The Philippine Expedition: Reptiles

The review of the systematics of the recent crocodilians by Wermuth (1953) calls attention to the extremely close relationship of the Philippine *Crocodylus mindorensis* with *Crocodylus novae-guineae*. *Crocodylus mindorensis* is now known to be widely distributed in the Philippine Islands; Mertens (1943) found specimens in the collections of the Senckenberg Museum from Luzon, Mindanao, and Jolo. This wide range of *mindorensis* is paralleled by that of *novae-guineae*, which was first known from the Sepik River, on the northern watershed, but has now been reported from Papua by myself (1932), with field observations by Wilfred Neill (1946) from marshes north of Port Moresby. The New Guinean species has not yet been traced into the western part of the island.

There appears no longer to be any question of the distinctness of either *mindorensis* or *novae-guineae* from the wide-ranging *porosus*. In its over-all range, from India to the Solomon Islands, *Crocodylus porosus* broadly overlaps the ranges of the two fresh-water forms, but it appears to be sharply isolated from them, where they meet, by its predilection for salt and brackish water, for larger bodies of fresh water, and for more open situations. Its failure to develop distinguishable races is associated with its adjustment to salt water and its capacity for swimming freely from island to island. It has reached the New Hebrides and the Fijis, to the east of its normal range, but it is not known to be permanently established in either archipelago.

In the course of routine identification of the reptiles collected by the Hoogstraal Philippine expedition of 1946 for Chicago Natural History Museum, Dr. Robert F. Inger found that five specimens of *porosus* and seven of *mindorensis* had been added to the crocodilian material available for study in our collections. These are skins or alcoholic juveniles, and Dr. Inger has called my attention to a striking external difference between these species that does not seem to have been previously discerned, namely, the much larger and hence fewer ventral scutes of *mindorensis*.

A total of seven specimens of skins or juveniles of *Crocodylus porosus* is at hand. These are CNHM nos. 14346, 52363, 52364,

52754, 52755, and 95826, from Mindanao, together with no. 63280, from Sandakan, North Borneo. Counting the transverse rows of enlarged ventral scutes from axilla to a point opposite the anterior face of the thigh, these number from 23 to 30, averaging 26. Corresponding ventral counts are available from nine specimens of *mindorensis:* Nos. 11135 (type) and 11137 (paratype), from Lake Naujan, Mindoro; nos. 52357, 52358, 52752, and 52753, from Mindanao; and nos. 52360, 52361, and 52362, from Busuanga. In this series the transverse rows of ventrals are 16 in three, 17 in three, and 18 in three, averaging, therefore, 17. Thus the two forms are sharply distinguished by this character, and Busuanga is added to the range of the species *mindorensis.*

Examination of the two juvenile specimens of *Crocodylus novaeguineae* obtained by myself in 1929 from the marshes along the Sepik River shows that these have ventrals respectively in 17 and 18 rows, so that the close relation of *mindorensis* and *novae-guineae* is confirmed, together with the distinction of both from *porosus.* I had quite failed to note this character in my redescription of *novaeguineae* in 1932, when I had no skins or alcoholic specimens of *porosus* available.

Through the courtesy of my valued colleague C. M. Bogert, two specimens of *Crocodylus johnstoni,*[1] in alcohol, recently obtained by the American Museum of Natural History, have been made available for my examination. These are AMNH no. 69336, from Archer River, Wenlock Crossing, and no. 69337, from five miles north of Laura, Queensland, Australia. Two specimens in Chicago Natural History Museum, no. 16162, from Normanton, and no. 18301, from Saxby River, Queensland, are also available, the latter the dry skin and skull of a specimen measuring 1463 mm. in life, the former a juvenile individual measuring only 232 mm., the smallest on record.

Examination of these four specimens of the Australian species shows that their ventral plates correspond in number to those of *novae-guineae* and *mindorensis,* so that *johnstoni,* which has the same ecological relations with *porosus* as the other two species, seems clearly to belong in a series *mindorensis–novae-guineae–johnstoni.* I have commented on this series and on possible additions to it from

[1] There seems to be no good reason for maintaining the erroneous spelling *johnsoni* of the original description. It seems evident that the dropping of the "t" in the original description was a typographical error (Krefft, 1873; Gray, 1874). I have not thought the further emendation to *johnstonei* (Wermuth, 1953) essential.

Celebes and Borneo, in describing *mindorensis* (1935). The transverse series of ventral plates in the four specimens number 17 in two and 18 in two.

The two American Museum specimens of the Australian species, with lengths of 453 and 523 mm., fall between the two in Chicago Natural History Museum. They have relatively broad snouts as compared with illustrations of mature *johnstoni,* and I have accordingly examined them for further evidence as to the change in proportionate length of snout with growth in this species. Measuring the width and length of the snout at and from the anterior border of the orbits in the four specimens, a regular increase in slenderness is discernible with increase in size:

Specimen number	Length of snout	Width of snout	W/L
CNHM 16162	16 mm.	12 mm.	0.75
AMNH 69336	43	22	0.51
AMNH 69337	50	25	0.50
CNHM 18301	172	62	0.36

This agrees essentially with the changes in this proportion with age demonstrated by Longman (1925), but extends his maximum width of 0.58 (in his specimen of 295 mm. total length) to 0.75 in our smallest specimen, which is perhaps a hatchling. The least proportionate width of snout in *johnstoni* (33 per cent) is found in the Queensland Museum specimen no. J. 4280, whose length may be estimated at 1570 mm., a little longer than our no. 18301. Beyond this total length, the proportionate length of the snout (and of the skull) is likely to decrease, as shown in Dr. Longman's report. The relative width of the snout in the two juvenile specimens of *novaeguineae,* CNHM nos. 13965 and 14080, respectively 345 mm. and 605 mm. in length, is 0.66 and 0.57. It is much wider, therefore, than in adults, and also distinctly wider than in juveniles of *johnstoni* of the same length, though at hatching there may be no difference in this respect between the two species.

In the series *mindorensis–novae-guineae–johnstoni, johnstoni* has diverged somewhat farther from the common ancestor than have the Philippine and New Guinean forms. Wermuth (1953, p. 421) finds it extremely difficult to distinguish *mindorensis* from *novae-guineae* by means of skull characters, and for this reason has made the two forms subspecies (of *novae-guineae*). It appears that he was dependent on my figures of the skulls of *mindorensis* and *novae-guineae;* with four Philippine skulls before me, and skulls of comparable size

of the New Guinean form as well, I find no difficulty in distinguishing the two forms quite positively. Wermuth himself discerned that the suture of the maxillaries on the palate is longer than that of the premaxillaries in *novae-guineae* and shorter in *mindorensis*. This distinction holds in all the specimens I have been able to examine. It is a reflection of the greater slenderness of the snout in *novae-guineae*.

Similarly associated with the form of the snout is the anterior extent of the palatal fenestra, to the middle of the ninth tooth in *novae-guineae* and well beyond it in *mindorensis*. The anterior branches of the palatines are more obtuse and more laterally directed in *novae-guineae* than in *mindorensis*. While certainly in agreement with Wermuth that these two forms are very closely related, I prefer to give emphasis to their broad geographic separation by retaining both at the species level. *Crocodylus mindorensis*, *C. novae-guineae*, and *C. johnstoni* form an Artenkreis rather than a series of subspecies. It is significant that *novae-guineae*, though morphologically closer to *mindorensis*, tends somewhat toward *johnstoni* in slenderness of snout.

It may not be easy to distinguish juvenile specimens of *johnstoni* from juveniles of *novae-guineae;* the specimens at hand, however, have the individual scutes of the transverse occipital series much closer together in *johnstoni* than in *novae-guineae*, while with the meager evidence available, *johnstoni* and *novae-guineae* agree in having four occipitals (in the single main row), whereas *mindorensis* has six (Schmidt, 1935), as confirmed in the present series of nine specimens. If this character proves valid in larger series, *mindorensis* thus becomes more readily distinguished from *novae-guineae* in external characters than was supposed by Wermuth.

A tentative key for the distinction of juvenile specimens of the four species in question would therefore be as follows:

A. Occipital scutes absent, ventrals from axilla to anterior face of hind limb 23–28 ..... *porosus*
(India to Solomon Islands)

AA. Occipital scutes present, ventrals from axilla to anterior face of hind limb 16–18.

B. Occipital scutes 6, widely spaced ..... *mindorensis*
(the Philippine Islands)

BB. Occipital scutes normally 4.

C. Space between occipital scutes, especially on the midline, greater than the width of a scute ..... *novae-guineae*
(New Guinea)

CC. Space between occipital scutes less than the width of a scute, or scutes juxtaposed ..... *johnstoni*
(northern Australia)

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