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BIRDS COLLECTED DURING THE WHITNEY SOUTH SEA EXPEDITION. 52[1]

NOTES ON SOME NON-PASSERINE GENERA, 3

By DEAN AMADON

The present taxonomic notes on some of the non-passerine birds of Polynesia collected by the Whitney Expedition are a continuation of those contained in American Museum Novitates Nos. 1175 and 1176. In this paper species belonging to one genus of the Anatidae and to several genera of the Columbidae are discussed.

Dr. E. Mayr gave me much valuable assistance and advice in the preparation of the manuscript, and in other ways. For the loan of rare specimens or for other courtesies I am greatly indebted to Drs. H. Friedmann, A. Wetmore, J. T. Zimmer and Mr. J. L. Peters.

A REVISION OF *ANAS SUPERCILIOSA*

Anas superciliosa is a typical member of the central, mallard-like group of the genus *Anas*. Its distribution suggests that this species is an Australian endemism which later spread to New Zealand, the East Indies and much of Polynesia. *Anas superciliosa* resembles *A. luzonica* of the Philippines sufficiently to suggest that the two may have been subspecies at some remote period. Other species of this genus native to the islands of the western Pacific are *wyvilliana* of Hawaii, *laysanensis* of Laysan and *oustaleti* of the Marianne Islands. The latter three species are evidently rather recent derivatives of the mallard, *A. platyrhynchos*, as shown by the presence of curled tail feathers in some males of all three and by numerous other characters. Presumably *wyvilliana*, like *Nesochen sandwichensis*, evolved from North American migrants or stragglers which remained in the Hawaiian Islands. Whether *laysanensis* and *oustaleti* represent independent colonizations by mallards or secondary extensions of range from Hawaii is not at once apparent. The spread of *superciliosa* into the Pacific islands has given it a range more or less complementary, insofar as that of an island species can be, with those of *oustaleti* and *luzonica;* this is believed to be secondary and fortuitous.

In all, 273 specimens of *superciliosa*, not including downy young, were studied. Dr. Herbert Friedmann of the U. S. National Museum generously lent six Celebes skins from the series from which Riley described the race *percna*.

VARIABLE CHARACTERS.—New Zealand specimens are paler than those from other localities; this is the only geographical color variation that was found. Non-geographical variation is extensive and in small samples deceptive. This has resulted in great over-emphasis on the importance of color as a racial character in this duck. Fading and bleaching, processes which are accentuated by the glare of sunlight upon water and perhaps by the frequent contact of water with the plumage, greatly affect its coloration. Many skins are discolored by the ferruginous stains so common on waterfowl. The light areas of the throat and neck are the first to become stained, sometimes so uni-

[1] The preceding ten papers in this series are American Museum Novitates, Nos. 1057, 1091, 1116, 1133, 1144, 1152, 1166, 1175, 1176 and 1192.

formly that this buffy coloration appears natural. Misinterpretation of such stains, in my opinion, led Riley to state that Celebes birds have the throat "deeper buff, more pinkish . . . " than Australian ones (1919, Proc. Biol. Soc. Wash., XXXII, p. 94).

Sexual differences in color are restricted to the elongated inner secondaries. In females these (always?) have buffy longitudinal streaks in addition to their narrow buffy margins. Unfortunately these streaks often disappear completely with wear, but when present they are diagnostic of females. Females also tend to have less of the metallic purple-green of the speculum continued on the inner vanes of these longer secondaries, but this is not constant.

Size variation in *Anas superciliosa* is better reflected in the wing length than in any other "skin" measurement. Wing length is greatly affected by wear. That part of the tip of each of the longer primaries which is not covered by the one above becomes bleached and weakened by the sun until it breaks off as though cut with a knife. The wing is thus shortened by several millimeters in a way that is not evident without careful inspection. Another difficulty results from the anseriform molt in which all the primaries are renewed together. Primaries which appear newly molted and in good condition for measuring may lack several millimeters of attaining full length, even though the sheath has disappeared from their shafts. Such partially grown primaries are best detected by the fact that they do not project beyond the ends of the secondaries as much as is normal. The absence of any characters by which immature birds may be recognized as such is a further difficulty. In general their plumage is softer and more subject to wear and staining, and they are smaller than adults. Males are considerably larger than females, and among adults only a few of the extremes overlap in wing length.

Since so many factors affect wing length in this species, the elimination of all except geographical variation is difficult, but every attempt to do so has been made in the present study. As a result the measurements given below average considerably larger than those given by many other writers for this species. For example, wing measurements of males of the race *rogersi*, as recorded in the literature, usually vary from 230–275 mm.; actually very few adult males of this form with the primaries in good condition have a wing length of less than 258 or 260 mm.

Anas superciliosa superciliosa Gmelin

TYPE LOCALITY.—New Zealand.

SUBSPECIFIC CHARACTERS.—Like *rogersi* of Australia but with the feather margins pale grayish or buffy white, rather than buffy or brownish white; hence a paler bird with more conspicuous feather margins; size the same as in *rogersi*.

RANGE.—New Zealand region: "Kermadec Islands, North, South and Steward Islands, Great Barrier Island, Mayor Island, Kapiti, Chatham, Auckland, Campbell and Macquarie Islands. Abundant everywhere except on the southern islands where small numbers only have been seen" (Oliver, 1930, Birds New Zealand, p. 217).

WING.—NEW ZEALAND: ♂ 256+, 262; ♀ 246, 246+, 255+ (sex ?).

CULMEN.—New Zealand: ♂ 50, 53.5; ♀ 47.5, 49, 52.5.

REMARKS.—*A. s. superciliosa* is a rather poorly differentiated race, but specimens in unworn plumage can probably be separated from *rogersi* with few exceptions. Eight old specimens from New Zealand and a single juvenal female collected by the Whitney Expedition on Pitt Island, Chathams, in 1926 were available. The latter specimen is very pale, with the feathers broadly margined; hence it represents extreme development of the characters of *superciliosa*. This is probably to be attributed to its immaturity or possibly to individual variation rather than to geographical variation.

According to Oliver, several partial or complete albinos of this race have been recorded; he suggests that this may be the result of crossing with feral domestic ducks. One of the eight New Zealand birds examined is partially albinistic. It is in wretched condition but shows no indication of the larger size or color characters which might be expected in a cross with domestic or mallard stock. Probably this race has acquired an inherent albinistic

tendency, as have so many other New Zealand birds.

Anas superciliosa rogersi Mathews

Anas superciliosa rogersi MATHEWS, 1912, Austr. Av. Rec., I, p. 33, Augusta, southwestern Australia.

Anas superciliosa percna RILEY, 1919, Proc. Biol. Soc. Wash., XXXII, p. 93, Celebes.

SUBSPECIFIC CHARACTERS.—Differing from *superciliosa* as noted above; in color similar to the third race, *pelewensis*, but larger, with the wing averaging about 20 mm. longer.

RANGE.—Tasmania—0, Australia—37, Sumatra—3, Java—0, Kangean—3, Lesser Sunda Ids. (Lombok—1, Timor—2, Savu—3, Sumba—1, Sumbawa—0, Flores—0), Celebes—7, Moluccas (Buru—1), Arfak Mts., Vogelkop, New Guinea—1, southern coast of New Guinea—0, Louisiade Archipelago (Misima or St. Aignan Is.—2). (Figure after localities indicates number of specimens examined.)

WING.—Southern (temperate) half of Australia: ♂ 260 (type *rogersi*), 267, 267, 268; ♀ 250, 251. Northern (tropical) half of Australia: ♂ 256+, 260, 260, 260?, 261, 264, 266?, 275; ♀ 249?, 250, 250?, 252, 252, 253, 254. Sumatra: ♂ 258; ♀ 243?, 250. Lombok: ♂ 263? Savu: ♂ 257; ♀ 250. Sumba: ♂ 266+. Celebes: ♂ 260+, 265?, 270; ♀ 246, 248? Buru: ♂ 260. Arfak Mts.: ♂ 260. Misima: ♂ 262; ♀ 234(?).

CULMEN.—Australia: 14 ♂ 49.5–55 (52.36); 6 ♀ 48–53 (50.0). Misima: ♂ 53.5; ♀ 45. Arfak: ♂ 52. Celebes: ♂ 50.5, 52, 52, 53 (51.9); ♀ 48, 50 (49). Other East Indies Ids.: 5 ♂ 49–51.5 (50.4); 5 ♀ 46–51 (48.4).

REMARKS.—There seems to be no geographical variation within Australia. The populations of the various East Indian islands other than New Guinea may have a slightly shorter average wing length than those of Australia, but a very large series and statistical treatment would be needed to be sure of this. The culmen length of the Australian birds averages slightly longer, but it is possible that more material would not confirm this variation. Since the Celebes and other East Indian birds are identical with Australian ones in color and differ in size, if at all, very slightly indeed, it seems best to consider *percna* a synonym of *rogersi*.

This race seems to have extended its range into New Guinea along the southeastern coast in the Louisiades and in the Vogelkop Peninsula. A male from Misima Island is of average size for *rogersi*, and the same is probably true of the birds which occur on the mainland of south New Guinea, although no measurements seem to have been recorded. A female from Misima is rather small; perhaps it is immature, but it is also possible that the smaller race which occurs in north New Guinea has infiltrated to some extent around the eastern end of New Guinea. In the Oranje, Saruwaged and perhaps other mountains of New Guinea populations occur intermediate between *rogersi* and *pelewensis* but distinctly nearer to the latter and referred to it in this paper (see measurements below), although some previous authors have referred them to *rogersi*. On the other hand, a male taken by Mayr in the Arfak Mountains has the wing length of 260 mm. and represents *rogersi*, which has perhaps reached the Vogelkop from Buru. This male is considerably larger than the maximum of a series from higher altitudes in the Oranje Mountains.

Anas superciliosa pelewensis Hartlaub and Finsch

TYPE LOCALITY.—Palau (Pelew) Ids.

SUBSPECIFIC CHARACTERS.—Like *rogersi* in color, but markedly smaller, wing averaging about 20 mm. shorter, except in one or two localities as noted below.

RANGE.—Society Ids. (Tahiti—2, Moorea—16, Huaheine, Raiatea—1), Austral Ids. (Rimitara—7, Tubuai—9, Rapa—14), Cook Ids. (Rarotonga—1), Tonga Ids. (Fanua Lai—4, Vavua, Namuka—3, Tongatabu), Samoa (Anuu—1, Tutuila—1, Upolu—3), Fiji (Ono Ilau—4, Mothe—2, Oneata—4, Mango—6, Kanathea, Taviuni—1, Ngau—2, Ovalau, Viti Levu, Matathoni—1, Kandavu—3), Niuafoo Id., New Caledonia—2, Loyalty Ids. (Uvea—2, Lifu), New Hebrides (Aneiteum, Efate—1, Aoba—1 duckling, Espiritu Santo), Banks Ids. (Gaua—3), Santa Cruz Ids. (Tucopia—13), Solomon Ids. (Rennell—7, Guadalcanal—8, Malaita—1, Tetipari—3, Rendova—4, New Georgia—1, Ysabel—5, Choiseul—5, Bougainville—6), Bismarck Archipelago (Feni Is., east of New Ireland—7, New Hanover—3, Manus, Admiralty Group—5), Palau—3, New Guinea (northern lowlands—12, Balim R., 1600 meters—3, Oranje Mts., 3225–3600 meters—21). (Figure after localities indicates number of specimens examined; where none is given locality was taken from the literature.)

WING.—Moorea: ♂ 232, 236, 238, 242, 243, 246; ♀ 226, 226, 227, 228, 228, 229, 231. Austral Ids.: ♂ 233, 235, 236, 237, 240, 241, 245; ♀ 223, 224, 225, 225, 226, 227, 227, 227, 228,

233. Rarotonga: ♂ 242. Tonga Ids.: ♂ 240, 241, 242; ♀ 222, 223, 226. Upolu: ♂ 236, 240?; ♀ 230. Fiji Ids.: ♂ 231, 235, 239, 242, 243, 244, 246, 246; ♀ 222, 227, 227, 230, 230, 231, 233, 233, 235. New Caledonia: ♀ 240, 243. Loyalty Ids.: ♂ 251?; ♀ 241. New Hebrides: ♂ 248. Banks Ids.: ♂ 241, 243. Santa Cruz Ids.: ♂ 243, 246, 253, 253; ♀ 230, 232, 237, 239, 240, 242, 243. Solomon Ids.: ♂ 227, 227+, 228, 230, 230+, 230?, 232?, 235, 236, 237, 238, 240; ♀ 219, 220?, 221, 222+, 223?, 226, 226. Bismarck Arch.: ♂ 239+, 241, 245; ♀ 220?, 226? Northern lowlands of New Guinea: ♂ 224, 224, 227, 227, 230?, 236. Balim R., N. G.: ♂ 235, 236; ♀ 223+. Oranje Mts., N. G.: ♂ 238, 238, 242, 242, 243, 246, 246, 250, 250, 250; ♀ 218?, 221, 226, 227, 228, 232, 236, 243. Saruwaged Mts., N. G.: ♀ "237" (Mayr, 1931, Mitt. Zool. Mus. Berlin, XVII, p. 704).

CULMEN.—Eastern and central Polynesia: 16 ♂ 42–50 (45.6). Southern Melanesia (Santa Cruz to New Hebrides): 5 ♂ 46–51 48.4). Solomon Ids.: 19 ♂ 42.5–48 (45.4).

On the basis of the wing lengths listed above, two major and two or three minor size groups may be recognized whose average measurements are as follows. For comparison *rogersi* has been included. New Caledonia has been included with southern Melanesia.

WING LENGTHS OF *Anas superciliosa*

	pelewensis			
Palau	1 ♂	223+	...	...
Solomons, Bismarck and northern lowlands of New Guinea	18 ♂	224–245 (232.6)	8 ♀	219–226 (222.6)
Central and eastern Polynesia	27 ♂	231–246 (239.7)	30 ♀	222–235 (227.6)
Oranje and Saruwaged Mts., New Guinea	10 ♂	238–250 (244.5)	8 ♀	221–243 (231.3)
Southern Melanesia	8 ♂	241–253 (247.3)	10 ♀	230–243 (238.7)
	rogersi			
	19 ♂	257–275 (263.3)	14 ♀	243–254 (249.8)

The populations of eastern and central Polynesia, from the Society Islands to Fiji, are composed of birds which are very uniform in size. It has been difficult to decide whether the series from the Solomons and the northern lowlands of New Guinea actually are smaller or whether this impression is the result of the large number of molting and badly worn specimens from these localities. The few specimens from the Bismarck Archipelago are as large as ones from central Polynesia, and it is very doubtful if smaller birds would occur to the north and south of the Bismarcks in the Solomons and New Guinea. Furthermore, the average culmen length of the series from the Solomons is almost identical with that of the central Polynesian series. When better specimens are available, the birds of northern New Guinea and the Solomons may prove to be almost if not quite as large as those of Fiji and other central and eastern Polynesian localities.

This leads to the important question of the size of the birds of Palau, the type locality of *pelewensis*. Unfortunately, of the three skins secured there by the Whitney Expedition two are only half-grown and the other, although a male with gonads indicated as large, has the primaries not fully grown. Its wing measures 223 mm. plus. The bill of this bird measures 44 mm., well over the minimum found in males from the Solomons and Polynesia. Palau birds are probably of the same size as those of the Solomons, or very close to it. To be sure, Finsch (1875, Jour. Mus. Goddefroy, III, p. 40) has published measurements which suggest that they may be even smaller. Changed to millimeters, his measurements of the wing for seven unsexed Palau skins are: 207, 212, 212, 214, 223, 225, 230. These measurements indicate that the Palau birds are rather small, but it is not necessary to conclude that they are smaller than those of the Solomon Islands. As already noted, most authors have not been critical enough in eliminating non-geographical variation; furthermore in other species where material has been available, Finsch's measurements average considerably smaller than mine.

Specimens of *Anas superciliosa* from southern Melanesia and New Caledonia are distinctly larger than those already discussed. Despite the considerable north-

south range involved, this is a uniform size group from Tucopia in the Santa Cruz Group to New Caledonia. In the Saruwaged, Oranje and perhaps other mountain ranges of New Guinea altitudinal increase in size occurs, but even from the highest altitude (Lake Habbema) specimens do not average quite so large as those from southern Melanesia. Furthermore some small birds occur at high altitudes in New Guinea, and there is a gradual decrease in size until one reaches the small birds of the north coast, as Rand has already pointed out (1942, Bull. Amer. Mus. Nat. Hist., LXXIX, p. 429). Comparison of the above measurements makes it evident that the populations of the Oranje and (probably) the Saruwaged Mountains are distinctly closer to *pelewensis* than to *rogersi*. The southern Melanesian birds are almost intermediate, yet closer to *pelewensis*. For geographical reasons also it is more satisfactory to refer them to *pelewensis*.

Since the differences in wing length of these populations merely reflect a general size variation, it is to be expected that weights will show an even greater relative difference. This is true of the few available:

	A. s. pelewensis		
Solomons	♂	650, 690, 700, 700 gms.	
New Guinea	♂	700, 700, 700	♀ 655 gms.
Loyalty Ids.	♂	835	♀ 751
Saruwaged Mts.	..	...	♀ 800
	A. s. rogersi		
Arfak Mts.	♂	950	..

If Palau birds do prove to average appreciably smaller than those from the Solomons and central Polynesia, they probably will not overlap at all in wing length with those of southern Melanesia, and it might be justifiable to describe the latter as a new race, to which some of the higher mountain populations of New Guinea would unfortunately have to be referred also.

Columbidae

NOTES ON FOUR SPECIES OF *PTILINOPUS*

Ptilinopus SWAINSON, 1825, Zool. Journ., I, p. 473.

Chrysoena BONAPARTE, 1854, Compt. Rend. Acad. Sci., Paris, XXXIX, p. 879.

Among the most beautiful native birds of Fiji are three geographically representative species of golden fruit pigeons, *victor*, *luteovirens* and *layardi* (*viridis* auct.), which have their centers of distribution on the three largest islands of the group, Vanua Levu, Viti Levu and Kandavu. The females are plainly colored, greenish birds washed with yellowish white on the under tail coverts and abdomen. This is the commonest and apparently primitive coloration of the female in the widespread genus *Ptilinopus*. Even such specialized species, as regards male coloration, as *nanus*, *superbus* and *solomonensis* have females very similar in coloration to those of the Fijian species; indeed *solomonensis* might be considered conspecific with the latter if only the females of the various forms were known. Although the females of *victor*, *luteovirens* and *layardi* might appear to be only subspecifically distinct, the males are very different from one another and have specialized plumages. The male of *victor* is reddish orange in coloration, and its plumage is diffuse and hairlike; that of *luteovirens* is yellowish green, and the feathers are lanceolate and thickened and have bifid tips. The male of *layardi* is less specialized; it is greenish with a ring of thickened feathers with bifid tips around the breast and upper back. In all three the head is greenish yellow.

These specializations of coloration and plumage in the males have prompted most authors to place these species in a separate genus, *Chrysoena*. Wetmore (1925, Ibis, p. 853) went a step further and segregated *victor* in a subgenus, *Chrysophaps*. Peters (1934, Proc. 8th Int. Orn. Cong., p. 382) accepted this subdivision and stated that

he did not elevate *Chrysophaps* to generic level only because "the peculiar structure of the contour feathers is found only in the males." This is true of all three species, however, and is an equally valid reason for not recognizing *Chrysoena* as distinct from *Ptilinopus*. Furthermore, the male of *layardi* is also quite different, and to be consistent each of the three species should be put in a subgenus, or none of them. In view of the great similarity of the females and the complementary ranges of these doves, the second alternative seems preferable, and it is justifiable to consider them as comprising a superspecies.

As regards the question of maintaining *Chrysoena* distinct from *Ptilinopus*, it has already been pointed out that the females of some forms in the two groups scarcely appear to be specifically, much less generically, distinct. The peculiar plumage of the males of *Chrysoena* represents only a further development of two characters common in various species of *Ptilinopus*, namely, (1) a tendency toward diffuse and hair-like plumage which is noticeable in all the species of eastern Polynesia, such as *huttoni;* (2) the presence of feathers in which the barbs are closely appressed, giving a thickened appearance, and the tip is forked. In other species, however, such bifid feathers are found only on the breast, and the thickened portion does not extend along most of the feather as in *luteovirens*. From these considerations it seems justifiable to conclude that the peculiarities of plumage found in the males of these Fijian species, especially since all three differ from one another, are of specific but not generic importance. D. G. Elliot reached the same conclusion many years ago (1878, Proc. Zool. Soc. London, p. 511). If *Chrysoena* becomes a synonym of *Ptilinopus*, the species usually known as *Chrysoena viridis* Layard requires a new name. Elliot supplied the appropriate alternative, *layardi*.

INTRAGENERIC RELATIONSHIPS.—For convenience in the present discussion, the three species under consideration are referred to as the *luteovirens* superspecies. Peters (*ibid.*, p. 383) has stated that this group was "doubtless derived from the same stock that gave rise to *Ptilinopus tannensis*." After comparison of most of the species in the genus, I have reached a different conclusion. Although the *luteovirens* superspecies and *P. tannensis* both have yellow heads, this is apparently parallelism. Among the important differences between the two are: (1) the *luteovirens* superspecies belongs to that section of *Ptilinopus* in which bifid breast feathers occur; *tannensis* does not; (2) *tannensis* is obviously an offshoot of the *perlatus-ornatus* group of New Guinea, with which it agrees in large size, presence of spots on the scapulars and in other characters lacking in the *luteovirens* group; (3) the *luteovirens* group has marked sexual dimorphism and the males tend to be orange or yellow; neither is true of *tannensis*.

Evidently the *luteovirens* group was derived from the central group of *Ptilinopus*, of which such species as *coronulatus* and *regina* are examples. This group agrees with the *luteovirens* group in the following characters, among others: small size, presence of bifid breast feathers, bright coloration of the males (and sometimes of both sexes). Many of them have orange coloration ventrally which is very reminiscent of *P. victor*. In several the crown patch is bordered by yellow, and in some (e.g., *coronulatus*) the throat is yellow too. An extension of this would produce the yellow-headed Fijian species. All the eastern Polynesian species of the genus have been derived from this stock (1942, Ripley and Birckhead, Amer. Mus. Novitates, No. 1192). Perhaps the three species of the *luteovirens* group are the only descendants of an earlier arrival of this typical *Ptilinopus* stock in Polynesia.

Ptilinopus layardi Elliot

Chrysoena viridis LAYARD, 1875, Proc. Zool. Soc. London, p. 151, Kandavu, Fiji.

Ptilopus layardi ELLIOT, 1878, Proc. Zool. Soc. London, p. 567, new name for *Chrysoena viridis* Layard, preoccupied by *Columba viridis* Linnaeus, 1766.

TYPE LOCALITY.—Kandavu, Fiji.

RANGE.—Kandavu Group (Kandavu and Ono), Fiji.

WING.—Kandavu: ♂ 116, 116, 118, 118, 118,

122; ♀ 114, 115, 116, 121. Ono: ♂ 116, 117, 117, 117, 117, 118, 120; ♀ 116.

Birds from the two islands appear identical.

Ptilinopus luteovirens
Hombron and Jacquinot[1]

TYPE LOCALITY.—Ovalau, Fiji.

RANGE.—Viti Levu Group (Viti Levu, Ngau, Ovalau, Mbenga, Waia), Fiji.

WING.—Ovalau: ♂ 118, 118, 119, 120, 120, 121, 124; ♀ 116, 117, 117, 120, 120, 121. Ngau: ♂ 123. Viti Levu: ♂ 119, 121, 123, 123; ♀ 117, 120, 120, 123, 123. Mbenga: ♂ 117, 120. Waia: ♂ 125.

No geographical variation is apparent in the material examined.

Ptilinopus victor victor Gould

TYPE LOCALITY.—M'Bua, Vanua Levu Is., Fiji.

SUBSPECIFIC CHARACTERS.—Size smaller; coloration of the upper parts and wing and tail, especially in adult males, darker than in the other (following) race.

In adult males of *P. v. victor* the bright orange of the under parts extends around as a collar fringing the greenish head. The remainder of the upper parts, however, are noticeably darker, with a dull reddish cast. The primaries are dusky gray, washed with yellowish, with a narrow yellowish orange edge on the outer vane, and a wider concealed edge of the same color on the inner vane. The tail feathers have large dusky or even blackish areas, which tend to form a poorly defined subterminal band. Specimens from Taviuni tend to vary both in color and size in the direction of the following race, but are much nearer to *P. v. victor*.

RANGE.—Vanua Levu, Kio Rambi and Taviuni, northern Fiji Ids.

Wetmore (1925, Ibis, p. 832) recorded a specimen of *P. victor* from "Lambasa, Viti Levu." Dr. Wetmore has been kind enough to look up this specimen and writes me that Lambasa is on Vanua Levu. It was first said to be on Viti Levu, and through an oversight this error was not corrected.

The smaller size of the present race is noticeable even from a gross comparison of skins. Most of our series have the primaries in molt. The italicized measurements (both of this and the following subspecies) are of specimens with some molt in the wing but not enough to make the measurement valueless for comparison.

WING.—Vanua Levu: ♂ 114, *117*, *119*, *120*, 120; juv. ♂ 120, 121; ♀ 122. Kio: ♂ *120;* ♀ 117. Rambi: ♂ 115, 119; ♀ 120. Taviuni: ♂ *118*, 119, *119*, *120*, *121*, *122*, *123*, 123, *125;* ♀ *118*, 120, 120, *121*, 122.

TAIL.—(♂ only) Vanua Levu: 60, 61, 61, 61, 62, 64. Kio: 60. Rambi: 61, 63. Taviuni: 60, 61, 62, 63, 64, 65, 66.

CULMEN.—Vanua Levu, Kio and Rambi: 11 ♂ 13–15 (14.05).

Ptilinopus victor aureus, new subspecies

TYPE.—No. 249,168, Amer. Mus. Nat. Hist.; ♂ ad.; Ngamea, Fiji Ids.; November 25, 1924; Whitney South Sea Expedition (J. G. Correia).

SUBSPECIFIC CHARACTERS.—Size larger; coloration of the upper parts, wing and tail lighter than in *P. v. victor*.

In adult males the upper parts are bright orange, not appreciably darker than the under parts. The primaries are yellowish, only slightly dusky, and have much broader yellowish orange edgings on the outer vanes than in *victor*. In *aureus* even the shafts of the outer primaries become light and yellowish near their tips. Females and juvenal males are a shade paler below, especially as regards the green of the breast, than the corresponding stages of the nominate form.

RANGE.—Ngamea, Fiji Ids. The specimens in the British Museum from the small island of Lauthala (Lanthala, Laucala), a few miles east of Ngamea, probably belong to the race *aureus* also.

WING.—Ngamea: ♂ *124*, *127*, *128*, *128*, 128, *130;* juv. ♂ 126, 126, 131; ♀ *123*, 125.

TAIL.—Ngamea: ♂ 64, 64, 65, 66, 67, 68.

CULMEN.—Ngamea: 8 ♂ 14–15.5 (14.88).

Ptilinopus tannensis Latham

TYPE LOCALITY.—Tanna, New Hebrides.

RANGE.—Specimens were examined from the following islands, which seem to include all those from which this species was previously known, as well as some others. New Hebrides: Tanna, Erromanga, Efate, Mau, Nguna, Mai, Tongariki, Tongoa, Epi, Ambrym, Malekula, Espiritu Santo, Pentecost, Aurora; Banks Ids.: Gaua, Vanua Lava.

WING.—Tanna: ♂ 153, 159; ♀ 161. Erromanga: ♂ 157; ♀ 154. Efate: ♂ 155, 155, 156, 156, 157, 158, 158, 162, 162, 163; ♀ 149, 154, 154, 155, 157. Mau: ♂ 154, 155. Nguna: ♀ 154. Mai: ♂ 165. Epi: ♂ 157. Tongoa: ♂ 155. Ambrym: ♀ 152. Aurora: ♂ 158. Pentecost: ♂ 155. Gaua: ♂ 157. Vanua Lava: ♂ 157, 158.

TAIL.—Tanna and Erromanga: ♂ 83, 84, 89; ♀ 80, 90. Other New Hebrides Ids.: 23 ♂

[1] The parentheses have been omitted from the describers' names here and throughout this paper in agreement with W. H. Osgood's suggestion that this practice has outworn its usefulness (1939, Science, LXXXIX, p. 9).

82–91 (86.43); 12 ♀ 79–86 (83.33). Banks Ids.: ♂ 80, 82, 84.

PLUMAGES.—Only the males of this species have white spots on the lesser wing coverts. In *P. perlatus* and other related species similar spots or shoulder bars, when present, occur in both sexes. Males of *tannensis* have the under tail coverts mostly yellow, and to a variable extent the lower abdomen is yellowish or yellowish white. In females the yellowish extends much further forward over the entire posterior half of the under parts. On the upper abdomen the yellow is restricted to the tips of the feathers and produces an indistinct barring, which is entirely lacking in adult males.

In juvenals of both sexes the yellow of the under parts is as extensive as in the adult female, or more so, and tends to be deeper and less whitish. Juvenal males have fewer white spots on the wing coverts than adults, and the spots tend to be grayish, but they can be distinguished from juvenal females by this character. Juvenals have the primaries narrowly tipped and edged on the outer vane with yellow. Most of the back feathers and wing coverts are also tipped with yellow.

No geographical variation either in size or color was found in *Ptilinopus tannensis*.

A REVISION OF *DUCULA PACIFICA*

This pigeon occurs on a great many islands scattered over a very large area in the south Pacific. Inevitably specimens from several localities were described as "new species" by early authors who lacked comparative material. Later it was realized that all belonged to the same species, *Ducula pacifica* Gmelin, described from the Tonga Islands, but museum material was still too insufficient and scattered to determine how many distinct subspecies exist.

The present study is based on a splendid series of 315 skins from 71 different islands. It includes specimens from the type localities of all the names which have been applied to this species except Sikaiana Island. Skins from other islands in the Solomons make this single deficiency less important. Careful study of this long series of specimens shows the nominate race to have a very extensive range. All other names that have been applied to this species are best considered synonyms of *D. p. pacifica*. Nevertheless the isolated population found in the Bismarck Archipelago and the coastal islands of north central New Guinea is distinctly different in size and to a lesser extent in color, and is here described as new. The evidence prompting this rather drastic treatment is summarized below.

This species, like several other species of *Ducula*, has a horny knob at the base of the bill, which is absent or very small in immature birds. The latter are also smaller; they have the gray of the hind neck darker, and the plumage of the under parts is tinged with brownish and dusky as compared with the clear bright vinaceous of adults. Males are somewhat larger than females but are otherwise the same externally. Measurements of this species are summarized in the table. Undoubtedly a few mis-sexed specimens have affected some of the means given. The bill was measured from the nostril to the tip. The number of specimens measured is indicated in parentheses.

The following maximum and minimum measurements of the various populations should be considered in connection with the table:

WING.—Solomon Ids.: ♂ 239–255; ♀ 226–237. Santa Cruz Ids.: ♂ 241, 243, 252; ♀ 231–242. Duff Ids.: ♂ 245; ♀ 242. Reef Ids.: ♂ 241, 243. Banks Ids.: ♂ 241, 245; ♀ 233, 233, 238. New Hebrides: ♂ 240–250; ♀ 229?–242. Loyalty Ids.: ♂ 246. Fiji Ids.: ♂ 241–260; ♀ 234–256. Tonga Ids.: ♂ 247?; ♀ 232, 242. Alofa Is.: ♂ 250. Boscawen Is.: ♀ 236, 237, 242. Danger Ids.: ♂ 243, 245, 251; ♀ 237. Samoa Ids.: ♂ 240–256; ♀ 232–243. Cook Ids.: ♂ 245?, 253; ♀ 233?, 241, 244.

TAIL.—Solomon Ids.: ♂ 137–159; ♀ 132–150. Santa Cruz Ids.: ♂ 139–157; ♀ 135–153; Duff Ids.: ♂ 145; ♀ 148. Reef Ids.: ♂ 143, 150; ♀ 139, 150. Banks Ids.: ♂ 140–149; ♀ 140–145. New Hebrides: ♂ 140–155; ♀

135–150. Loyalty Ids.: ♂ 137, 145, 153. Fiji Ids.: ♂ 146–161; ♀ 144–160. Tonga Ids.: ♂ 145, 145; ♀ 146, 146. Alofa Is.: ♂ 146. Boscawen Is.: ♀ 150, 152, 155. Danger Ids.: ♂ 149, 150, 158; ♀ 144. Union Ids.: ♀ 135. Samoa Ids.: ♂ 148–160; ♀ 145–152. Cook Ids.: ♂ 153, 158; ♀ 155, 157.

It will be seen from the table that the four birds from the Bismarck Archipelago and the seven from Tarawai (D'Urville) Island, New Guinea, are distinctly smaller than the others. The measurements of the Tarawai specimens are quoted from Salvadori (1880–2, Ornit. Pap. Mol., III, p. 73). He remarked that the birds from this island are uniformly smaller than Polynesian ones. Since the Tarawai-Bismarck population differs also in color, it is described as new.

MEANS OF MEASUREMENTS OF *DUCULA PACIFICA* (SEE TEXT)

Locality	Wing		Tail		Bill	
	♂	♀	♂	♀	♂	♀
E. Bismarck Arch.	229.5 (2)	220.5 (2)	133.0 (2)	126.0 (2)	17.0 (2)	16.3 (2)
Tarawai Is., N. G.	♂ ♀ "230–235" (7)		♂ ♀ "130–135" (7)		...	...
Solomon Ids.	243.6 (9)	232.0 (10)	146.6 (14)	140.5 (10)	18.5 (13)	17.9 (10)
Santa Cruz, Duff, Reef Ids.	244.2 (6)	238.0 (6)	147.4 (7)	144.3 (9)	18.0 (4)	17.8 (6)
Banks, New Hebrides, Loyalty Ids.	245.9 (8)	234.8 (9)	145.8 (15)	142.9 (9)	18.8 (4)	18.0 (1)
Fiji Ids.	250.4 (19)	244.5 (19)	150.0 (15)	149.4 (17)	18.8 (5)	18.8 (4)
Tonga Ids.	247.0 (1)	237.0 (2)	145.0 (2)	146.0 (2)	18.3 (2)	19.2 (3)
Samoa Ids.	251.5 (10)	237.6 (12)	153.5 (10)	147.9 (8)	18.1 (8)	17.8 (4)
Other Central Polynesian Ids.	247.3 (4)	238.0 (4)	150.8 (4)	147.2 (5)	19.2 (3)	17.7 (3)
Cook Ids.	249.0 (2)	239.3 (3)	155.5 (2)	156.0 (2)	17.5 (3)	17.2 (3)

Ducula pacifica sejuncta,
new subspecies

Type.—No. 336,321, Amer. Mus. Nat. Hist.; ♂ ad.; Loof Is., Hermit Group, Bismarck Archipelago; May 24, 1934; Whitney South Sea Expedition (W. F. Coultas).

Subspecific Characters.—Smaller than typical *pacifica;* top of head and hind neck pale gray, lighter than in *pacifica;* under parts slightly paler than in that race.

Range.—Recorded from the Ninigo Group (Pihun Is.) and Hermit Group (Loof Is.) in the western Bismarck Archipelago, and from two islands (Seleo and Tarawai) off the north central coast of New Guinea.

Wing.—Loof: ♂ 229 (type); ♀ 218, 223. Pihun: ♂ 230?

Tail.—Loof: ♂ 131 (type); ♀ 125, 127. Pihun: ♂ 135.

Bill.—♂ 17, 17; ♀ 16, 16.5.

Remarks.—Salvadori (*loc. cit.*) noted the same color distinctions in his series from Tarawai Island that were found in the Bismarck Archipelago specimens. Between the range of *D. p. sejuncta* and the westernmost colonies of *D. p. pacifica* in the Solomon Islands and Louisiade Archipelago (subsp.?) there is a gap of several hundred miles. This species would have been collected before now if it occurred on the intervening islands such as New Britain. It is not surprising that this isolated population has become subspecifically distinct, a process which may have been accelerated by the acquisition of more sedentary habits. In *sejuncta* the wing is somewhat rounded, with the third primary longest. In the larger race, *pacifica*, which is known to be of vagrant, roving habits, the wing is more pointed, with the second primary longest.

The restricted and irregular distribution of this species in the Papuan part of its range may be the result of competition with closely related species of similar ecological requirements, such as *D. pistrinaria* and perhaps *D. rubricera*. Indeed, *D. pacifica* may have extended its range into the Papuan region secondarily from Polynesia However, the presence of closely related forms to the west (*D. myristicivora* and *D. concinna*) as well as to the east (*D. p. pacifica, D. oceanica*, etc.) would suggest that the range of this group of species was once continuous on suitable islands from the Moluccas to eastern Polynesia.

Ducula pacifica pacifica Gmelin

Columba pacifica GMELIN, 1789, Syst. Nat., I, pt. 2, p. 777, Insulis amicis (= Tonga Ids.).

Globicera tarrali BONAPARTE, 1854, Compt. Rend. Acad. Sci., Paris, XXXIX, p. 1073, Vanikoro, Santa Cruz Ids.

Globicera sundevalli BONAPARTE, 1854, Consp. Av., III, p. 32, "ab Arnoux. ex Ins. Tonga-tabou et Wallis." Peters (1937, Check-List, III, p. 44) gives the Loyalty Ids. as the type locality of this name, for reasons unknown to me. Specimens from the Loyalty Ids. and from Tonga appear identical.

Globicera microcera BONAPARTE, 1855, Compt. Rend. Acad. Sci., Paris, XL, p. 215, "ab Astrolabe ex Ins. Vavao, a Zelee, ex Samoa." I am not aware on what grounds Peters (*loc. cit.*) restricts this name to Samoa, instead of Vavao, Tonga. In any event, the birds of Tonga and of Samoa appear to belong to the same race.

Carpophaga frauenfeldi PELZELN, 1865, Reise Novara Voeg., p. 106, Stewart (Sikaiana), Solomon Ids.

Globicera farquhari SHARPE, 1900, Ibis, 249, Erromanga, New Hebrides.

Ducula pacifica intensitincta "Neumann" STRESEMANN, 1923, Arch. f. Naturg., VIII, p. 76, Fiji Ids.

SUBSPECIFIC CHARACTERS.—Larger than *sejuncta*. Wing in males averaging about 248 mm., in females about 238 mm.; head and hind neck usually darker gray; coloration of under parts perhaps slightly deeper than in *sejuncta*.

RANGE.—Cook Ids. (Rarotonga); Samoa (Savaii, Upolu, Tutuila, Olosinga, Ofu, Tau); Tonga Ids. (Tongatabu,* Ata, Tofua, Late); Union Ids. (Atafu,* Fakaafo); Ellice Ids.* (Funafuti); Fiji Ids. (Turtle, Ongea Levu, Fulanga, Yangasa cluster, Marambo, Kambara, Wangava, Tavunasithi, Namuka Ilau, Olorua, Oneata, Aiwa, Naiau, Tavutha, Thikombia, Avea, Kimbombo, Naitamba, Vatu Vara, Yathata, Vatauua, Ngele Levu, Nakumbasanga, Nukumbalate, Namena, Sovu Rocks, Ovalau,* Wakaia,* Mokongai,* Viti Levu,* Kandavu,* Kanathia*); other central Polynesian Ids. (Niuafoo,* Danger, Boscawen, Alofa, Wallis, Niue); Santa Cruz Ids. (*Duff Group:* Disappointment, Treasurers; *Reef Group:* Nupani, Lomlom; *Santa Cruz Group:* Santa Cruz, Anuda, Utupua, Vanikoro, Tinakula, Tucopia); Banks Ids. (Valua, Vanua Lava, Bligh, Gaua); New Hebrides (Espiritu Santo, Pentecost, Epi,* Malo,* Malekula, Mai, Efate, Erromanga, Aniwa, Tanna, Aneiteum*); Loyalty Ids. (Lifu, Uvea*); New Caledonia; Solomon Ids. (Sikaiana,* Rennell, Gower, Buena Vista, Ontong Java, Ramos); Louisiade Archipelago* (Duchateau, Teste, Suau).

This species wanders to so many small islets that even the above list is undoubtedly not complete. Mr. L. Macmillan, while collecting for the American Museum, saw one individual of this species on Uvea Island, Loyalties, following a hurricane, but states that native persecution, if not other reasons, prevents this species from becoming established there. At least at the present time, Mr. Macmillan considers *Ducula pacifica* as accidental on New Caledonia also.

REMARKS.—Within the wide range of *D. p. pacifica* only slight geographical variation exists. Even extremes from other localities cannot be distinguished with certainty from topotypical Tongan specimens. The trends of variation, insofar as can be judged from the various samples available are as follows. Size: central Polynesian birds are large. Those from the Cook Islands are fully as large, but their bills tend to be slightly shorter. The birds of the Solomon Islands average slightly smaller in all dimensions, as shown in the table. Those from southern Melanesia are intermediate in size, as well as in geographical position, between the Solomon Islands and central Polynesian groups.

Perceptible geographical variation in color seems restricted in this race to the gray of the hind neck and top of the head. Some authors have referred to color variation in the under wing coverts. I have been unable to detect any in the occasional specimens in which these feathers are not grease-stained. The specimens examined from the Cook Islands were collected almost fifty years ago. They are very greasy but appear to average slightly darker on the head and neck than Tonga birds. Samoan specimens tend to have the gray of the hind neck a shade paler. Those from the various islands in southern Melanesia agree closely with topotypes. Sharpe's type of *farquhari* from Erromanga must be abnormally dark, unless it is immature or grease-stained. In the Solomon Islands a tendency toward paler coloration can be detected, but the great majority of specimens cannot be separated. Mayr (1931, Amer. Mus. Novitates, No. 486, p. 11) reached the same conclusion, using specimens from the Santa Cruz Islands for comparison. Hence Solomon

* No specimens were examined from these localities.

Islands birds vary slightly towards *sejuncta* in both size and color. On geographical ground the records from the Louisiade Archipelago probably belong to *pacifica* also, but this population may be intermediate if it continues the trends noted in the Solomon Islands. The following tabulation is based on variation in the shade of gray of the head and hind neck:

Locality	Closer to Topotypical *pacifica*	Closer to *sejuncta*
Solomons	26 (a few doubtful)	9
Southern Melanesia	64	4
Fiji	86	3
Samoa and nearby islands	71	9
Cook Ids.	4	0

NOTES ON THE RACES OF *DUCULA OCEANICA*

This Micronesian pigeon has a more rounded wing than *D. pacifica*, with the third rather than the second primary longest, and is undoubtedly more sedentary. Although its range is much smaller than that of *pacifica*, subspeciation has proceeded further.

Ducula oceanica ?monacha Momiyama

Subspecific Characters.—Doubtfully distinct from the following race. Gray of the head, neck and breast perhaps a shade paler; back less bluish, and more noticeably tinted with olive and green than in *teraokai*.

Type Locality.—Yap, Caroline Ids.

Range.—Palau Ids. and Yap, Caroline Ids. Kuroda described a race from Palau which was later synonymized with *monacha* by other Japanese authors. I have seen no birds from Yap Is., but since those of Palau are only doubtfully distinct from specimens from Truk, east of Yap, the Palau race very probably cannot be upheld, as variable characters in this species change more or less gradually from east to west.

Wing.—♂ 225, 230, 232; ♀ 229.

Tail.—♂ 158, 160; ♀ 157.

Bill.—♂ 17, 17.5; ♀ 15.5.

All measurements are from Palau specimens.

Ducula oceanica teraokai Momiyama

Subspecific Characters.—Possible differences between this and the preceding race are given above. Our series of *teraokai* differs from all other material of this species examined in having the back purer blue, without tints of olive and green. This series was collected in the 1890's, while all the other material was collected after 1930. If this distinction in the color of the back proves to be the result of age, *monacha* may be united with *teraokai*, as the other differences are negligible.

Type Locality and Range.—Islands of the Truk Atoll, Caroline Ids.

Wing.—♂ 227, 227, 234, 236, 237; ♀ 222, 228, 232, 233, 235, 237, 241, 242.

Tail.—♂ 156, 159, 160; ♀ 148, 150, 156, 156.

Bill.—♂ 16, 16.5, 16.5, 16.5; ♀ 16, 16.5, 16.5, 17, 17.

Ducula oceanica ?townsendi Wetmore

Subspecific Characters.—Gray of the head and hind neck, and to a lesser degree of the breast, much darker than in the two preceding races; bill slightly longer. Differs from the following race, *oceanica*, only by being larger, but adequate material may reveal that the difference is too slight to make it profitable to recognize *townsendi*. In describing *townsendi* Wetmore mentioned only two adults of the new form and one from Kusaie. He described *townsendi* as similar to *oceanica* from Kusaie but " . . . darker on upper breast, foreneck, hindneck, and upper back; no whitish line indicated on lower eyelid beneath eye; and under tail coverts paler." Careful comparison of a long series taken at about the same time from the two localities has not revealed any differences in color. Those noted by Wetmore apparently represented individual variation.

Type Locality and Range.—Ponape Is., Carolines.

Wing.—♂ 236; ♀ 228, 231, 233.

Tail.—♂ 157, 158, 159, 160, 163; ♀ 157.

Bill.—♂ 17, 17, 17.5, 18; ♀ 16.5, 17.5, 18.

Ducula oceanica oceanica Lesson and Garnot

Subspecific Characters.—Like the preceding race, *townsendi*, but slightly smaller.

Type Locality.—Kusaie, Caroline Ids.

Range.—Kusaie, Caroline Ids. According to Japanese authors, this is the form occurring on Jaluit and Elmore Ids. in the Marshall Group. Probably specimens from these islands will be intermediate between *oceanica* and the following race, in agreement with the cline toward diminution of size from west to east which is noticeable in this pigeon. *Ducula oceanica* was secured at an early date on the Gilbert Ids., but nothing is known of the racial affinities of that population. It is best referred tentatively to *D. o. oceanica* until a comparison becomes possible.

Wing.—♂ 226, 229, 232, 232; ♀ 220, 220, 223?

Tail.—♂ 154, 154, 157, 158, 159; ♀ 148, 148, 149, 149, 151, 154.

BILL.—♂ 17.5, 18, 18, 18, 18.5, 19; ♀ 17.5, 17.5, 18.5, 19.

Ducula oceanica ratakensis
Takatsukasa and Yamashina

SUBSPECIFIC CHARACTERS.—Like *oceanica*, but smaller.

TYPE LOCALITY.—Arno, Marshall Ids.

RANGE.—Arno and Wotje, Marshall Ids.

MEASUREMENTS.—Arno: ♂ wing: 203? (juv. quills); tail: 138 (ad. rectrices?); bill: 17.5. Wotje: ♀ wing: 218 (much worn, ad. ?); tail: 137; bill: 18.5. From original description (1932, Dobuts. Zasshi, XLIV, p. 221): "Wing 6 ♂, ad., 211–217; 3 ♀, ad., 208–213."

I am greatly indebted to Mr. J. L. Peters for the loan of two specimens of this race from the collection of the Museum of Comparative Zoölogy. As will be noted from the qualifications above, they are not in very good condition for measuring. However, since the measurements of the original describers also indicate a small bird, *ratakensis* must be maintained. It is possible, however, that further material may show this impression of small size to have resulted from the measurement of birds in badly worn plumage or subadult.

The original describers also attributed certain peculiarities of color to *ratakensis*. Since these seemed at variance with the type of geographical variation occurring in this species, it was not surprising to find that the specimens examined are indistinguishable from Kusaie specimens in coloration.

The primaries of *Ducula oceanica* become greatly abraded. This is very noticeable in our series of typical *oceanica* from Kusaie and, together with the poor condition of the two specimens of *ratakensis* examined, makes it impossible to reach a final conclusion as to whether it is necessary to recognize three size races, *townsendi*, *oceanica* and *ratakensis*.

REMARKS.—The four species, *Ducula pacifica*, *oceanica*, *aurorae* (Society Islands) and *galeata* (Marquesas Islands) form a superspecies (together, perhaps, with other Papuan and East Indian species). Mayr (1940, Amer. Nat., LXXIV, p. 270) has mapped the distribution of these four species. *D. galeata*, although specialized as regards gigantism and hypertrophy of the bill excrescence, is in coloration closer to the more primitive *pacifica-oceanica* group than is *aurorae*. The latter differs from the other three species by lacking the chestnut under tail coverts, by having a distinct immature plumage and by the deep blue rather than greenish blue color of the upper parts. It is therefore better to consider *galeata* as independently derived from the *oceanica* and *pacifica* groups rather than directly from *aurorae*, as was done in the map referred to.

NOTES ON *DUCULA GOLIATH*, *D. BAKERI* AND *D. LATRANS*

Ducula goliath G. R. Gray

RANGE.—New Caledonia and the Isle of Pines.

WING.—♂ *292*, *295*, 300; ♀ 294, *295*, *301*, 301, 307.

TAIL.—♂ 210, 214, 218; ♀ 206, 210, 212, 220, 236.

WEIGHT.—The weights of the four birds whose wing lengths are italicized, given in the same order, were: ♂ 697, 680.6; ♀ 711.2, 716 gms. Mr. L. Macmillan, who collected these specimens, states that the females were in laying condition; the heavier one had a shelled egg in the oviduct. Since the weight of female birds is known to increase considerably during the laying season, perhaps the female is normally no heavier than the male, although the other measurements suggest that the female in *goliath* may actually be larger.

All the examined specimens are from New Caledonia.

Ducula bakeri Kinnear

TYPE LOCALITY.— Espiritu Santo, New Hebrides.

RANGE.—Larger islands of the northern New Hebrides (Espiritu Santo, Pentecost, Ambrym, Aurora) and Banks Ids. (Vanua Lava, Gaua, Bligh). It will not be surprising if this species is eventually found to occur on Malekula, New Hebrides, also.

WING.—*New Hebrides:* Espiritu Santo: ♂ 224, 225?, "230" (type, *fide* Kinnear), 235; ♀ 224? Ambrym: ♀ 218. Aurora: ♂ 221. *Banks Ids.:* Vanua Lava: ♂ 218, 222, 222, 223, 223, 224, 224, 224; ♀ 216, 218. Bligh: ♂ 224. Gaua: ♂ 219.

TAIL.—*New Hebrides:* Espiritu Santo: ♂ "162" (type), 175, 175; ♀ 167. Ambrym: ♀ 169. Aurora: ♂ 159, 162. Pentecost: ♀ 162. *Banks Ids.:* Vanua Lava: ♂ 159, 161, 162, 166, 167, 167, 170; ♀ 151, 153. Bligh: ♂ 158. Gaua: ♂ 164.

REMARKS.—The above measurements make it quite certain that Banks Islands specimens average slightly smaller than those of the New Hebrides. Perhaps this difference, which is paralleled in many other species, is correlated with the smaller size and lower elevation of the islands in the Banks Group. I can detect no other difference between the two populations.

Juvenals with down still clinging to their feathers scarcely differ in coloration from adults. They are duller, however, with the gray of the head washed with blackish and reddish brown, and with the maroon areas, especially the band across the shoulders, duller. Juvenals also lack the bluish gray bloom on the wings, and their rectrices are narrower and become somewhat pointed with wear.

Ducula latrans Peale

RANGE.—Fiji Ids. Specimens were examined from the following islands: Matuku, Totoya, Moala, Naiau, Thithia, Tavutha, Mango, Avea, Vanua Mbalavu, Naitamba, Vatu Vara, Thikombia, Tavinui, Rambi, Vanua Levu, Koro, Ngau, Viti Levu, Ovalau and Kandavu. The species has been recorded also from Kanathia, Wakaia and Mokongai.

WING.—Matuku: ♂ 243; ♀ 227. Moala: ♂ 223, 230, 233, 235, 237; ♀ 225, 227, 229. Naiau: ♂ 232. Thithia: ♀ 229? Tavutha: ♂ 241, 245; ♀ 236. Mango: ♂ 240?, 245. Avea: ♂ 243. Vanua Mbalavu: ♂ 252+ (!), 236+; ♀ 231, 239. Naitamba: ♂ 242. Thikombia: ♂ 240, 241. Taviuni: ♀ 238. Vanua Levu: ♀ 232. Ovalau: ♀ 237. Viti Levu: ♂ 230, 235?, 235?; ♀ 230, 231, 232, 233+. Kandavu: ♂ 242.

TAIL.—14 ♂ 167–186 (176.7); 7 ♀ 163–178 (169.4).

The small samples available from each island tend to give to individual variation the appearance of geographical variation. The sexing is from the labels and may include a few errors. It will be noted that one male from Vanua Mbalavu is very large; this specimen is a giant, visibly larger than all other specimens. Although the longest primaries are in molt, its wing length is considerably greater than in other skins. One of the females from this island, if correctly sexed, is unusually large, but the other pair is of normal size.

REMARKS.—*Ducula latrans* varies considerably in the shade of gray of the head and hind neck. In lighter birds this area is set off from the back; in darker ones the two blend. No geographical variation in color could be detected.

RELATIONSHIPS OF THE SPECIES.—*D. goliath* has been thought to differ from all its congeners by having forked tips on the feathers of the breast and upper back. Most specimens of *D. bakeri*, however, have a few such feathers, but I have been unable to find any in *brenchleyi* or *latrans*. This, as well as general coloration, shows *bakeri* to be most closely related to *goliath* and not to *latrans* as stated by Kinnear in the original description. These four species are in some respects rather unspecialized, and it is difficult to say to which of the species found on the larger islands to the west they are most closely related. They have a resemblance to the unspecialized group of species which includes *rosacea*, *pickeringii* and perhaps *cineracea*, but whether this indicates close relationship or chance retention of more or less primitive characters in two long separated groups is uncertain.

NOTES ON *COLUMBA VITIENSIS*

This pigeon is one of a group of closely related species, most of which still replace each other geographically as follows: *janthina* (Japan and nearby islands), *versicolor* (Bonin Islands), *jouyi* (Riu Kiu Islands), *pallidiceps* (Bismarck Archipelago and Solomon Islands), *vitiensis* (Moluccas, New Guinea, Solomon Islands and Polynesia) and *norfolciensis* (eastern Australia). Stresemann (1939, Jour. f. Orn., LXXXVII, p. 351) has published a map showing the distribution of some of these species. *C. pallidiceps*, *vitiensis* and *norfolciensis* probably evolved in New Britain, New Guinea and Australia, respectively. Later, *pallidiceps* and *vitiensis* spread to

the Solomon Islands, but in neither instance has this population become subspecifically distinct. *C. vitiensis* is unknown from New Britain, although that island is, of course, closer to New Guinea than are the Solomons. The interesting probability thus exists that *vitiensis* has been unable to colonize New Britain, the home island of *pallidiceps*, though both species have secondarily colonized the Solomons, where they occur side by side.

Although *vitiensis* appears to have been once one in a chain of subspecies which eventually extended from Japan to Australia, it has been distinct long enough to divide secondarily into eight subspecies. Two of these, *metallica* of the Lesser Sunda Islands and *griseogularis* of the Philippines, both characterized, among other things, by having the throat gray in both sexes, do not come within the scope of the present notes. The widespread race *halmaheira* occurs in the Moluccas, New Guinea and the Solomons. Since the Polynesian races are closely related to *halmaheira*, it is desirable to state the racial characters of this race. They are: throat and cheeks white in both sexes; scapulars and wing coverts sooty black with conspicuous green and amethyst margins; plumage highly iridescent; size large. Of the four Polynesian races, that of the New Hebrides is most like *halmaheira*, while the Fijian form is also similar but continues a trend towards duller coloration and smaller size. The other two races, one native to New Caledonia and one to Samoa, are much more distinct and do not continue the cline just described. Presumably their greater distinctness is to be attributed to the genetic effects of more complete isolation upon one or a few islands, rather than to longer isolation. *Columba vitiensis* probably reached the New Hebrides from New Guinea and spread to the other Polynesian localities from there.

Columba vitiensis leopoldi Tristram

SUBSPECIFIC CHARACTERS.—Throat and cheeks white in the male, washed with gray in the female; dark coloration of crown extending below the lores as a malar spot and narrow line below the eyes; scapulars and wing coverts dull black with inconspicuous margins; color similar to *halmaheira* but duller, and as a result the dark gray ground color of the under parts is much less concealed by iridescent green and amethyst tints, especially in the female; size medium, wing averaging about 7 mm. shorter than in *halmaheira*.

RANGE.—New Hebrides (Aneiteum, Tanna, Aniwa, Erromanga, Efate, Nguna, Makura, Mai, Epi, Lopevi, Pauuma, Ambrym, Malekula, Malo, Espiritu Santo) and Torres Ids. (Lo, Hiw). It is surprising to find this species in the Torres Ids. but not in the Banks Ids.; yet the Whitney Expedition collected extensively in the latter group without securing it.

WING.—*New Hebrides:* Tanna: ♂ 249. Aniwa: ♂ 237. Efate: ♂ 229. Makura: ♀ 223+. Mai: ♀ 214. Malekula: ♂ 230; ♀ 224, 225? Malo: ♀ 228?; Espiritu Santo: ♂ 224, 227, 232, 233. *Torres Ids.:* Hiw: ♂ 242.

TAIL.—*New Hebrides:* Tanna: ♂ 171. Efate: ♂ 157. Makura: ♀ 162. Mai: ♀ 150. Malekula: ♂ 160; ♀ 155. Malo: ♀ 152. Espiritu Santo: ♂ 151, 159, 163, 164; ♀ 164. *Torres Ids.:* Hiw: ♂ 169.

NOTES ON PLUMAGE.—Females vary in the amount of gray present on the throat and cheeks, but I believe it is never entirely absent. This is difficult to determine from the specimens at hand, most of which have the head feathers soiled and saturated with plaster. The pigmented malar spot and line beneath the eye are reduced or absent in a few individuals. It is interesting to note that such a spot, or a suggestion of one, occurs as an individual variation in about ten per cent of skins of *halmaheira*. Females in fresh plumage are dark slate gray below; when viewed in certain lights, tints of green and amethyst are conspicuous. This is the plumage described by Salvadori (1893, Cat. Birds, XXI, p. 318) from a skin from Aneiteum. In worn plumage the breast feathers in the female become noticeably reddish, and the gray feathers of the abdomen acquire dull chestnut tips. The coloration of males is similar but brighter and more iridescent, with the breast always noticeably reddish; the changes with wear are as in the female. Males of *leopoldi* are thus more like *halmaheira* in coloration than are females but average duller and grayer than that race. Juvenals of the New Hebrides race are like dull-colored females. Their color changes greatly as the result of fading, bleaching and wear and becomes very dull and brownish, tinged with rufous ventrally.

Columba vitiensis vitiensis
Quoy and Gaimard

SUBSPECIFIC CHARACTERS.—Throat and cheeks white in males, washed with grayish in females; upper parts similar to *leopoldi*, but lighter and with a grayish bloom which reduces the iridescence and makes the coverts less blackish; under parts prevailingly vinaceous or dull chestnut (worn plumage); gray of under parts, as compared with *leopoldi*, paler and much reduced, being in evidence only on the flanks and under tail coverts; size small.

RANGE.—Fiji Ids. Specimens were examined from Ongea Levu, Fulanga, Marambo, Kambara, Namuka Ilau, Mothe, Aiwa, Totoya, Moala, Vanua Vatu, Thithia, Tuvatha, Katavanga, Mango, Munia, Thikombia Ilau, Avea, Vanua Mbalavu, Kimbombo, Naitamba, Vatu Vara, Yathata, Taviuni, Kio, Namena, Makongai, Wakaya, Mbatiki, Nairai, Yanutha, Ovalau, Viti Levu, Vatu Leile, Ngualito, Waia, Mathatoni, Nathoulla, Yasawa, Kandavu, Ono, Yankuve and Vanua Kula. Others have recorded the species from Vanua Levu and Ngau.

MEASUREMENTS.—Single specimens or small series from each of no less than forty-two islands as just listed were available. There is no indication of geographical variation within this uniform race. The measurements for *C. v. vitiensis* have therefore been combined. That this procedure is justified is further indicated by the low values obtained for the Standard Deviation (σ) and Coefficient of Variation (V). If populations differing appreciably in average wing and tail lengths had been mixed, these values would very likely have been larger.

WING.—27 ♂ 214–239 (226.15); σ = 5.20; V = 2.3. 26 ♀ 208–226 (217.5); σ = 4.81; V = 2.21.

TAIL.—27 ♂ 152–172 (160.59); σ = 5.19; V = 3.23. 28 ♀ 146–163 (155.11); σ = 4.79; V = 3.09.

NOTES ON PLUMAGE.—As Salvadori noted (*op. cit.*, p. 317), females of *vitiensis* are duller and have the under parts less vinaceous than males. As in *leopoldi*, a pigmented malar spot and line beneath the eye are almost always present; in females they blend with the gray of the cheeks. Females also have the scapulars and wing coverts slightly more brownish and less grayish. In juvenals the breast feathers are gray, tipped with rufous to produce a barred effect; this appearance is not present in the fluffy feathers of the abdomen, which are more broadly tipped with rufous. In juvenals in worn plumage the under parts become dull rufous washed with grayish on the flanks and breast.

The sexual difference in throat color is constant in this race and noticeable even in juvenals.

Columba vitiensis castaneiceps Peale

SUBSPECIFIC CHARACTERS.—Throat and cheeks white in the male, tending to be gray in the female; plumage slaty gray with a conspicuous greenish and slight reddish iridescence; crown purple-chestnut contrasting with neck and back; a few feathers of the same color usually extend around the margin of the white throat patch.

RANGE.—Western Samoan Ids. (Savaii, Upolu, Manono, Apolima).

WING.—Savaii; ♂ 237; ♀ 220?, 222, 225, 226, 228, 230. Upolu: ♂ 228, 231?, 232, 233; ♀ 222.

TAIL.—Savaii: ♂ 162; ♀ 148, 155, 156, 157, 160, 165. Upolu: ♂ 155, 156, 159, 161; ♀ 147, 153.

NOTES ON PLUMAGE.—In *castaneiceps* the reddish coloration and iridescence noticeable in the other Polynesian races of this species are almost entirely lacking, except on the crown. Even in worn plumage the feathers of the under parts do not acquire rufous tips, but remain gray. It is interesting to find that in the only juvenal in the series the ventral feathers are tipped with dull rufous and the specimen is scarcely separable from immatures of *vitiensis*.

In females the white throat patch tends to be smaller, and there is not such a distinct break where it meets the gray of the breast as in males. Some of the females have the throat and cheeks washed with grayish, but as in *leopoldi* the condition of the specimens hinders a study of this variation. In this race the malar spot and line are usually absent; only one of fifteen skins has them well developed.

Columba vitiensis hypoenochroa Gould

SUBSPECIFIC CHARACTERS.—(Male only.) Throat and cheeks white; crown, hind neck and under parts except under tail coverts purple-chestnut, glossed with amethyst; upper parts, except crown and hind neck, like *leopoldi;* size large.

RANGE.—New Caledonia, Isle of Pines, Loyalty Ids. (Mare, Lifu, Uvea).

WING.—New Caledonia: ♂ 243, 247. Mare: ♂ 248. Lifu: ♂ 240; ♀ 235. Uvea: ♂ 241.

TAIL.—♂ 167, 170, 170, 176, 177; ♀ 170.

WEIGHT.—Loyalty Ids.: ♂ 373, 426, 441, 459; ♀ 456.

REMARKS—We have only one female

of this race. This specimen is bleached and worn but agrees quite well with Salvadori's description. Females of *hypoenochroa* are evidently much like those of *leopoldi*, but adequate material of the former will probably show that some differences in addition to size exist. Sexual color dimorphism is much greater in *hypoenochroa* than in other races of *vitiensis*. Males of this race usually have a pigmented malar spot and line beneath the eye. Mayr (1940, Amer. Mus. Novitates, No. 1057, p. 2) has already pointed out that the birds of the Loyalty Islands and New Caledonia are identical and that Sarasin's race *uveaensis* cannot be upheld.

It may be mentioned here that it now seems probable that Lord Howe Island was formerly inhabited by a race of this pigeon, now extinct, which Mathews has named.

Columba vitiensis godmanae Mathews

Raperia godmanae MATHEWS, 1915, Austr. Av. Rec., III, p. 24, Lord Howe Is.

No specimen of this bird is known, and the description is based upon a painting by Raper. Peters (1937, Check-List, III, p. 70) suggested that the locality attributed to the bird portrayed by Raper was probably erroneous and considered the above name a synonym of *halmaheira*. Hindwood, however, in his recent paper on the birds of Lord Howe Island (1940, Emu, XL, p. 10, footnote) has shown that Raper visited Norfolk Island several times and probably stopped at Lord Howe Island or obtained birds from there. He also quotes many early accounts which leave no doubt that a large pigeon, which became extinct at an early date, inhabited this island. It thus appears probable, though by no means certain, that Raper's painting portrays this extinct bird. The painting, which Hindwood has had reproduced, obviously represents some form of *Columba vitiensis* which might be *halmaheira* or the male of *leopoldi*. Lord Howe Island is so isolated, however, that if this species occurred there, it was probably racially distinct; this race may be tentatively listed under the name *godmanae*.

SOUTHERN MELANESIAN RACES OF *MACROPYGIA MACKLINAYI*

The following tabulation of measurements of adults of this dove indicates that two races may be recognized in southern Melanesia, a small one from the Santa Cruz Islands and a large one from the New Hebrides and Banks Islands.

Locality	Wing Length	
New Hebrides	19 ♂ 153–166 (158.53)	9 ♀ 150–161 (154.44)
Banks Ids.	1 ♂ 157	3 ♀ 148–155 (151.67)
Santa Cruz Ids.	9 ♂ 148–154 (150.22)	4 ♀ 139–153 (148.25)
	Tail Length	
New Hebrides	11 ♂ 166–194 (178.36)	10 ♀ 160–180 (171.4)
Banks Ids.	0	2 ♀ 165, 165
Santa Cruz Ids.	4 ♂ 157–167 (164.0)	3 ♀ 164–171 (167.67)

Macropygia mackinlayi mackinlayi Ramsay

Macropygia mackinlayi RAMSAY, 1878, Proc. Linn. Soc. New South Wales, II, p. 286, Tanna Is. (gray phase).

Macropygia rufa RAMSAY, 1878, *ibid.*, p. 287, Sandwich (Efate) Is. (rufous phase).

SUBSPECIFIC CHARACTERS.—Larger and longer-tailed than the other races; coloration slightly paler than that of the following race, much paler than that of the non-Polynesian races; occurs in a gray phase unknown in the other races of the species.

RANGE.—*New Hebrides:* Aneiteum—1, Tanna—5, Erromanga—1, Efate—4, Mau—1, Mai—2, Tongoa—2, Tongariki—2, Epi—3, Lopevi—1, Pauuma—2, Ambrym—6, Malekula—3, Pentecost—1, Aurora—3, Aoba—18, Malo—2, Espiritu Santo—5, Dolphin—1. *Banks Ids.:* Meralav—3, Gaua—3, Vanua Lava—3, Valua—3. (The figures indicate the number of specimens examined.)

WING.—*New Hebrides:* Aneiteum: ♂ 158. Tanna: ♂ 159, 161; ♀ 160, 161. Erromanga: ♂ 166. Efate: ♂ 153, 156, 159, 162; ♀ 150, 150, 155. Mau: ♂ 161. Mai: ♀ 157. Tongariki: ♂ 155. Epi: ♂ 158. Lopevi: ♂ 160. Aurora: ♂ 158. Aoba: ♂ 156, 157, 158; ♀ 150, 153, 154. Espiritu Santo: ♂ 156, 157, 162. *Banks Ids.:* Meralav: ♀ 148. Gaua: ♂ 157. Vanua Lava: ♀ 152. Valua: ♀ 155.

TAIL.—*New Hebrides:* Tanna: ♂ 172, 181; ♀ 170+, 177. Erromanga: ♂ 194. Efate: ♂ 176, 178, 180; ♀ 160, 167, 169. Mau: ♂ 190.

Mai: ♀ 170. Tongoa: ♀ 172, 180. Tongariki: ♂ 166. Epi: ♂ 173. Ambrym: ♀ 174. Aoba: ♂ 175; ♀ 175. Espiritu Santo: ♂ 177. *Banks Ids.:* Vanua Lava: ♀ 165. Valua: ♀ 165.

COLOR PHASES.—This race occurs in a normal brown phase and in a rarer gray phase. In the latter, brown coloration is entirely lacking, except perhaps on the under tail coverts, which are pale buffy white. Intermediates between the two phases do not occur. In worn plumage, females of the brown phase become somewhat grayish on the breast, but examination of the less faded parts of their plumage shows at once that they are not intermediate. A gray juvenal from Aoba is as completely gray as adults of this phase. The above suggests that the gray phase is controlled by a single alternative genetic factor. Phases are unknown in other races of this species or in other species of the genus.

The two phases of *Macropygia mackinlayi* were at first believed to be distinct species, while Peters (1937, Check-List, III, p. 81) considered them to represent the sexes. That the brown and gray birds represent color phases which occur independently of age or sex became apparent as soon as adequate material of this race was collected for the first time by the Whitney Expedition. Five of fifteen specimens taken on Tanna Island in the southern New Hebrides by the American Museum collector, L. Macmillan, were in the gray phase, and this proportion is probably a fair indication of their proportions on this island. He believed that the gray phase is more common in the higher parts of Tanna, but this requires confirmation. Of seventy-eight skins from other islands, one from Mau, an island off the north coast of Efate in the south central New Hebrides, and one from Aoba in the northern part of the group are in the gray phase. This is a small proportion, but it is interesting that the mutation has been carried the length of the New Hebrides. With the exception of these two skins, the gray phase has apparently been taken only on Tanna. It might be expected that gray birds would be commoner in the other southern islands near Tanna; this may be true but only to a limited extent. Macmillan reports that of fifty birds observed on Erromanga only one was gray. Regarding Aneiteum we know only that the single specimen collected there is brown.

NOTES ON PLUMAGE.—Several species of *Macropygia* have a patch of specialized feathers on the breast. In *M. mackinlayi* these feathers are forked at the tip and have black bases which in the females extend nearer to the tips of the feathers and produce distinct black spots on the breast. In the males this black is scarcely or not at all visible. This is the principal color difference between the sexes. The ventral surface is slightly paler chestnut in the female and with wear becomes pale rufous stippled with grayish white on the breast. The coloration of males seems to be less affected by plumage wear.

In juvenals of both sexes the breast feathers are not bifid; they are more black than those of adult females, only the tips being brown. Hence the blackish breast contrasts with the remainder of the under side more than in adults. The dorsal feathers in juvenals have blackish subterminal areas followed by clearly defined brown tips. Their wing feathers are also brown tipped.

The only sexual color difference in the gray phase is the more extensive black mottlings on the breast in the female. The plumage of this phase has a peculiar appearance, as though a white powder had been sifted over it. As noted above, brown phase birds in worn plumage acquire this stippled appearance to some extent. These markings are apparently equally present in both phases, but mostly concealed by the brown coloration of the common phase. Gray juvenals differ from adults as do those of the brown phase, except that all brown markings are replaced by gray.

Macropygia mackinlayi troughtoni Kinghorn

Macropygia rufa troughtoni KINGHORN, 1937, Proc. Zool. Soc. London, p. 177, Vanikoro, Santa Cruz Ids.

SUBSPECIFIC CHARACTERS.—As compared with the large pale race, *mackinlayi*, of the New Hebrides and the small, deep chestnut race,

arossi, of the Solomons, *troughtoni* agrees in coloration with *mackinlayi*, though slightly more chestnut, and in size with *arossi*, though considerably larger. Kinghorn compared the Santa Cruz birds only with *arossi* and not with *mackinlayi*, to which they are much more closely allied, and it is quite by accident that *troughtoni* may be accepted as a somewhat poorly differentiated race.

RANGE.—Santa Cruz Ids. (Vanikoro, Utupua, Santa Cruz, Tinakula, Lomlom).

WING.—Vanikoro: ♂ 150; ♀ 139, 152. Utupua: ♂ 149, 149, 149. Santa Cruz: ♂ 148, 152, 153; ♀ 149, 153. Tinakula: ♂ 148. Lomlom: ♂ 154; ♀ 147+.

TAIL.—Vanikoro: ♂ 157?; ♀ 168. Utupua: ♂ 166, 166? Santa Cruz: ♀ 171. Lomlom: ♂ 167?; ♀ 164.

REMARKS.—The observations on plumage made for the preceding race apply to *troughtoni*, except that the gray phase is unknown. The long, graduated tail is rarely in perfect condition for measuring, but there is little doubt that the tail is relatively, as well as absolutely, longer in *mackinlayi* than in *troughtoni* and the other races of this dove. Banks Islands birds are closest to *mackinlayi*, but they are more or less intermediate. The two races are very similar in coloration; individuals cannot be identified, but in a series of *troughtoni* the chestnut coloration averages perhaps a shade deeper.

THE POLYNESIAN RACES OF *CHALCOPHAPS INDICA*

The southeastern part of the range of this dove is occupied by four subspecies, all of which lack the white forehead and superciliary stripes found in the other races.

These four subspecies may be separated as follows:

A.—Shoulder patch white in adults of both sexes.
  1.—Size medium (wing 12 ♀: 151–160; 14 ♂: 155–170)..... *timoriensis*.
  2.—Size large (wing 1 "♀": 160; 3 ♂: 168?, 169?, 172)..... *longirostris*.
B.—Shoulder patch white in males, brownish gray or grayish white in females.
  1.—Size small (wing 16 ♀: 135–147; 24 ♂: 136–153)..... *sandwichensis*.
  2.—Size medium (wing 6 ♀: 149–153; 9 ♂: 153–163)..... *chrysochlora*.

The only specimen of *longirostris* sexed as female is violaceous on the breast instead of brownish, as are the females of other races, and may be a male despite the small size. Regardless of what the color characters prove to be, *longirostris* is valid because of its large size. Only Australian specimens are included in the above measurements of *chrysochlora*.

Chalcophaps indica sandwichensis
Ramsay

TYPE LOCALITY.—Efate, New Hebrides.

SUBSPECIFIC CHARACTERS.—Much like *chrysochlora*, but smaller; breast, crown and upper back in males vinaceous cinnamon; in males of *chrysochlora* in fresh plumage these regions are perceptibly lighter, more violaceous, but many worn specimens are inseparable; the wing patches are slightly less conspicuous in both sexes in *sandwichensis;* females of the two races are otherwise identical in coloration.

RANGE.—Santa Cruz Ids. (Disappointment, Lomlom, Fenualoa, Nupani, Tinakula, Utupua, Vanikoro), Torres Ids. (Lo, Hiw), Banks Ids. (Bligh, Vanua Lava, Gaua), New Hebrides (Espiritu Santo, Malo, Malekula, Ambrym, Pauuma, Epi, Efate, Erromanga, Tanna, Futuna—near Tanna, Aneiteum and probably others), Loyalty Ids. (Mare, Lifu, Uvea). The species was observed but not collected on Mare by Macmillan.

WING.—*Santa Cruz Ids.:* Disappointment: ♂ 142. Lomlom: ♂ 142, 142, 144, 144, 144; ♀ 139. Nupani: ♂ 139. Tinakula: ♂ 140; ♀ 141, 142. Utupua: ♂ 136, 140; ♀ 138. *Torres Ids.:* Lo: ♂ 141, 147, 147; ♀ 136. *Banks Ids.:* Bligh: ♀ 136. Vanua Lava: ♂ 143. Gaua: ♀ 135. *New Hebrides:* Espiritu Santo: ♂ 147. Malo: ♂ 147, 147. Malekula: ♂ 153. Ambrym: ♂ 143, 149. Pauuma: ♂ 153; ♀ 142. Epi: ♂ 148; ♀ 147. Efate: ♀ 141, 142, 144, 145, Erromanga: ♂ 144? Tanna: ♂ 146+; ♀ 144. *Loyalty Ids.:* Lifu: ♀ 145+. Uvea: ♀ 145?

TAIL.—*Santa Cruz Ids.:* Lomlom: ♂ 81, 83; ♀ 81. Fenualoa: ♂ 83. Nupani: ♂ 86. Tinakula: ♀ 83. *Torres Ids.:* Lo: ♂ 77, 87; ♀ 82. *Banks Ids.:* Bligh: ♀ 85. Vanua Lava: ♂ 84. Gaua: ♀ 81. *New Hebrides:* Espiritu Santo: ♂ 88. Malo: ♂ 90, 92. Malekula: ♂ 90. Ambrym: ♂ 87, 91. Pauuma: ♂ 92; ♀ 86. Epi: ♀ 92. Efate: ♀ 85, 87, 89, 90. Erromanga: ♂ 89. Tanna: ♂ 88; ♀ 91. *Loyalty Ids.:* Lifu: ♀ 93.

There is a slight increase in size from north to south but no perceptible difference in color. From the Loyalty Islands we have only two specimens, both females; in neither of these can the wing length be determined with certainty. Brasil (1916, Rev. Franc. d' Orn., IV, p. 195) records the wing length of a female from Lifu as 147 mm. The measurements of these three birds are nearest to those of *sandwichensis*, to which the Loyalty Islands population is here tentatively referred. It is possible that a better series would show them to be closer to *chrysochlora*.

Chalcophaps indica chrysochlora Wagler

Columba chrysochlora WAGLER, 1827, Syst. Av., Columba, sp. 79. New South Wales designated as type locality by Mathews.

Chalcophaps chrysochlora disjuncta BRASIL, 1916, Rev. Franc. d'Orn., IV, p. 195, New Caledonia.

SUBSPECIFIC CHARACTERS.—This race is nearest to *sandwichensis* but is larger; there are also slight color differences as noted above; from *longirostris*, *chrysochlora* differs by being smaller, and perhaps adequate material of the former will reveal color differences. *C. i. chrysochlora* is also very similar to *timoriensis*, and some males are indistinguishable. Those of *chrysochlora* average slightly grayer and less violaceous ventrally, and the white patch on the bend of the wing is in many individuals less pronounced, a smaller portion of each feather being white; they usually have the neck and upper back less suffused with slate color. Females of *chrysochlora* have the wing patch grayish, while in adult females of *timoriensis* it is white as in the male; *chrysochlora* also averages slightly smaller than *timoriensis*.

RANGE.—In Polynesia: New Caledonia. Elsewhere: Lord Howe Is.; eastern Australia; eastern New Guinea westward to the Oriomo R. and Astrolabe Bay; Manam; D'Entrecasteaux Archipelago; Trobriand Ids.; Woodlark Group; Bonvouloir Group; Louisiade Archipelago.

WING.—New Caledonia: ♂ 154, 154; ♀ 149+; New South Wales: ♂ 155, 156, 156, 163; ♀ 149, 151, 151.

TAIL.—New Caledonia: ♂ 96, 100, 101; ♀ 97. New South Wales: ♂ 88, 92, 95, 97; ♀ 92, 94, 97.

New Caledonian specimens are distinctly larger than those of the New Hebrides and nearer both in wing and tail measurements to *chrysochlora*, even when comparison is limited to topotypical specimens from New South Wales. They are fully as large as those of many of the Papuan islands and other tropical parts of the range of *chrysochlora*. Brasil based *disjuncta* on supposed size differences, but the difference in size between *sandwichensis* and *chrysochlora* is certainly not sufficient to justify an attempt to maintain an intermediate race between them. Brasil and others, perhaps influenced by Gould's name *longirostris*, have emphasized variation in bill length in this dove. Aside from slight, scarcely demonstrable differences correlated with variation in general size (of which wing length is the best indicator available) I have found no variation in bill length in the races studied. The difference in color between *sandwichensis* and *chrysochlora* is so slight that it was of no aid in allocating the few specimens available from New Caledonia and the Loyalty Islands, all of which are in rather poor plumage.

NOTES ON *GALLICOLUMBA STAIRI*

This ground dove belongs to a superspecies containing from west to east, the following species: *hoedti*, Wetar Island (north of Timor); *beccarii*, New Guinea, Bismarck Archipelago and Solomon Islands; *sanctaecrucis*, Santa Cruz Islands and Espiritu Santo Island, New Hebrides (specimen in British Museum, *fide* Mayr); *stairi*, central Polynesia; and *canifrons*, Palau Islands. Dr. Mayr has pointed out to me that *canifrons* is a member of this superspecies and not of the *jobiensis* group as he at first thought (1936, Amer. Mus. Novitates, No. 828, p. 4). *G. hoedti* is no more distinct from *beccarii* than is *canifrons*, and I see no reason to follow Sharpe in assigning it to a separate genus or subgenus as Peters has done (1937, Check-List, III, p. 137). The three species *beccarii*, *sanctaecrucis* and *stairi* are more closely related to each other than to *hoedti* or *canifrons* but are so distinct that after a general consideration of this genus it seems best to consider them species. The relationships of the rare *G. salamonis* are uncertain, but it is probably closer to the *jobiensis* group (only one specimen, an immature female, was seen).

G. b. beccarii exhibits striking sexual dimorphism in color. Males have a sharply defined light gray breast shield and the bend of the wing is deep red; females lack the red, and the shield is cinnamon and contrasts little with the general brownish tone of the plumage. In other races of *beccarii* the females have acquired a somewhat male-like, advanced type of plumage in which the breast shield is grayish, but not so light and contrasting as that of the male. In *Gallicolumba stairi*, the series collected by the Whitney Expedition reveals the interesting fact that this trend has continued and produced a female plumage which is indistinguishable from that of the adult male, though perhaps averaging a shade more olive and less brown on the back. More remarkable is the fact that a second type of female plumage of the retarded, feminine type also occurs in *stairi*. The latter has hitherto been considered the only female plumage of the species and is the one described in the "Catalogue of Birds" and elsewhere. The existence of the male type of plumage in females of *stairi* has been overlooked because of the rarity of this species in collections and the improbability of two types of female plumage existing. *G. stairi* seems to be the only dove or pigeon in which both advanced and retarded plumages occur in the same sex. Surprisingly, none of the specimens in our series is intermediate, and the type of plumage appearing in each female must be controlled by a mechanism operating on the "all or none" principle. The following numbers of females have the advanced, male type of coloration: 18 of 30 from Fiji, 6 of 6 from Tonga, 0 of 1 from Alofa Island. Sexual size dimorphism is greater in this species than in any other pigeon treated in this paper and permits the sexing of the collectors to be evaluated.

Eight of nine specimens from Samoa are of male type plumage. They are battered skins of "missionary" make and cannot be measured accurately enough to determine how many, if any, of the eight are females, especially since the normal measurements of the Samoan population are not known. Most are sexed as male, but perhaps only because this plumage was considered to be that of the male. The other Samoan skin is a female in the retarded type of plumage. Some related species such as *sanctaecrucis* are known from so few specimens that it is still possible, though improbable, that they have two types of female plumage also.

The normal juvenal plumage of the members of this superspecies is similar to the retarded female plumage but somewhat darker, and the back and wing feathers are tipped with cinnamon-brown. In most forms, for example, *G. b. beccarii*, this juvenal plumage is retained for a considerable period and full-grown males in this plumage or just molting over to adult plumage are common in collections. *G. stairi* is peculiar in that the juvenal plumage is largely suppressed. Two or three partly grown individuals with down still clinging to some of the feathers already had red feathers on the bend of the wing, and the breast shield was aquiring a white border. Such specimens have juvenal back feathers, but these too apparently are replaced by adult feathers much sooner than in related species. Evidence is insufficient to determine if females in the retarded type of plumage also assume adult plumage immediately upon leaving the nest, but presumably they do.

NOMENCLATURE.—Gray (1856, Proc. Zool. Soc. London, p. 7) described *Gallicolumba stairi* from a bird in the London Zoo; the specimen was later added to the British Museum collection. Concerning the origin of the type he wrote: "I suppose was brought from the Samoan or Navigators' Islands, as the British Museum was previously in possession of a skin given by the Rev. J.S tair as from that locality . . . ." Finsch (1872, Jour. f. Orn., XX, p. 49), without seeing the type and with very scanty material, concluded tentatively from the plate published by Gray that the type had come from the Tongas; he proposed names for both the Samoan and Fijian populations, should they prove to be distinct. Salvadori (1893, Cat. Birds, XXI, p. 596), after comparing Gray's type and plate with two Samoan specimens, concluded that Gray's name was based on a bird from Fiji or possibly Tonga. However, the two birds from Samoa which he

had for comparison must have been immature or abnormal for he said they differ from Fiji skins by the absence of the white border on the breast shield and gray on the occiput and nape. All of the eight Samoan birds in this plumage now available have both of these characters. At least one of the eight agrees better with Gray's plate than do most Fijian skins. Salvadori evidently found the type to agree with Stair's supposed Samoan bird, as he questioned the locality of the latter also and lists it under the Fiji form (p. 596).

We now know that the three populations of this species are so similar that it is impossible absolutely to identify the published plate with any of them. Salvadori's action was based on a misunderstanding of the characters of the Samoan form, and he did find the type to agree with what was apparently the only adult he had from Samoa. Under the circumstances the changing of the type locality designated by Gray appears to have been unjustified and I am using Samoa as the type locality of *stairi*. Dr. J. T. Zimmer has been kind enough to examine the evidence and reached the same conclusion. Re-comparison of the type with good specimens from Fiji and Samoa is needed.

Gallicolumba stairi stairi Gray

Caloenas (Phlegoenas) Stairi G. R. Gray, 1856, Proc. Zool. Soc. London, p. 7, Pl. cxv, probably from Samoa.

Phlegoenas samoënsis Finsch, 1872, Jour. f. Orn., XX, p. 50, Samoa.

Unfortunately the Whitney Expedition obtained only two specimens of this dove in Samoa, both immatures. We also have seven adults collected by Woodford in 1895 and another undated but more recent skin lent by the U. S. National Museum. All these specimens show evidence of "foxing," and most of them have the wing in molt. Specimens available for comparison from Tonga and Fiji were all collected more recently, so it is difficult to say to what extent the differences visible may be the result of age. It is significant that Finsch and especially Wiglesworth (1891, Aves Polynesiae, p. 57) found much the same characters in Samoan specimens which seem to be indicated in the present series, poor though it is. There would seem to be little doubt that the Samoan and Fijian populations are racially distinct, as would be expected in a land bird such as *Gallicolumba*, but the following diagnosis will undoubtedly be modified when good material of the present race becomes available.

Subspecific Characters.—Differs from the other race, *vitiensis*, as follows: size smaller, wing averaging about 8–10 mm. shorter in each sex; breast shield in male plumage lighter, more vinaceous, less brownish and with a narrower, less well-defined white border; under wing perhaps more extensively rufous; gray patch on back of head restricted to occiput and not extending onto upper neck; the single specimen in female plumage has the upper parts more brownish, less olive and greenish than in *vitiensis* (fading?).

Range.—Upolu and Savaii Ids., Samoa.

Wing.—Upolu: 148, 154, 154+. "Samoa": 143+, 150+. All these skins are sexed as males, but perhaps only because it was believed that this plumage is restricted to that sex. The one undoubted female is from Upolu and has the wing in very poor condition; perhaps its true length was about 145 mm.

Tail.—"♂": 84, 88, 88, 88, 91, 95.

Gallicolumba stairi vitiensis Finsch

Subspecific Characters.—Differs from *s. stairi* by being larger and by the color characters described above.

Type Locality.—Fiji.

Range.—Alofa Is. (subsp.?), Fiji Ids. (Yangasa cluster, Olorua, Aiwa, Tavutha, Vanua Mbalavu, Vatu Vara, Ngamea, Taviuni, Rambi, Kio, Vanua Levu, Koro, Makongai, Wakaya, Ovalau, Viti Levu, Mbenga), Tonga Ids. (Late, Nomukaiki, Levuka, Telekitonga, Tonumela, Hongatonga, Hongahapai, Kuakafa, Kao) and probably other islands in these groups. The only specimen from the rather isolated island of Alofa is a juvenal female which in size seems to agree best with this race, as would be expected on geographical premises.

Wing.—*Fiji:* Yangasa cluster: ♂ 166. Olorua: ♂ 160+, 162; ♀ 157. Aiwa: ♂ 163, 164, 167, 171; ♀ 152, 153, 153, 154, 155, 156. Tavutha: ♂ 163, 164. Vanua Mbalavu: ♂ 166, 166; ♀ 152. Vatu Vara: ♀ 152. Taviuni: ♂ 160. Rambi: ♂ 161; ♀ 155. Kio: ♀ 148. Koro: ♀ 148. Makongai: ♀ 149. Wakaya: ♂ 162+; ♀ 146. Ovalau: ♀ 143. Viti Levu: ♂ 161; ♀ 153. Mbenga: ♀ 147. *Tonga:* Late: ♂ 161. Nomukaiki: ♂ 163+. Hongatonga: ♂ 161+; ♀ 150+, 151. Hongahapai: ♂ 162. *Summary:* 15 ♂ 160–171 (163.8); 18 ♀ 143–157 (151.3).

Tail.—*Fiji:* Yangasa cluster: ♂ 108. Olorua: ♂ 107, 107; ♀ 104. Aiwa: ♂ 105,

106, 108, 108; ♀ 96, 96, 97, 98, 99. Tavutha: ♂ 107. Vanua Mbalavu: ♂ 104; ♀ 99. Vatu Vara: ♀ 99. Ngamea: ♂ 107 Taviuni: ♂ 102. Rambi: ♂ 104; ♀ 101. Vanua Levu: ♂ 104. Makongai: ♀ 98 Wakaya: ♂ 105; ♀ 93. Ovalau· ♀ 100. Viti Levu: ♂ 98, 103; ♀ 98. Mbenga: ♂ 107; ♀ 100. *Tonga:* Late: ♂ 105. Nomukaiki: ♂ 103. Telekitonga: ♀ 96. Hongatonga: ♂ 109; ♀ 97, 98, 98. Hongahapai: ♂ 105. *Summary:* 21 ♂ 98–109 (105.3); 18 ♀ 93–104 (98.2).

No differences could be found between Fijian and Tongan birds.