almost as familiar as those with immaculate under parts. Murphy (1924, p. 12) has referred to two males of *Nesofregetta* from Christmas Island, Pacific Ocean, and a female from the Marquesas Islands which are so heavily streaked on the breast and belly that they approach the condition in the various specimens of petrels that have been labeled with the name "*Pealea*." The same phenomenon occurs as a variant from the normal plumage of *Fregetta grallaria*. Thus among 68 adult examples of *F. g. grallaria* collected near Juan Fernández and off the adjacent coast of Chile, at least eight are more or less conspicuously flecked with dark feathers on their white ventral surfaces. The same is true in seven among 35 adults of a larger race (*F. g. titan*) obtained at or near Rapa Island of the Austral group in the central South Pacific.

In a second species of the same genus, namely, *Fregetta tropica*, the "*Pealea*" tendency is more difficult to distinguish because of the highly variable and frequently asymmetrical dark ventral pattern in this bird. Nevertheless, among 26 adults collected south of New Zealand during the course of the Whitney South Sea Expedition, several have well-defined dark blotches and arrowhead markings in the white plumage of the flanks. These closely match the pattern in one or more of the several skins of "*Pealea*." There is indeed good evidence that one of the recorded examples of "*Pealea lineata*" is a sport or mutant of *Fregetta tropica*.

Still another member of the long-legged group is the small storm petrel known as *Garrodia nereis*. This bird is so closely related to *Fregetta* and to *Oceanites* that the grounds for generic differentiation are slight. It lacks the white rump of *Fregetta*, and its toes are more slender. In the latter respect it more nearly resembles *Oceanites*, with which it has been combined by some authors. At any rate, *Garrodia nereis* agrees with the several species already discussed in not infrequently revealing a type of ventral streaking which we have called the "*Pealea*" phenomenon. The series of *Garrodia nereis* in the American Museum collection comprises 32 examples from the New Zealand and Falkland Island areas. Seven of these are more or less blotched and streaked on the breast, belly, and flanks, most pronouncedly so in a bird of unknown sex from Cook Strait, New Zealand. Its nearest

match is found in adults collected on eggs in the Falkland Islands, and in two of six birds from Kerguelen Island, southern Indian Ocean, kindly lent for this study by the United States National Museum.

The remaining species of long-legged storm petrels are dark-bellied birds, but even these show certain phylogenetic or ontogenetic variations which are suggestively similar to those found among the white-breasted representatives. Thus *Oceanites gracilis*, known only from the west coast of South America, differs from the more nearly cosmopolitan *Oceanites oceanicus* in having a white patch in the middle of its dark abdomen. And finally in *Oceanites oceanicus* itself, the first plumage to succeed the molt of nestling down differs from that of adult birds in having white margins on the feathers of the belly. It is probable, as is shown below, that the dark ventral plumage of *Oceanites oceanicus* may occasionally break up as a rare individual variation into a pattern responsible for one of the alleged representatives of *Pealea*.

THE STATUS OF *PEALEA LINEATA* (PEALE)

The account of *Pealea lineata* in Godman (1907, p. 57) begins with the following paragraph: "I know of only three specimens of this rare Storm-Petrel in collections. The type is in the U.S. National Museum at Washington, and was procured by Titian Peale at Upolu, in the Sandwich [= Samoan] Islands, during the celebrated exploring expedition promoted by the United States. Salvin states that a second specimen is in the Paris Museum, and I found a third in our own National collection, for since Salvin wrote his 'Catalogue' an example of Peale's Storm-Petrel has been presented to the British Museum by Mr. G. Carrick Steet, who procured it in the neighbourhood of Banks's Peninsula, New Zealand. This is, however, not the first record of the species from New Zealand seas, for Bonaparte mentions the specimen in the Paris Museum as having been procured in 1829, during the voyage of the 'Astrolabe,' off East Cape in the North Island."

We have had the opportunity of examining the three specimens cited by Godman as well as two additional examples, namely, a second in the Paris museum from the same source as the first (which is Banks Peninsula rather than East Cape), and a specimen collected during the Whitney South Sea Expedition off Huapu Island, Marquesas Archipelago, and reported upon by Murphy (1924, p. 7).

The two petrels from New Zealand in the Muséum d'Histoire Naturelle are identical. They do not agree, however, in proportions and patterns with the type of the putative species in Washington, D. C., nor with the American Museum specimen from the Marquesas; nor do the latter two agree with each other. In other words, the alleged samples of *Pealea lineata* in collections represent at least three different kinds of storm petrels, and it is time to attempt to relegate them to the respective species of which each appears to be a phase or aberration.

We conclude that the several specimens that have been reported upon under the specific name *lineata* and have been associated with the *Thalassidroma lineata* of Peale (1848) are in reality aberrant examples of three different petrels, namely, *Fregetta grallaria*, *Fregetta tropica*, and *Oceanites oceanicus*.

EVOLUTION OF THE FOOT IN THE LONG-LEGGED STORM PETRELS

Lack of uniformity in the long-legged members of the family Hydrobatidae shows most pronouncedly in: (1) the relation of length of foot to length of tarsus; (2) the differential growth of the single proximal and two middle phalanges; and (3) the marked depression and flattening of the toes in certain species. In other words, foot and leg structure may offer the best clues to relationship among a group of birds in which resemblance is easier to see than differences.

In *Garrodia*, *Oceanites*, and *Pelagodroma* the toes are slender. A broadening and flattening trend appears in *Fregetta tropica*, is more pronounced in *Fregetta grallaria*, and culminates in the strange foot of *Nesofregetta*, in which the ventral surface of the toes alone is of greater area than that of the two intervening webs (Murphy, 1924, p. 12, fig. 2).

The following list shows the ratio of foot to tarsometatarsus in several forms of storm petrels, including three specimens that have been previously recorded as "*Pealea lineata*":

" <i>Fregetta lineata</i> " (= <i>grallaria</i>)	1 ♀	.58
<i>Fregetta grallaria</i>	10 ♂	.60
" <i>Thalassidroma leucogaster</i> " (Gould's type)		.62
<i>Fregetta tropica</i>	♂ type specimen	.67
<i>Fregetta tropica</i>	20 ♂	.68
" <i>Thalassidroma melanogaster</i> " (Gould's type)		.71
<i>Fregetta tropica</i>	1 ♂	.72
" <i>Pealea lineata</i> " (= <i>tropica</i>)	type specimen	.79

<i>Nesofregatta albigularis</i>	8 ♂	.73
" <i>Pealeornis maoriana</i> " (= <i>oceanicus</i>)	3 sex unknown	.78
<i>Oceanites oceanicus</i>	97 ♂ and ♀	.79
<i>Garrodia nereis</i>	10 ♂ and ♀	.83
<i>Pelagodroma marina</i>	36 ♂ and ♀	.86

Since the above figures are suggestive of the probable affinities of several examples of "*Pealea*," let us record also the ratio of the proximal phalanx of the middle toe to the next two phalanges, measured to the base of the nail. "*Pealeornis maoriana*" is perforce omitted because the dimensions of the phalanges were not taken when the London and Paris specimens were examined. The two middle phalanges are expressed as a fraction of the proximal unit.

<i>Garrodia nereis</i>	.97
<i>Oceanites oceanicus</i>	.88
<i>Pelagodroma marina</i>	.83
" <i>Thalassidroma melanogaster</i> " (type)	.79
" <i>Pealea lineata</i> " (type)	.78
<i>Fregatta tropica</i>	.73
" <i>Thalassidroma leucogaster</i> " (type)	.67
<i>Fregatta grallaria</i>	.67
" <i>Fregatta lineata</i> "	.64
<i>Nesofregatta albigularis</i>	.56

We are indebted to the authorities of the British Museum, the Muséum National d'Histoire Naturelle, the United States National Museum, and the Academy of Natural Sciences of Philadelphia for access to, or loan of, specimens. The types of Peale and of Gould, respectively, have been generously placed at our disposal by the Washington and Philadelphia institutions.

Fregatta grallaria

Procellaria grallaria VIEILLOT, 1817, Nouveau dictionnaire d'histoire naturelle, vol. 25, p. 418 ("les mers australes" = west coast of South America).

Thalassidroma leucogaster GOULD, 1844, Ann. Mag. Nat. Hist., vol. 13, p. 367 (South Atlantic Ocean).

Fregatta melanoleuca SALVADORI, 1908, Bull. Brit. Ornith. Club, vol. 21, p. 79 (allegedly Tristan da Cunha).

Fregattornis royanus MATHEWS, 1914, Austral Avian Rec., vol. 2, p. 86 (Lord Howe Island).

Fregatta lineata, MURPHY, 1924, Amer. Mus. Novitates, no. 124, p. 7 (off Huapu Island, Marquesas group).

Fregattornis guttata MATHEWS, 1933, Novitates Zool., vol. 39, p. 46 (new name for preceding specimen).

Fregatta leucogaster deceptis MATHEWS, 1932, Bull. Brit. Ornith. Club, vol. 52, p. 146 (off New Zealand).

This species and its relatives have received bizarre treatment by Mathews in several successive papers. He described, for example, no fewer than five forms, each under a distinct specific name, from Lord Howe Island alone. Subsequently (1934, p.195) he synonymized all of these under the subspecific name *royana*. In another paper (1933, pp. 34-53) he published a series of six plates of plumage patterns and foot and leg structure which, regardless of unacceptable interpretation, are extremely useful, and to which reference is made below.

The difficulty in determining the number and distribution of the several forms of *Fregetta grallaria* has been due to the scarcity of specimens and to the miscellaneous data of those available. Several forms, both real and imaginary, have been based on single specimens, in most instances without reference to known breeding stations. Fortunately, these circumstances have been remedied in the case of two nesting populations, the first of which has now been generally accepted as topotypical. These two forms are *Fregetta grallaria grallaria*, breeding on Mas Atierra Island, Juan Fernández group, and *Fregetta grallaria titan*, breeding on Rapa Island, Austral group, central South Pacific. In each of these races, females slightly exceed males in size.

TABLE 1
DIMENSIONS OF TWO RACES OF *Fregetta grallaria*

	Wing	Tail	Culmen	Tarsus	Toe and Claw
<i>F. g. grallaria</i>					
51 ♂	155.4	73.3	13.1	35	21.6
12 ♀	156.4	73.5	13.4	35.6	21.5
Minimum of series	146	71	12.6	33	20
Maximum of series	163	77	14	37	22.6
<i>F. g. titan</i>					
17 ♂	181	82.4	15.4	40.6	25.1
10 ♀	184.1	83.8	15.5	41.6	25.8
Minimum of series	177	78	15	39	23.6
Maximum of series	188	89	16.3	43	27

It will be conceded that in populations of breeding petrels represented by 63 examples of one form and 27 of the other, in which every maximum dimension in the first is less than the minimum in the second, we have data of statistical significance for

the recognition of distinct races. It is doubtful, however, whether any similar series of specimens from a third breeding station exists in all other museum collections together. This means, in our opinion, that all of a dozen or more other names applied to alleged forms of *Fregetta grallaria* between 1844 and 1932 still have no more than doubtful systematic status.

Let us consider the identities of 17 specimens examined since the compilation of the figures tabulated above, including four of Mathews' Lord Howe Island types, and his one New Zealand type, now in the American Museum of Natural History.

In the British Museum are five specimens labeled "*F. g. segethi*, Philippi," taken during the "Challenger" Expedition in latitude 37° 29' S., longitude 83° 07' W., November 11, 1875. The locality is in the Pacific Ocean, due south of Juan Fernández and west of Concepción, Chile, and the specimens completely agree in appearance and dimensions with the topotypical race, *F. g. grallaria*.

Six other examples, of which two are in the American Museum and four in the British Museum, comprise two males, two females, and two of unrecorded sex, collected at the following localities: Nightingale Island, Tristan da Cunha, on the nest; at sea within 150 miles of Tristan da Cunha; between Tristan da Cunha and the Cape of Good Hope; latitude 7° 05' S., longitude 3° 30' W. (midway between Ascension Island and the African coast); "South Atlantic" ("Rattlesnake" Expedition); latitude 37° 30' S., longitude 42° E. (east of southernmost Africa and south of the Mozambique Channel). All of these have been grouped together because of their close similarity and because of the well-established rule that the same races of sea birds commonly inhabit the South Atlantic and Indian oceans. The range and means of dimensions, so far as can be judged from admittedly inadequate material, are intermediate between those of *Fregetta grallaria grallaria* and *Fregetta grallaria titan* (see table 2).

If the birds from the area represented in table 2 are entitled to a subspecific name, it would presumably be *leucogaster* of Gould, which antedates the *tristanensis* of Mathews by 88 years.

Finally, we have the three females and one male from Lord Howe Island which are, respectively, the types of *insularis*, *alisteri*, *innominatus*, and *royanus* of Mathews, and also the type of the same author's *deceptis*. We have compared these with all other available material, and we agree with Hartert (1926, p. 357)

that the all-black *royanus* (*royana*) is a melanistic example of *Fregetta grallaria*, to which the other three Lord Howe Island types undoubtedly belong. The name *royana* would take precedence as a subspecific term if such should prove to be warranted. It is highly noteworthy, however, that in dimensions (see table 3), morphology of the foot, and plumage pattern (except for the melanistic *royana*), the Lord Howe Island petrels closely agree with the South Atlantic and Indian Ocean specimens discussed above.

TABLE 2
DIMENSIONS OF SIX SPECIMENS OF *Fregetta grallaria*
FROM SOUTH ATLANTIC AND INDIAN OCEANS

	Wing	Tail	Culmen	Tarsus	Toe and Claw
Both sexes	167.5	74	14.6	38.9	23.9
Minimum of series	160	69.7	13	36	22.4
Maximum of series	172	79.8	15.1	41	26

TABLE 3
DIMENSIONS OF TYPE SPECIMENS FROM LORD HOWE ISLAND,
AND OF *Fregetta leucogaster deceptis*

	Wing	Tail	Culmen	Tarsus	Toe and Claw
3 ♀, 1 ♂	163.5	77.2	13.9	35.8	21.3
Minimum of series	161	75.2	13.5	34.8	20.3
Maximum of series	166	78	14.1	37.1	23.5
<i>F. g. deceptis</i> (type)	166	80	14.7	39.2	25.8

The type of *deceptis* is in some dimensions as large as the race *titan*, described from Rapa Island.

The type of "*Thalassidroma leucogaster*" and a second specimen from the Gould collection in the Academy of Natural Sciences of Philadelphia are both out-and-out examples of *grallaria*, despite what Mathews has stated about their peculiarities of plumage and foot structure. The type has the back feathers fringed with white, and it appears to have been in process of quill replacement when it was collected. No distinctive data appear on the label of either skin. Their dimensions are as follows:

	WING	TAIL	CULMEN	TARSUS	TOE AND CLAW
Gould No. 5144, type	155	73.4	14.4	38.2	23.7
Gould No. 5145	165	79.8	15.5	40.8	26.4

There remains for consideration the example of "*Pealea*" already reported upon by Murphy (1924, p. 7) under the name *Fregetta lineata*. This petrel was collected off Huapu Island, Marquesas group, on September 15, 1922. It was a female with enlarged gonads. Its close and detailed resemblance to *Fregetta grallaria*, except for the spotting of the ventral surface, has already been pointed out. Its dimensions are wholly conformable with those of the South Atlantic, Indian Ocean, and Lord Howe Island series recorded, viz.: wing, 165; tail, 73.5; exposed culmen, 14; tarsus, 38; middle toe and claw, 22 mm.

We have no hesitancy in identifying this example of "*Pealea lineata*" as a phase of *Fregetta grallaria*, the particular subspecies of which remains to be determined by future research.

Fregetta tropica

Thalassidroma tropica GOULD, 1844, Ann. Mag. Nat. Hist., vol. 13, p. 366 (latitude 6° 33' N., longitude 16° 06' W., Atlantic Ocean).

Thalassidroma melanogaster GOULD, *ibid.*, vol. 13, p. 367 (southern Indian Ocean).

Thalassidroma lineata PEALE, 1848, United States exploring expedition . . . under Charles Wilkes, vol. 8, p. 293 (allegedly Upolu Island, Samoa). CASSIN, 1858, United States exploring expedition . . . under Charles Wilkes, vol. 8, p. 403; atlas, pl. 39.

Fregetta tubulata MATHEWS, 1912, The birds of Australia, vol. 2, p. 42 (near the coast of Australia).

Pealea lineata MATHEWS, 1933, Novitates Zool., vol. 39, p. 49, pls. 6, 9.

This storm petrel, despite its specific misnomer, is a bird inhabiting a higher belt of latitude than *Fregetta grallaria*. The type specimen is alleged to have been captured north of the Equator in the Atlantic Ocean, but there seems to be no evidence that the species breeds even as far north as Tristan da Cunha, St. Paul, and Amsterdam Islands, despite numerous such associations in the literature. Rather, it is a petrel of islands close to the Antarctic Convergence and largely to the south of that line.

This species seems to be constantly distinguishable from *Fregetta grallaria* by the following characters: a whitish throat due to the exposure of basal white on the feathers of this area;

distinct foot form, with longer, more slender, and less flattened toes than *grallaria* (Mathews, 1933, pl. 9); a dark, sometimes asymmetrical median stripe on the belly. There is considerable variation in the last-named feature. The type of the species in the British Museum shows no more than a few ventral mottlings, a condition that is matched by one member of a New Zealand series and two other South Pacific examples in the American Museum collection. Furthermore, *tropica* has little if any of the narrow white terminal fringing on the back and scapular feathers, which *grallaria* invariably shows when in fresh plumage.

In this species, as in *Fregetta grallaria* and *Pelagodroma*, females appear to average slightly larger than males. Adequate series from any one source are extremely rare in collections, but Murphy (1936, p. 766) has recorded the dimensions of 26 adults taken by the Whitney South Sea Expedition in latitude 49° S., longitude 179° E., a point not far from known nesting grounds on the Bounty and Auckland Islands. With these we have compared 25 other specimens in the American and British museums and the Academy of Natural Sciences of Philadelphia, comprising examples from the tropical and South Atlantic, the Indian Ocean, the ocean south and east of Australia, the New Zealand area, the eastern South Pacific, and the American quadrant of Antarctica. In the last-named group are eight specimens taken at the nest, and in some instances on the egg, at Deception Island of the South Shetlands and Laurie Island of the South Orkneys.

The point to emphasize is that we see no grounds for sub-specific differentiation in the entire assemblage. That fact is not surprising, because it has been repeatedly demonstrated that sea birds which nest in high latitudes of the south show a notable morphological constancy throughout the circumpolar range. It is chiefly the species of lower latitudes, isolated at discrete islands and groups of islands to the north of the West Wind Zone, that exhibit subspeciation.

In table 4 is a comparison of the dimensions of the 20 males and six females taken in mid-February, 1926, at sea between the Bounty and Antipodes Islands, with those of the 25 birds referred to above, collected in the southern oceans all around the world.

The type of "*Pealea*," that is, of the *Thalassidroma lineata* of Peale, is clearly to be associated with *Fregetta tropica* rather than with *F. grallaria*. Its measurements also appear in table 4.

The left wing was the one measured, the right being strongly flexed in the dismantled type specimen, which is in poor condition. The long toe and relatively slender claws agree with those of *F. tropica*, and are quite unlike the shorter, broader, and more flattened toes of *grallaria*. The under wing is also as in

TABLE 4
DIMENSIONS OF SERIES OF *Fregetta tropica* REFERRED TO IN THE TEXT

	Wing	Tail	Culmen	Tarsus	Toe and Claw
Latitude 49° S., longitude 179° E.					
20 ♂	160	73.9	15.1	41.1	28.2
Minimum of series	154	72	14	40	27.5
Maximum of series	167	77	15.8	41.8	29
6 ♀	163.3	74	15.1	42.8	28.8
Minimum of series	158.5	72	14.5	42	27.5
Maximum of series	167	76	15.7	43.5	29.6
Southern circumpolar oceans					
25 ♂ and ♀	165.2	75.4	14.5	43.4	27.4
Minimum of series	156	70	13.2	39	25.4
Maximum of series	173	82	15	43.2	29.8
" <i>Thalassidroma lineata</i> " (type)	166	71.2	14.6	37	28.6
<i>Fregetta tropica</i> (type, male, Brit. Mus., from latitude 6° 33' N., longitude 18° 06' W., Atlantic Ocean)					
	166	75	15.5	41	27.5
<i>Thalassidroma melanogaster</i> (type, Gould coll. No. 5146)					
	145	75.5	15.6	40.1	28.3
<i>"Cymodroma melanogaster"</i> (♀, Gould coll. No. 5147)					
	159	85.4	^a	40.9	28.2

^a Broken.

tropica, showing less white than in the other species. The white bases of the throat feathers also seem to agree with the condition in *tropica*. In fact, the only difference from the normal plumage of *Fregetta tropica* is the rather uniform striping of the ventral surface due to broad dark terminal wedges on many of the feathers.

In the original description Peale (1848, p. 294) stated that "this bird was frequently seen within the torrid zone on the Pacific Ocean," and that a native of Upolu "represented to us that they bred in holes, very high up in the mountains."

It deserves to be emphasized that both statements fit well the

distribution and habits of another petrel with which "*Pealea*" might readily be confused in the field, namely, *Nesofregatta albigularis*.

There remains for consideration only the type of *Fregatta tubulata* Mathews, 1912. This bird was subsequently synonymized by Mathews himself (1934, p. 194) with *Fregatta tropica*. Its unusual or possibly deformed bill is matched exactly by a nesting female from the South Orkney Islands. Some of its measurements are slightly smaller than those of *F. tropica* in the tabulated series, but there is no reason to regard it as anything other than a slightly abnormal member of the species.

Oceanites oceanicus

Procellaria oceanica KÜHL, 1820, Beitr. Vergl. Anat., vol. 1, p. 136, pl. 10, fig. 1 (no type locality; South Georgia has been designated).

Oceanites lineata, BONAPARTE, 1856, Conspectus generum avium, vol. 2, p. 200 (off Banks Peninsula, New Zealand).

Pealea lineata, GODMAN, 1907, A monograph of the petrels, p. 57, pl. 16 (off Banks Peninsula, New Zealand).

Pealeornis maoriana MATHEWS, 1932, Bull. Brit. Ornith. Club, vol. 52, p. 132 (off Banks Peninsula, New Zealand); 1933, Novitates Zool., vol. 39, p. 51, pls. 5, 9; 1936, A supplement to the birds of Norfolk and Lord Howe Islands, p. 79 and facing pl.

The two examples of "*Pealea lineata*" described and portrayed by Godman, which are in the British and Paris museums, respectively, are a quite different species from either of the two representatives thus far discussed.

Mathews, recognizing this, redescribed the British Museum specimen as *Pealeornis maoriana*. The two Paris specimens are extraordinarily similar to it in dimensions and general aspect, including morphology of the legs and feet, although they differ somewhat in the distribution of the sagittal spots on the ventral surface, having a smaller area of immaculate white near the midline than the British Museum bird. All three were collected off the eastern coast of New Zealand. The British Museum bird is known to have been procured "in the neighbourhood of Banks's Peninsula" (Godman, p. 57), and Mathews (1936, p. 79) is correct in ascribing the source of the two Paris birds to the vicinity of Banks Peninsula, South Island of New Zealand, rather than to East Cape of North Island. On the other hand, he had absolutely no evidence for assuming that this form of petrel nests on Banks Peninsula or anywhere else in New Zealand.

TABLE 5

DIMENSIONS OF THREE SPECIMENS OF "*Pealea*" FROM THE EAST COAST OF NEW ZEALAND, AND OF TWO SERIES OF *Oceanites oceanicus*

	Wing	Tail	Culmen	Tarsus	Toe and Claw
<i>"Pealeornis maoriana"</i>					
(type)	151.5	64.2	12.5	35	27.2
Paris specimen	147	56.6	12.7	35.3	27.6
Paris specimen	148	58	12.5	35.1	27.2
<i>Oceanites oceanicus</i> from South Georgia, averages of 12 ♂ and ♀					
	143.3	62.5	12.5	34.7	27.5
Minimum of series	140	59.6	11.8	33.1	26.7
Maximum of series	148	68	13	36	28.5
<i>Oceanites oceanicus</i> from North and South Atlantic, averages of 97 ♂ and ♀					
	144.9	63.7	12.6	34.6	27.5
Minimum of series	136	56.5	11.1	31.3	25.3
Maximum of series	155.5	73	13.2	36.8	30

Godman's plate, which was drawn from one of the Paris specimens, is a much better portrayal of the bird than the wash drawing by Mathews (1936, facing p. 79). The two Paris examples have dark throats, but the concealed parts of the throat feathers are white, so that a slight degree of wear would produce the mottled appearance of the British Museum specimen. The feet and legs of the Paris birds were apparently painted black when the specimens were mounted, but it is noteworthy that the color figure by Keulemans in Godman's monograph shows a yellowish area on the webs, immediately suggesting *Oceanites*, with the feet of which those of all three examples of "*Pealeornis*" agree in form. We strongly suspect that the storm petrel under discussion is a "*Pealea*" phase of *Oceanites oceanicus*.

The taxonomy of *Oceanites oceanicus* has never been satisfactorily worked out because of insufficiency of material representing known breeding populations. We do know, however, that there are at least two races differentiated by size, and that the smaller form, or forms, inhabit breeding stations in relatively low southern latitudes, such as the Magellanic region of South America (Murphy, 1936, p. 754) and Kerguelen Island (Falla, 1937, p. 208). The larger, more southerly, and apparently more highly migratory form of the species is generally accepted as the

typical race, *Oceanites oceanicus oceanicus*, the type locality of which has been designated as South Georgia. It is highly probable that this Antarctic form will prove to be completely circumpolar in breeding distribution. Murphy (1918, p. 125) has summarized the measurements of nearly 100 examples of *Oceanites oceanicus* collected throughout the length of the Atlantic Ocean between South Georgia and Newfoundland. The figures for minimum, maximum, and average measurements are such that the dimensions of *Pealeornis maoriana* fit perfectly into any part of the table referred to.

Nesofregatta albigularis

Procellaria albigularis FINSCH, 1877, Proc. Zool. Soc. London, p. 722 (Kandavu Island, Fiji group).

Nesofregatta albigularis, MURPHY, 1924, Amer. Mus. Novitates, no. 124, p. 11.

Fregatta moestissima SALVIN, 1879, Proc. Zool. Soc. London, p. 130 (Samoan Islands).

Murphy (1924, p. 11) has reported upon 13 Whitney South Sea Expedition specimens of this petrel from the Marquesas and

TABLE 6
DIMENSIONS OF TWO SERIES OF *Nesofregatta albigularis*
AND OF THE TYPE OF "*Fregatta moestissima*"

	Wing	Tail	Culmen	Tarsus	Toe and Claw
Line group and Marquesas Islands					
8 ♂	186	96	17.3	41.6	30.6
Minimum of series	179	94	16.6	40	29
Maximum of series	194	100	18	44	34
5 ♀	183.2	95.1	16.2	42	30.6
Minimum of series	178	91.5	15.7	40	30
Maximum of series	191	99	17	42	32
Aneiteum (New Hebrides) and Phoenix Islands					
5 ♂ and ♀	201.8	97	16.9	45.7	32.2
Minimum of series	200	88	15.6	45	31
Maximum of series	204	100	18	42.7	33
" <i>Fregatta moestissima</i> " type	213	104	17	47	33.5

Christmas Islands, Pacific Ocean. Since that date, the American Museum has received a female taken on its egg at Tanna Island,

New Hebrides, and we have also had an opportunity to examine in the United States National Museum, and the British and Paris museums, additional specimens from the New Hebrides, Phoenix, and Howland Islands, all in the tropical South Pacific.

As will be seen from table 6, some of the latter specimens exhibit dimensions exceeding the maxima previously recorded and recently rechecked for accuracy. In view of the overlapping distribution of the birds on which the table is based, it seems reasonable to discount subspecific distinctions, and to conclude that the normal limits of variation are in excess of those shown by the 13 adults previously studied.

There appears to be no difference in the dimensions of the sexes, in which respect the petrels of this well-marked genus differ from *Fregetta* and *Pelagodroma*.

Mr. L. Macmillan, who collected the female from Tanna, reports that the short burrows of this petrel (some measuring about 2 feet in depth) were scattered over large areas in the mountains of south central Tanna, about 6 miles inland from the sea. The female he collected was at an altitude of about 1400 feet on the inner slope of a volcanic crater which rises to 3000 feet.

"*Fregetta moestissima*," the type and only example of which was examined and compared in the British Museum, is evidently a melanistic example of the species under discussion. It is structurally indistinguishable from the others, and has very fresh, unworn, and long quills in the wing and tail, but older and more abraded body plumage.

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