A REVIEW OF THE SPECIES *Anas castanea*

BY S. DILLON RIPLEY

THIS species has been a subject of controversy for many years. The question of whether male specimens from Australia breed in female as well as in nuptial plumage provoked a great deal of confusion culminating in the setting up of a new genus, *Virago* Newton (1871), based on the mistaken impression that the female of this species also possessed the tracheal *bulla ossea* characteristic of the male. The present review has been prompted by the feeling that a careful study of the specimens in the collections in this country (especially in the splendid Mathews Collection) might reveal some facts of interest about the distribution of these little-known birds.

My thanks are due to the authorities of the United States National Museum and the American Museum of Natural History for the loan of specimens in their collections. Dr. Ernst Mayr has generously permitted me to describe a new subspecies from the American Museum's Whitney Collection. To Dr. G. M. Allen, Mr. J. L. Peters and Mr. J. C. Greenway, Jr., of the Museum of Comparative Zoology, I owe a great deal for their kindness and cooperation in the preparation of this paper.

In the following discussion all measurements are in millimeters; the wing is measured pressed as flat as possible against the ruler; the culmen is measured from the tip of the nail to the point where the forehead feathers commence between the nasal ridges. By the term mandible, I refer to the lower (mandibular) half of the bill.

THE SPECIES *Anas castanea*

Within this species I have included six races formerly considered to belong to the species *castanea, gibberifrons* and *albogularis* (Peters, 1931). The distribution of the species extends from the Andaman Islands to New Zealand and includes most of the East Indian islands and Australia. The nearest relative seems to be *Anas bernieri,* a shy, rare little duck from Madagascar. I have not been able to dissect any specimens of *A. bernieri,* however, in order to determine whether that species also possesses the curious frontal-sinus enlargement of *castanea.* Simply from external appearances, it does not seem to have any particular swelling in that region. Presuming, nevertheless, that *bernieri,* on account of similar coloration, is related to *castanea,* this points to an Asiatic origin for these rather primitive-appearing ducks.

ANAS CASTANEA CASTANEA (Eyton)

Mareca castanea Eyton, Monogr. Anatidae, p. 119, pl. (19), 1838.
Virago castanea alexanderi Mathews, Austral Avian Record, 3: 56, 1916.

Description.—Adult male: head and neck dark iridescent green, sometimes with a few brownish feathers irregularly on the throat; mantle and back blackish, the feathers edged with chestnut; rump and tail black with an indistinct greenish gloss; breast and abdomen chestnut, the feathers of the lower breast, abdomen and belly with black subterminal spots; posterior part of the flanks white, connected across the vent by a narrow band of white, with irregular blackish vermiculations. The wings are dark brown, the speculum is iridescent purple with a central green band, bordered with brownish white. Iris crimson; bill lead gray; the anterior half of the mandible yellowish; feet olive gray to lead color.

Adult male (eclipse): a specimen (Mus. Comp. Zool. no. 13015) collected in February 1869, at Mongup, Western Australia, seems to be just beginning to assume nuptial plumage. The head and neck are gray-brown with streaks of new greenish feathers on the crown and malar region. The feathers of the back are dark brown with pale edges. The tail-feathers are brown with new blackish-brown iridescent feathers still in their sheaths. The breast consists of mixed feathers, some brown with pale edges, others chestnut. The under parts are more nearly uniform brownish. A few of the chestnut feathers have black subterminal spots just appearing, and there are a few vermiculated feathers in the vent and posterior flank region.

A male bird (U. S. Nat. Mus. no. 278784) collected on Kangaroo Island, January 24, 1920, seems to belong to this form and to be in total eclipse plumage (see female) for there is no trace of the nuptial plumage. In size it conforms very well with *castanea,* having a tail measurement of 94 mm., which is longer than in any specimen of *mathewsi.*

Another male (Amer. Mus. Nat. Hist. no. 732060) collected in New South Wales in November 1873, seems to have been very slow in attaining nuptial plumage for there are still a few eclipse feathers on the throat, back, rump and tail. This seems to be unusual, however, for there are specimens in full plumage from March through December with the eclipse apparently occurring in January and February.

Adult female: crown and nape dark blackish brown (sometimes greenish) edged with pale brown; back, rump and tail dark brown edged with pale brown; throat and neck whitish; breast and belly pale brown barred subterminally with dark brown; flanks and vent brown indistinctly edged with pale brown; wings, iris, bill and feet as in the male.

Measurements.—Male: wing, 204–231 (214.5) mm.; tail, 87.5–107 (93.3); tail-wing index, 40–48 (43) %; culmen, 39.5–42.5 (40.5). Female: wing, 197–209.5 (202.9); tail, 80–87.5 (84); tail-wing index, 40–42 (42) %; culmen, 37–41.5 (38.6).

Range.—South Australia, Tasmania (see Text-fig. 1).

Specimens examined.—Thirty-seven.

Discussion.—On the map (Text-fig. 1) I have shown all the localities at which undoubted specimens of this form have been secured. From this evidence it is apparent that *castanea* is limited to the southern parts of Australia where the combination of twenty inches or more

of rainfall plus a temperate climate with contrasting seasons, has apparently been favorable to a definite breeding season. As a result of this it is possible for the males to have a cycle of molts stimulating the assumption of a nuptial plumage. If the distribution of these birds has been correctly interpreted as spreading out from Asia, one may suppose that the original ancestor of *castanea* in temperate Asia had a nuptial plumage the genes for which have been carried in a repressed condition ever since. Given the proper stimulus, it has eventually been possible for a nuptial plumage to make a reappearance in the species. Mr. Delacour writes that it is his impression that males of *castanea* never go into full-eclipse plumage (in captivity). This is a point which should be settled by observation of birds in the field.

ANAS CASTANEA MATHEWSI Phillips

Anas gibberifrons mathewsi Phillips, A Nat. Hist. of the Ducks, 2: 266, 1923 (new name for *Nettion castaneum rogersi* Mathews, Austral Avian Record, 1: 86, 1912, preoccupied by *Anas superciliosa rogersi* Mathews).

Anas gracilis Buller, Ibis, (2) 5: 41, 1869.

Description.—Adult male: head, nape, back and tail dark brown edged with light buff; cheek-feathers grayish brown with a central darker streak; throat and neck pale buffy brown to white (worn); breast and under parts generally grayish to buffy brown with brown centers to the feathers; wing as in *castanea*. Iris crimson to red; feet pale gray to black; premaxilla black to bluish; mandible dark gray, distal half orange.

Female: colored as the male.

Measurements.—Male: wing, 194–209.5 (203.5) mm.; tail, 77.5–90 (85.5); tail-wing index, 40–43 (42) %; culmen, 36–41 (38.4). Female: wing, 193–203 (198); tail, 79–93 (85.5); tail-wing index, 40–46 (43) %; culmen, 34.5–39.5 (37).

Range.—Northern Australia (see Text-fig. 1), New Zealand, New Caledonia, New Guinea, Aru and Kei Islands.

Specimens examined.—Forty-one.

Discussion.—From the above measurements it will be seen that *mathewsi* may be distinguished from *castanea* on the basis of generally smaller proportions. Aside from this, I can find no constant characters of color or structure. It is interesting to note, however, that judging from the seventy-eight specimens of both forms examined, there do seem to be two distinct ranges occupied by the two forms as shown on the map (Text-fig. 1). A few recent records such as that of McMicking (1925), indicate that *mathewsi* may breed throughout New South Wales and thus overlap the range of *castanea,* but more careful field work is needed on the actual breeding ranges of the two forms.

The contrast between the plumages of these two forms is most

interesting and reminiscent of that described by Mayr (1940) for the eclipse plumage of *Lalage tricolor.* Here again is an instance of two closely related populations of a species in which speciation has occurred in an ecotypic manner, to use Turresson's term. It differs from ordinary ecotypic differentiation such as that described by Dice

TEXT-FIG. 1.—Map of Australia showing the localities at which the specimens examined were secured. An open ring shows a locality for *Anas c. castanea;* a black square marks a place at which *Anas c. mathewsi* was taken. The small number of localities on the map is explained by the fact that many of the specimens came from the same place (nine specimens of *mathewsi* from Normanton, northern Queensland, for example) while others were from unidentifiable localities or marked simply 'Melbourne market.'

(1939) for populations of the cactus mouse, *Peromyscus,* where soil color apparently affects coat color. In this case, the difference is presumably due to the fact that the gonads of the tropical and arid-range male *mathewsi* are in near-breeding condition the year round, for it apparently breeds at all seasons, particularly after heavy rain (Phillips, 1923). The result of this activity is that the male plumage becomes permanently suppressed, a condition somewhat akin to that

of the Sebright fowl described by Morgan (1919). That this condition is now genetic and not simply environmental is shown by the fact that the birds which have reached New Zealand are evidently *mathewsi* (Oliver, 1930). I have examined two specimens from New Zealand and can find no size or color differences to support the name *gracilis.*

The range of *mathewsi* in New Caledonia is still problematical as the records are very old (Verreaux and Des Murs, 1860). Recently Macmillan has collected on New Caledonia for the American Museum but failed to find this duck (Mayr in litt.).

Dr. A. L. Rand has very kindly shown me two specimens of this duck taken by him on the recent Indisch-Amerikaansche Expeditie to Netherlands New Guinea at Lake Habbema (altitude 3225 m.). In their measurements and coloration they agree exactly with Australian specimens of *mathewsi.*

A female of *mathewsi* from Toeal, Little Kei Islands (Amer. Mus. Nat. Hist. no. 732079) is small (wing, 193). However, its plumage, though worn, is still paler than that of *gibberifrons,* and it also lacks the prominent swelling of the frontals so characteristic of the latter form.

I have not seen any birds from the Aru Islands from whence they are recorded by Meyer and Wiglesworth (1898) but they presumably belong to this form.

Anas castanea remissa new subspecies

Type.—No. 224659, American Museum of Natural History, adult male, from Rennell Island, southern Solomon Islands; collected September 4, 1928, by Hannibal Hamlin.

Subspecific characters.—Differs from *mathewsi* by being much smaller; color of the breast, abdomen, flanks, belly and under tail-coverts darker, more buffy; the feathers of the under side of the neck with dark central streaklets.

From *gibberifrons* this race differs by having a smaller bill, by lacking the distension of the frontal sinuses and by the streaked appearance of the under side of the neck. The pale margins on the feathers of the back and the scapulars are paler than in September specimens of *gibberifrons* from Celebes.

The adult female differs as the male.

Measurements.—Male (type): wing, 186.5 mm.; tail, 79; tail-wing index, 42%; culmen, 33. A female measures: wing, 179.5; tail (molting), 74; culmen, 33.

Range.—Rennell Island, Solomon Islands.

Discussion.—This little duck is found on an island renowned for its endemic fauna including a distinct grebe and cormorant. Geographically its position is interesting as it is completely surrounded, though at some distance, by *mathewsi* found in New Guinea and New Caledonia. Mayr (1931) felt that *mathewsi* and *gibberifrons* were

overlapping in size and that these Rennell birds agreed with *gibberifrons*. He failed to note, however, the lack of development of the frontal sinuses which form such a distinctive character separating *mathewsi* and *remissa* from *gibberifrons*.

ANAS CASTANEA GIBBERIFRONS S. Müller

Anas (Mareca) gibberifrons S. Müller, Verh. Nat. Ges. Nederl. Land-en-Volkenk., p. 159, 1842.

Description.—Adult male: crown, nape, back and scapulars dark blackish brown, the feathers edged with buffy brown. Cheek-feathers buffy with central brown streaks; throat and neck pale buff; breast and under parts generally rich buffy brown with dark-brown centers to the feathers; wing as in *castanea*.

Iris crimson to brown, feet gray-blue to dark brown, bill lead-blue to grayish blue, distal half of mandible orange-brown.

Female: colored as the male.

Measurements.—Male: wing, 181–200.5 (190.8) mm.; tail, 78–91.5 (85); tail-wing index, 42–46 (45) %; culmen, 35–40.5 (38). Female: wing, 178–187 (182.4); tail, 75–86 (78.2); tail-wing index, 40–46 (43) %; culmen, 34–41 (36.5).

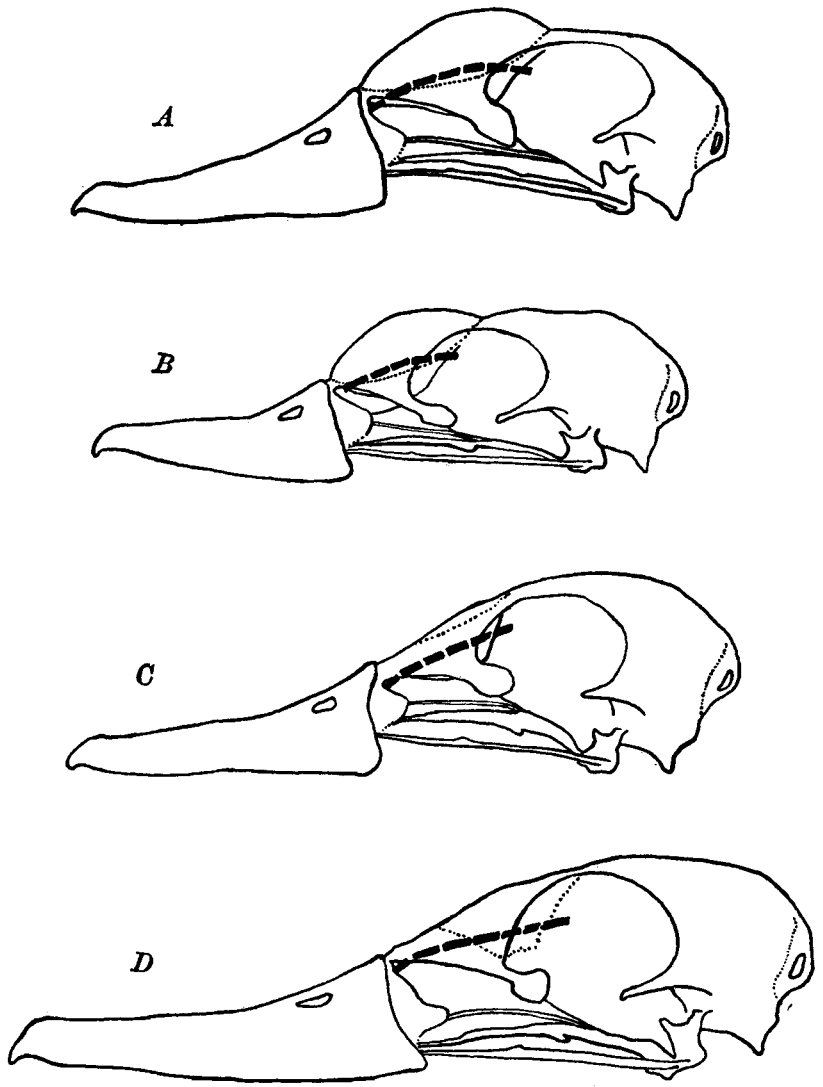
Range.—Java, Celebes, Sula Islands, Lesser Sunda Islands; Saleyer, Sumba, Flores, Timor and Wetar.

Specimens examined.—Thirty-two.

Discussion.—Aside from the smaller size and darker coloration of this form, the most striking character separating it from any of the preceding three subspecies is the curious enlargement of the frontal bones of the skull to form two frontal chambers or sinuses separated along the mid-line by a thin septum. In contrast to other ducks (*Anas boschas, A. acuta*) in which there are often septa between the lacrimals and the ventral process of the frontals and mesethmoid, tending to wall off the anterior part of the orbit, this development seems to occur entirely on the dorsal surface of the frontals. The resulting sinus is not only directed upward and outward, but serves to depress the frontal bones. This condition must arise very early in the embryological development of the duck as the ophthalmic branch of the fifth nerve instead of being deflected into a more ventral position, penetrates the frontal sinus by an antorbital foramen, passes along the floor of the sinus and out by another foramen in the anterior part of the sinus floor into the turbinal region (Text-fig. 2).

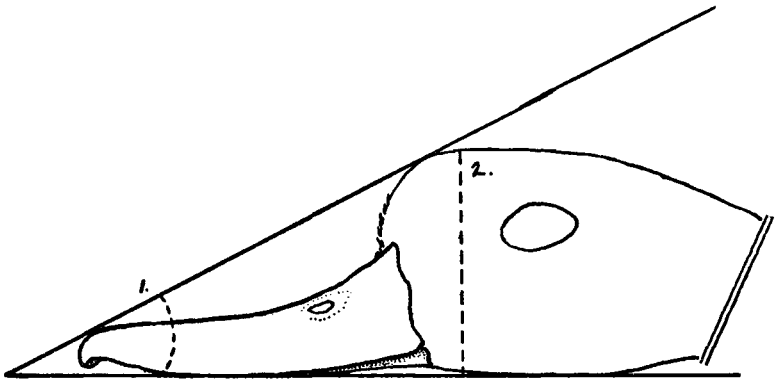
This sinus development is not by any means limited to males as Phillips (1923) suggests, but is present in females also as the figures show. A juvenal female (Mus. Comp. Zool. no. 270325) collected on Peleng Island in September 1938, has a pronounced frontal bulge.

In an attempt to express this character in terms of measurements, I have measured the angle between two lines, one running along the



TEXT-FIG. 2.—Skulls of (A) *Anas c. gibberifrons,* male, M. C. Z. 270,043; (B) *A. c. gibberifrons,* female, M. C. Z. 270,042; (C) *A. c. mathewsi,* male, M. C. Z. 170,010; and (D) *A. acuta,* M. C. Z. 2310, showing the striking development of the frontal-sinus area in A and B and its reduction in C to the area enclosed by dotted line. The typical condition in *Anas* is shown in D, in which the dotted line indicates an incomplete lacrimal-frontal septum. The heavy broken line follows the path through this region, of the ophthalmic branch of the fifth nerve.

ventral side of the mandible and the basicranial projection, the other from the nail of the bill along the frontals (Text-fig. 3). The size



TEXT-FIG. 3.—Outline to show method of measuring angle of forehead and depth of head.

of this angle is represented in Text-fig. 3 by the dotted line numbered 1. In order to check on this measurement I have also taken the distance in millimeters from the mandibular bone to the top of the frontal sinus as shown by the dotted line numbered 2. A list of the measurements follows:

Species	*Angle no. 1*	*Distance no. 2*
Anas c. castanea	♂ 20–25 (21.9) deg.	24–30 (27.6) mm.
	♀ 18–25 (21.4)	25–29 (27.3)
Anas c. mathewsi	♂ 20–25 (21.2)	23–29.5 (27.3)
	♀ 19–22 (20.1)	21.5–27.5 (24.8)
Anas c. remissa	♂ 22	22
	♀ 23	22
Anas c. gibberifrons	♂ 26–33.5 (29)	27–33.5 (29.5)
	♀ 29–30 (29.2)	26–30 (28.7)
Anas c. albogularis	♂ 22–24 (23)	25–28.5 (26.6)
	♀ 20, 23	22, 24
Anas c. leucopareus	♂ 23–28 (25)	29–31 (30)

From these measurements it will be seen that there is a well-marked difference between the development of the sinuses in *gibberifrons* and that in *mathewsi, remissa* or *castanea.* This condition is not only readily appreciable to the eye, but may be felt by running the thumb over the forehead area of the skins.

ANAS CASTANEA ALBOGULARIS (Hume)

Mareca albogularis Hume, Stray Feathers, 1: 303, 1873.

Description.—Adult male: above dark brown with brown edges to the feathers, cheeks uniform dark brown, a white eye-ring broader below, throat, neck and (in one male) the anterior nares whitish, rest of under parts as in *gibberifrons*. Iris reddish brown, legs and feet greenish blue to slate colored, bill slate colored, the distal half of the mandible "pink" (Hume).

Female: colored as the male except for a reduced eye-ring and lacking the whitish on the anterior nares.

Measurements.—Male: wing, 199–201 (200.2) mm.; tail, 78–79 (78.5); tail-wing index, 33, 34%; culmen, 34–36 (35). Female: wing, 197, 205.5; tail, molting; culmen, 34, 36.

Range.—Southern Andaman Islands.

Specimens examined.—Six.

Discussion.—This race differs from *gibberifrons* only in slightly larger size, darker color of the upper surface of the body, dark cheeks and the white ring around the eye. The frontal-sinus development is quite apparent, however. It is strange that *gibberifrons* has never been recorded with certainty from Sumatra. Whatever the reason for this, the isolation of the Andamans has resulted in the speciation of the Grey Teal resident there into two poorly marked races, characterized principally by their tendency to albinism.

ANAS CASTANEA LEUCOPAREUS (Fleming)

Polionetta albogularis leucopareus Fleming, Proc. Biol. Soc. Washington, 24: 215, 1911.

Description.—Adult male: differs from *albogularis* principally in the white nares, cheeks and post-ocular patches, and in the white ring around the neck.

The female is said to differ as the male.

Measurements.—Male: wing, 201, 204, 204.5 mm.; tail (molting), 81; tail-wing index, 40%; culmen, 35, 36, 36.

Range.—North Reef and Middle Andaman Islands, Andaman Islands.

Specimens examined.—Three males.

Discussion.—This race apparently differs from the preceding one by an increased amount of albinism on the head which has become fixed in a definite pattern. It is perhaps a questionable distinction but so long as it can be shown to be constant, will have to stand. There seems to be, in the three specimens measured, a slightly greater enlargement of the frontal sinuses than in *albogularis*.

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