Vol. 55, pp. 169–176 December 31, 1942

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

THE SPECIES *EURYSTOMUS ORIENTALIS.*

BY S. DILLON RIPLEY.[1]

"Dollar birds" are a striking and familiar component of the bird life of southeast Asia. Usually seen singly or in pairs, these bright blue rollers with their broad scarlet bills have a habit of perching high on the top of isolated trees in jungle clearings. At other times they may be seen hurtling over the forest, performing the aerial evolutions which have earned them one of their common names.

Actually little is known of the habits of these birds. Their nests have seldom been found, and their somewhat erratic migrations have taxed the understanding of most ornithologists who have studied them.

Aside from their unusual behavior, this is a difficult species taxonomically. There are few if any striking color or morphological differences between the various forms. Since Stresemann's revision (Novit. Zool., *xx*, 1913, p. 297), most workers have been inclined to pass over specimens of *orientalis* in their collections after a rather cursory identification.

Recently, during a speciation study of the bird fauna of the west Sumatran Islands, I have had to identify specimens of *orientalis* in the splendid Abbott collection at the United States National Museum. Careful study of these and other specimens in the Museum, as well as birds in the collection of the American Museum of Natural History in New York, inclines me to the belief that the facts in this case are rather different from those outlined by Stresemann (l. c.). However, I do believe also that in this case, the static study of museum specimens will never solve the very fluid problem of this wandering and erratic species. The fundamental biological problem of *Eurystomus orientalis* can only be properly interpreted by field studies and banding operations—work which it may be hoped will lie within the future scope of our great museums.

I am very grateful to Mr. H. G. Deignan for valuable comments on the

[1] Published by permission of the Secretary of the Smithsonian Institution.

zoogeography of North Thailand. Dr. Ernst Mayr has generously allowed me to look at specimens in the American Museum of Natural History, and Mr. James L. Peters has been most helpful on nomenclatorial matters.

In the following discussion, all measurements are in millimetres, the wing pressed flat against the ruler. The measurement listed as "bill height" refers to the distance from the ridge of the culmen to a point just posterior to the mandibular ramus. The wing-tip index is secured by measuring the difference between the longest and shortest primaries and dividing this by the wing length.

orientalis versus *calonyx*.

In his excellent review of this species (l. c., p. 298), Stresemann lists specimens under *orientalis orientalis* as occurring in the Greater Sunda islands and the Philippines. Under *orientalis calonyx*, he gives a range covering India, the Malay Peninsula, Thailand, Indo-China, and north in China to Manchuria. This distribution breaks down somewhat when he lists nearly a hundred specimens called *orientalis* ≷ *calonyx* from virtually every available locality.

As a result of this confusion of range, and due to the lack of any very well-defined characters by which the races may be separated, some recent writers on this area (Stuart Baker, Fauna of British India, Birds, *iv*. 1927, p. 228; Delacour et Jabouille, Les Oiseaux de l'Indochine Francais, *ii*, 1931, p. 298) have tended to feel that *calonyx* is insupportable. After examining one hundred sixty-one specimens of *orientalis* ≷ *calonyx*, I am inclined to feel that there is a well-defined northern breeding race of this species, characterized not only by the color of the primaries and tail, but also by a consistent difference in the wing-tail ratio and the wing tip index.

Unfortunately, as Mr. Peters has pointed out to me (in litt.), the name *calonyx* is inapplicable to this race. Originally spelled *calornyx*, it was a nomen nudum at its first appearance (Hodgson, Gray's Zool. Misc., 1844, p. 82). Later it was validated as *calonyx* by Sharpe (1890), but prior to this it had been cited in the synonymy of *E. orientalis* by G. R. Gray (1848). Thus *calonyx* cannot be used, and this northern race requires a new name.

Eurystomus orientalis abundus, nom. nov.

Type: ad ♂ (U. S. N. M. No. 276483) collected May 20, 1923, by Arthur deC. Sowerby at Nanking, China.

Diagnosis: from *orientalis* this race differs by having a pronounced dark blue wash on the primaries and secondaries. Characteristically in freshly-molted male specimens this blue wash extends along the outer webs of the primaries nearly to the ends of the feathers and is well marked on the inner webs also. Althouth this race averages only very slightly larger in size (wing average 192.7 compared to 188.3 for *orientalis* from the Malay Peninsula), there is a very marked difference in the wing tail ratio of *abundus*, 47–51% (49.6), as compared with that of *orientalis*

50–56% (53.1). There is also a constant difference in the wing-tip index of the two races—that of *abundus* being 35–38% (36.9), while in *orientalis* this index runs from 31–37% (33.8).

Measurements of type: wing 195, tail 95.5, wing-tail ratio 49%, wing-tip index 37%, bill height 13.

Range: India in northern Cachar, Nepal, upper Assam, and from north China to the lower Amur and east to Manchuria; in migration to India, the Malay Peninsula, Sumatra (December), Simalur (December), Indo-China, southern China, and Japan (Tsu Shima I., June).

From the figures quoted above it may be seen that *abundus* has a relatively shorter tail in proportion to its wing length than *o. orientalis*, and also a relatively more graduated wing indicating greater migratory habits. This is the bird which may be found from October to March wandering erratically in the southern half of its range.

In northern Thailand there is a breeding population of these birds. In habits and size they seem to agree with *abundus*, while in color they are more closely identified with *orientalis orientalis*. For this population I propose the name

Eurystomus orientalis deignani, subsp. nov.

Type: ad ♂ (U. S. N. M. No. 350027) collected April 22, 1936, by H. G. Deignan at Mu'ang Ngawp, N. Siam.

Diagnosis: from *orientalis* this race differs by having a shorter tail, wing-tail ratio 49–51% (50.1) as against 50–56% (53.1) for *orientalis*, and a more sharply graduated wing, wing-tip index 36–40% (36.7) as against 31–37% (33.8). The bill also is somewhat less deep, more thin and fine as in *abundus*. In color these birds resemble *orientalis* closely, differing only in the rather more blackish crown which presents more of a contrast with the color of the rest of the back.

From *abundus* these birds differ by lacking the pronounced dark blue wash on the outer webs of the primaries and secondaries and by having more of the brownish olive wash on the breast and sides of the neck. In *abundus* this area tends to be nearly concolorous with the abdomen and vent.

Measurements of type: wing 189, tail 94, wing-tail ratio 50% wing-tip index 36%, bill height 13.5.

Range: North Thailand east to Hin Lap, south to Raheng, in migration to Java, Sumatra, Nias, Borneo, and probably the Malay Peninsula.

Speculation on the origin of bird forms is not likely to be profitable, but in this case it is perhaps worth pointing out that the Himalayan upthrust left northern Thailand in a rather isolated position. Presumably then the basic *Eurystomus* stock arrived from the south where it already existed as typical *orientalis*. When speciation finally occurred, it took place along the morphological lines found in the highly migratory *abundus*. Specimens before me from the northern range of this bird are in breeding condition in March. A young male collected in July

resembles birds in similar plumage from southern Thailand but has a somewhat more blackish forehead. Birds from the southern winter range were collected in February (Borneo), March (Nias), and November (Java). I feel that it is this population which has caused the confusion about the status of *orientalis* and its races in the Malay area. As H. C. Robinson notes (Birds of the Malay Peninsula *I*, 1927, p. 92), "This form (*abundus*) is said to be distinguished by having more deep blue on the secondaries and tail feathers, and birds answering to the description certainly occur in the winter months, but intermediate specimens occur, and many ornithologists doubt the existence of the two forms." Presumably these intermediate specimens can be referred to *deignani*.

This race is named for Mr. H. G. Deignan of the United States National Museum, who has collected and studied the birds of Thailand so exhaustively.

Eurystomus orientalis orientalis (Linnaeus).

For a description of this form see Robinson (l. c., p. 91) or Sharpe (Cat. Birds Brit. Mus., *XVII*, 1892, p. 33).

Range: southern Himalayas, Bengal south to Madras, Assam, Burma, central and southern Thailand, Indo-China, Riu Kiu Is. (Yayeyama) south to the Malay States, Sumatra and its western islands, Borneo, Java, the Philippines (all months of the year), and in winter to Great Sanghir, northern Celebes, and Halmahera.

The records for the last mentioned islands are as follows: Great Sanghir (January). Celebes (December to March), Halmahera (September to December). I have yet to find any breeding records for these islands. Presumably, therefore, these birds are wanderers from the Philippines. The Halmahera specimens are three of those mentioned by Stressemann (l. c., 1913, p. 302) as *Eurystomus orientalis* subsp. They agree perfectly with the National Museum's large series from the Philippines. Their measurements are as follows: wing (two males, one sex undetermined) 180, 182, 193.5; tail 95, 95, 97; wing-tail ratio 49, 52, 53%; wing-tip index 35, 36, 37%; bill height 15, 16.

A single male specimen from Yayeyama in the Riu Kiu group (U. S. N. M. No. 335296) taken in February belongs to *orientalis* rather than *abundus*. It measures: wing 186.5, tail 103, wing-tail ratio 55%, wing-tip index 35.9%, bill height 13.5.

I have only seen one bird from Madras. This is a male in the Koelz collection (A. M. N. H. uncatalogued) collected in May. This bird measures: wing 186, tail 98, wing-tail ratio 52%, wing-tip index 38%, bill height 16.5. Except for the fact that the crown is rather blackish, it does not support Sharpe's original description of *laetior* (l. c., 1892, p. 36). In this specimen, however, the blue streaking on the throat is rather pronounced, extending down well onto the abdomen. Lacking further material, I feel it is impossible to settle the status of *laetior* at the present time.

A series of comparative measurements of the preceding three forms follows:

	WING	TAIL	WING TAIL RATIO
abundus ♂	185.5–198(192.7)	91.5–97.5(94.7)	48–51(49.6)%
abundus ♀	193–196 (194.1)	89.5–98.5(93.8)	47–50(48.7)
deignani ♂	189–193(191.3)	94–99 (97)	50–51(50.3)
deignani ♀	193, 194, 207	94, 95, 103	49, 50
orientalis ♂	174.5–193 (186.9)	93.5–106.6(100.1)	51–56(53.9)
orientalis ♀	172.5–200(186.5)	92–111(99.5)	50–55(53.8)

	WING TIP INDEX	BILL HEIGHT
abundus ♂	36–38(36.6)%	12–15(13.6)
abundus ♀	35–38(36.7)	12–14.5(13.2)
deignani ♂	36–40 (37)	13.5–15.5(14.6)
deignani ♀	36–37(36.5)	14, 14.5.
orientalis ♂	31–36(33.7)	13.5–17.5(15.8)
orientalis ♀	31–37(34)	14.5–17.5(15.8)

Eurystomus orientalis gigas Stresemann.

A single specimen from South Andaman (U. S. N. M. No. 178577) collected in January agrees with Stresemann's original description. It measures: wing 189.5, tail 106, wing-tail ratio 56%, wing-tip index 33, bill height 15.

Range: Rutland and South Andaman Is.

Eurystomus orientalis oberholseri Junge.

A female collected by Abbott in October agrees with Junge's description. It measures: wing 187.5, tail 103, wing-tail ratio 54% wing-tip index 30%, bill height 15.5.

Range: Simalur I., west of Sumatra.

Eurystomus orientalis azureus Gray.

This is an unusual form, differing from all other members of the species in being uniformly purplish blue all over, except for the typical pale bluish-white wing bar on the primaries. The crown is somewhat more blackish colored than the rest of the body. There are the usual bright blue streaklets on the throat found in all adult members of the species. The bill is longer and deeper than in any of the other forms.

Measurements: (one male, three sex undetermined) wing 204–212 (209), tail 111–117 (114), wing-tail ratio 54–55% (54.1), wing-tip index 31–33% (31.7), bill height, 18, 20.

Range: Batjan (Batchian) I., Moluccas.

Eurystomus orientalis waigiouensis Elliot.

This form is somewhat similar to *o. orientalis* but larger and brighter. The scapulars and wing coverts are rather more bluish, less infused with green. On the lower parts also, this form is brighter and somewhat deeper in color, approaching Sevres blue. The wings and tail are much

more extensively washed with purplish blue. The bill has a dark brown tip.

Measurements: ♂, wing 199–210 (204), tail 101–111 (107.4), wing-tail ratio 50–54% (52.4), wing-tip index 32–34% (33.7), bill height 15–17 (16.4); ♀, wing 205.5, 207, tail 107, 108.5, wing-tail ratio 51, 52%, wing-tip index 33, 34%, bill height 18.

Range: Misool, Batanta, Waigeu, all New Guinea, Japan, Dampier (Karkar), Rook (Umboi), Witu, Trobriand, D'Entrecasteaux and Louisiade Islands.

This is a relatively non-migratory from which has spread out to most of the neighboring New Guinea islands. Immature birds were collected on Dampier Island in February and March. A male with slightly enlarged gonads is recorded from Port Moresby in January. There seem to be no distinct size or color differences between east and west New Guinea birds.

Eurystomus orientalis crassirostris Sclater

For remarks on the taxonomic status and color characters of this form see Mayr (Amer. Mus. Novit. No. 709, 1934, p. 6). In mature specimens there is a strong contrast between the blackish crown and the light bluish green back which sets this race apart from all the others. Young birds (April to July) are darker, more uniform brownish green on the back not showing this strong color contrast. In this race the bill is clear orange red not tipped with brown.

Measurements: ♂, wing 198–203 (200.9), tail 113–118 (115.8), wing tail ratio 56–58% (57), wing-tip index 28–33% (31.9), bill height 17–19 (17.7); ♀, wing 198–208 (203.6), tail 111–121 (116.2), wing-tail ratio 56–58% (57), wing-tip index 31–35% (33).

Range: New Britain, New Hanover, and St. Matthias Islands, probably on New Ireland. An immature specimen was taken on St. Matthias in July, and a male with enlarged gonads is recorded from New Britain in October. Hartert (Novit. Zool. XXXIII, 1926, p. 177) records this race from Witu and Unia Ids. but I feel that Witu birds belong to *waigionensis*. I have seen no specimens from Unia.

Eurystomus orientalis solomensis Sharpe

Like the preceding two forms, this is a brighter bird than *o. orientalis*, as well as being larger. Occasional specimens, however, as a male from New Georgia (A. M. N. H. No. 643454) are almost indistinguishable in color, except for the bill, which is always clear orange-red. The tail in this race is longer than in any other member of the species.

Measurements: ♂, wing 190–204 (196.6), tail 124–137.5 (130.1), wing-tail ratio 63–67% (65.7), wing-tip index 28–33% (31), bill height 16–18 (17.4); ♀, wing 183–199 (194), tail 124–131 (128), wing-tail ratio 63–69% (66.2), wing-tip index 29–31% (30.1), bill height 17.5.

Range: Feni and probably Nissan, and Solomon Islands. This species has not been recorded from Rennell.

The following races belong to a sub-group within the species *Eurystomus orientalis* characterized by rather pale washed out plumage. Above these birds are rather dusty brownish on the crown and shoulders instead of blackish. The lower back scapulars and tail coverts are smokey greenish blue. The lower surface is paler, more cerulean than in the preceding forms.

Eurystomus orientalis connectens Stresemann.

This form is intermediate between the darker forms of *orientalis* and the paler *pacificus* of Australia. Like that race, it presents a rather washed out appearance.

Measurements: ♂, wing 188–201 (195.6), tail 93–100 (96.8), wing-tail ratio 47–50% (49), wing-tip index 33–38% (36), bill height 13.5–16 (14.5); ♀, wing 193.5–202 (198.5), tail 94.5–102 (98.3), wing-tail ratio 48–52% (50), wing-tip index 35–37% (36), bill height 13.5–15 (14.2).

Range: Celebes, Peling and Tukang Besi Island, and the lesser Sunda Islands from Lombok to the Tanimbar group, wandering to east Borneo.

It is unfortunate that Stresemann picked Moa, so near Australia, for the type locality of this race. Moa birds are nearer in color to *pacificus* than are those from further west. Indeed there is a continuous cline from Celebes to Moa. A Makassar bird (A. M. N. H. No. 298952) is very dark, particularly on the crown, sides of the head, and breast. Birds from Jampea, Lombok, and Sumba also are dark; but as specimens are examined all along the line of the lesser Sundas, it becomes evident that there is no single break or gap in the chain of specimens.

In his Birds of Celebes, Stresemann (Journ. für Ornith., *88*, pt. 3, 1940, p. 422) lists *Eurystomus o. orientalis* as occurring in the northern part of the island and *connectens* in the southern part. The National Museum has specimens of *connectens* from Parigi and Gimpoe in the north central part of the island and also an immature female from Batoe Hangoes Baroe taken in June. The latter locality is near Manado at the extreme northern tip of the island. On the other hand, the three specimens of *o. orientalis* from Likoepang and Toli Toli in the Manado Peninsula of the island were all taken in December and January. I note also that the specimens of this latter race listed by Stressmann are from Rurukan Kumarsot and Paleleh, localities in which Heinrich was collecting from October through March (l. c., pt. 1, p. 14). Thus these birds could all have been wanderers from the Philippines, with which population they agree exactly in size and color.

Somewhat the same situation applies to the specimens of *connectens* taken by Raven in Borneo. Two males taken in June and August on the Mahakpam river and at Tandjong Seglu on the east central peninsula which projects towards the north coast of Celebes, are new records for Borneo; but due to the season when they were collected, they are presumably post breeding birds. From specimens of typical *connectens* from Celebes these birds do not seem to differ. The wings of both specimens are slightly longer (200.5, 201) than in the Celebes birds

(190–199.5, ave. 196.8), but this is well within the range of the subspecies as a whole.

Young were taken on Dammar in December and on Timor in January (Stein coll.).

Eurystomus orientalis pacificus (Latham)

This race differs from *connectens* by being paler, the upper surface presenting a more washed out appearance, the lower parts being more cerulean.

Measurements: ♂, wing 190–200.5 (196.5), tail 89.5–101 (95), wing-tail ratio 46–50% (48.2), wing-tip index 34–39% (37.8), bill height 13–15 (14.1); ♀, wing 192.5–198.5 (195.6), tail 92–96 (93.9), wing-tail ratio 47–49% (48), wing-tip index 36–37% (36.4), bill height 13–15 (13.9).

Range: Australia migrating north from April to November to the Kei islands, Ceram, New Guinea and adjacent islands. Wandering individuals have even been taken in New Zealand.

It is noteworthy that the figures for the wing-tail ratio and the wing-tip index for this migratory race compare very favorably with those for the two northern races, *abundus* and *deignani*.

Mathews named a race *bravi* from west Australia (Novit. Zool., *xviii*, 1912, p. 285) based on the character of being paler below than east Australian birds. I have compared specimens from east and west Australia without being able to observe this as a constant character.

Conclusion: *Eurystomus orientalis* is a widely scattered species with eleven races. Seven of these show a tendency to erratic post-nuptial wandering which has taken the form of definite migration in the three most northern and most southern forms, *abundus*, *deignani* and *pacificus*.

The four races from the Moluccas to the Solomons, *azureus*, *waigiouensis*, *crassirostris*, and *solomonensis*, apparently show little tendency to wander, perhaps due to the combination of their geographical isolation and the climatic stability of their environment. Those races having the most migratory habits have a corresponding adjustment in the wing-tail ratio and the wing-tip index.