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A NEW CROCODILE FROM CEYLON

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Reprinted from

THE Ceylon JOURNAL OF SCIENCE, SECTION B, ZOOLOGY AND GEOLOGY

VOLUME XIX, PART 3

February 18, 1938

pp. 272-285, p. 3

L.A.S. 25/10/78

A New Crocodile from Ceylon

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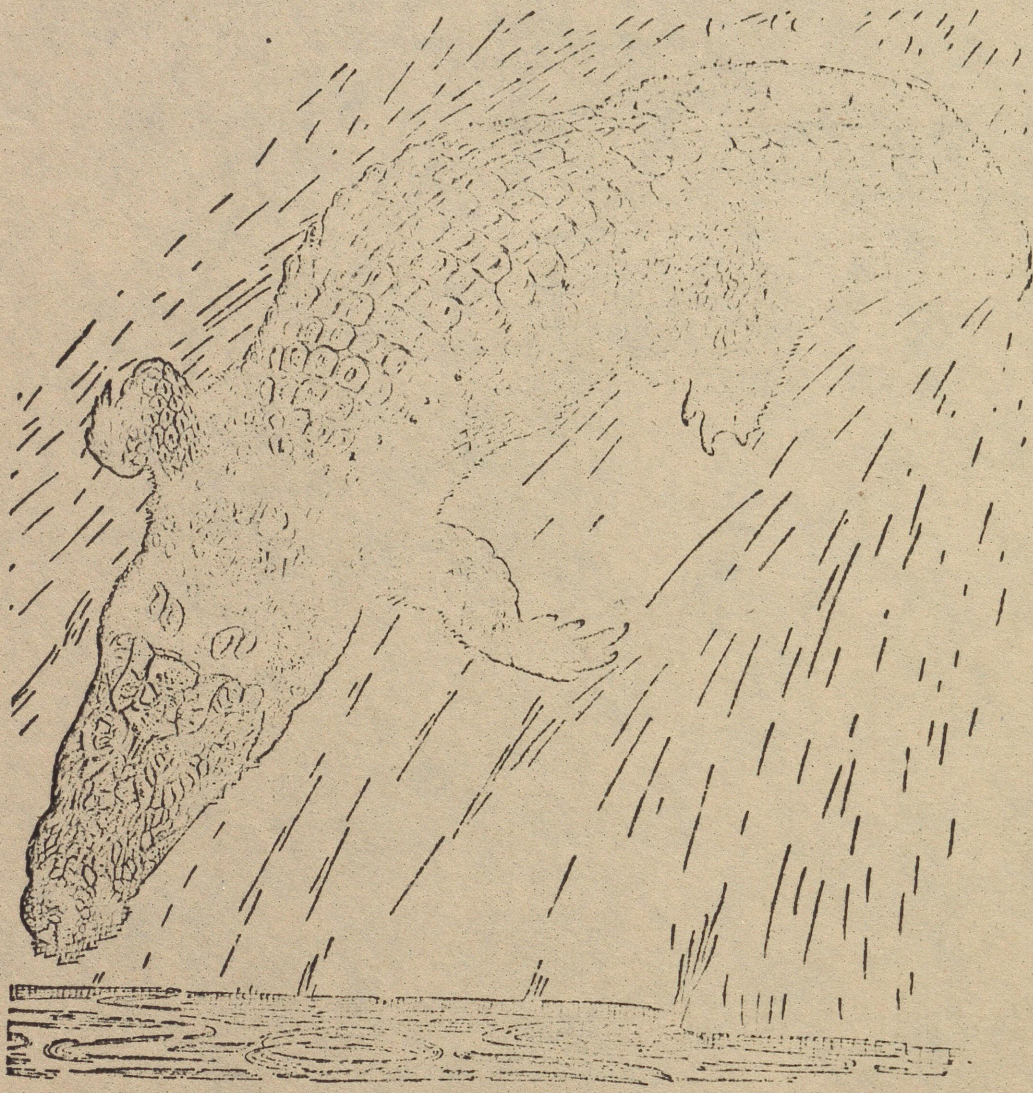
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(With Two Plates and Three Text Figures.)

Early herpetologists of the British Museum, who had only two imperfect skulls of the Ceylon swamp crocodile on which to base their conclusions, considered this animal identical with the Indian swamp crocodile *Crocodilus palustris* Lesson. Comparison of the two forms now reveals distinct subspecific differences and as this examination is by no means exhaustive, it is possible that the two animals deserve separate specific rank; more particularly as the specific differences between many crocodiles, which, in the case of smaller animals, be considered by some to be of almost negligible importance. For instance the Madagascan crocodile *C. robustus* Vell. et Grandid. differs chiefly from the Indian *C. palustris* in its larger number of dorsal scutes and more completely webbed hind toes (Poulenger 1892, p. 296). The occurrence of several fossil broad-snouted crocodylians in Australia (Longman 1927) and the prevalence of living broad-snouted forms in the southern hemisphere suggests that the modern broad-snouted forms spread northward from southern ancestors; this view is supported by the higher specialization of the more northern Indian swamp crocodile as indicated by the scutes of this form being fewer and more differentiated than in the Ceylon species.

According to Poulenger (1890, p. 5) the Indian swamp crocodile has the dorsal scutes arranged 'in 4 (rarely 6) longitudinal series, those of the two median rows being usually considerably broader than long'. This description, while appropriate for the Indian species, is not entirely

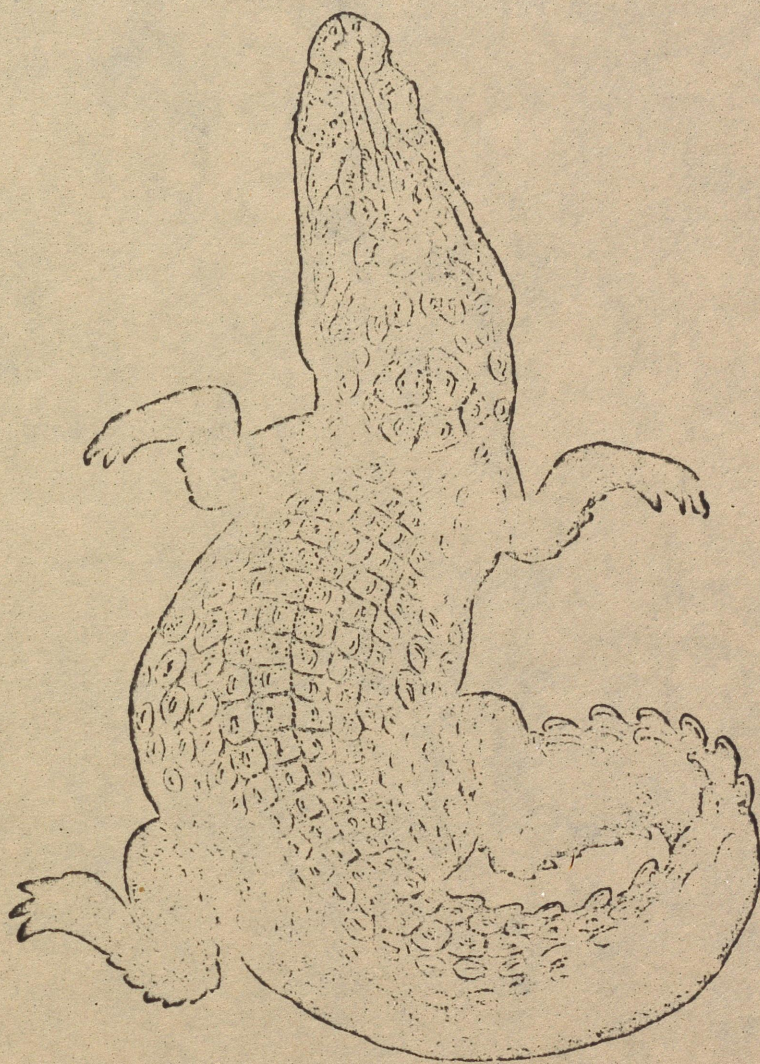
¹ Gray (1874) is of the opinion that one Madagascan crocodile is a distinct living species. Vossler & (1927) states that when in Madagascar he saw one crocodile and heard of another which was short bodied and inhabited jungle rivers. Fairbairn (1919) considers *C. robustus* to be only valid as a fossil species. The skull he figures is rather similar to the skull of the Ceylon swamp crocodile.



P. Deraniyagala del.

Fig. 1. *Crocodylus palustris kiribula* sub-sp. nov. emerging from burrow. Micigama $\times \frac{1}{2}$

applicable to the Ceylon form, which usually possesses more transverse dorsal rows with six contiguous scutes than with four, while the scutes are subequal, with only an occasional one enlarged (Fig. 1). It is also



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Fig. 2. Osteoderms of adult *Crocodylus p. kimbula* from Viravila S. P. $\times \frac{1}{10}$

known that the Indian form never attacks man and lives 'usually if not always above the limits of salt water' (Smith 1931, p. 48), whereas the Ceylon form frequently attacks man and is not uncommon in salt lagoons (Deraniyagala 1930, p. 92). Consequently it is now suggested that the swamp crocodile of Ceylon be separated from the Indian as a subspecies and named *Limbula*, from the Sinhalese signifying 'crocodile'.

The following table shows the number of transverse dorsal rows comprising 4, 6, 7 or 8 contiguous scutes in each crocodile examined from Ceylon and India. The rows which were counted as far back as the last above the hips, usually numbered 17 but 16 and 18 also occurred.

TABLE I. Dorsal rows with contiguous Scutes¹.

India ²				Ceylon			
<i>Crocodylus palustris palustris</i> Lesson.				<i>Crocodylus palustris limbula</i> sub-sp. nov.			
Serial No. of Crocodile	4 Scuted rows	6 Scuted rows	7 Scuted rows	Serial No. of Crocodile	4 Scuted rows	6 Scuted rows	7 Scuted rows
1	10	2	0	(1)	(6)	(4)	0
2	0	0	0	2	5	8	3
(3)	(6)	(6)	0	3	4	9	2
4	11	1	0	4	4	6	1
5	9	0	0	5	4	8	2
6	5	4	0	6	6	5	1
7	8	1	0	7	4	11	0
8	9	1	0	8	3	6	2
9	7	3	0	9	5	5	2
10	7	5	0	10	4	8	0
11	11	2	0	11	3	9	0
12	7	3	0	12	5	10	0
13	7	3	1	13	6	2	1
14	7	3	0	14	3	9	0
15	12	0	0	15	4	10	0
16	10	3	0	16	4	11	0
17	9	0	0	17	5	10	0
18	8	3	0	18	4	7	1
				19	4	8	0
				(20)	(8)	(6)	0
				21	5	6	1
				22	8	6	1
				23	4	12	0
				24	4	11	0

¹ Numbers within brackets denote individuals which are more or less intermediate or resemble those of the other subspecies.

² Specimens 14 to 19 were examined at Madras, Prince of Wales and Baroda Museums.

The graphs (Fig. 3) represent the numerical ratio of four scuted transverse rows to six scuted rows in eighteen Indian and twenty-three Ceylon crocodiles. The ratio for each individual is plotted directly above that animal's serial number. The latter in this instance is in ascending order of ratio and differs entirely from the serial numbers of the table I. The ratios are given in the following table.

TABLE II Scute ratios

Serial No.	Indian	Ceylon	Serial No.	Indian	Ceylon
1	1.0	0.33	13	8.0	0.5
2	1.25	0.33	14	9	0.5
3	1.4	0.36	15	9	0.5
4	1.5	0.36	16	9	0.57
5	1.75	0.36	17	11	0.71
6	2.23	0.36	18	12	0.71
7	2.33	0.37	19	—	1.0
8	2.33	0.4	20	—	1.1
9	2.63	0.4	21	—	1.33
10	3.33	0.45	22	—	1.5
11	5.0	0.5	23	—	1.5
12	5.5	0.5			

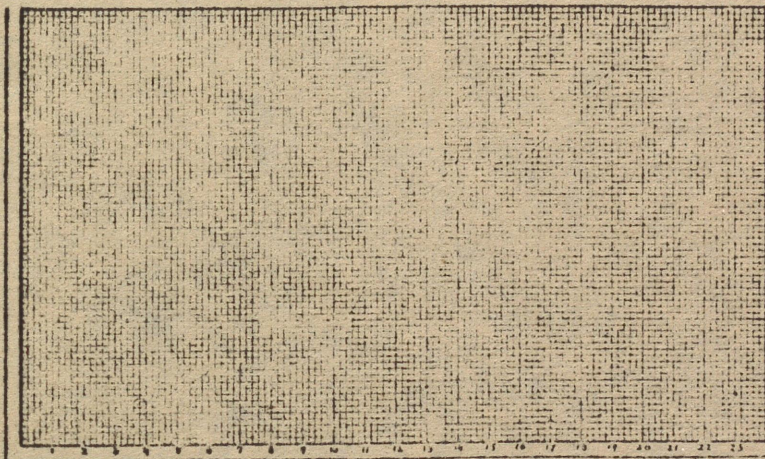


Fig. 3. Ratio of 4 to 6 scuted transverse dorsal rows. *C. p. palustris* continuous line *C. p. kimbula* broken line

Features which usually distinguish the Indian and Ceylon swamp crocodiles are as follows:—

A. *Indian swamp crocodile.*

- (1) More transverse dorsal rows with four contiguous scutes than with six; rows with seven are rare.

- (2) Two median longitudinal rows of conspicuously widened dorsal scutes (Plate XXXII, Fig. 2).
- (3) No strongly enlarged ventral collar of scales (Plate XXXIII, Fig. 2).
- (4) Lives usually, if not always above the limits of salt water (Smith 1931).

B. *Ceylon swamp crocodile*.

- (1) More transverse dorsal rows with six contiguous scutes than with four rows with seven not uncommon and occasionally a row with eight.
- (2) Dorsal scutes subequal; only a few isolated ones enlarged (Fig. 1).
- (3) A ventral collar of scales which are usually about twice as deep as the surrounding scales (Plate XXXIII, Fig. 1).
- (4) Not uncommon in salt water (Deraniyagala 1930).

Genus *Crocodylus*

Crocodylus Gronov 1763. *Zoophyl. fasc. 1*, p. 10
Crocodylus Laurenti 1763. *Syn. Rept.* p. 53 (type *niloticus*)

Seventeen to nineteen upper and fifteen lower teeth on each side, fourth mandibular tooth fits into a notch in upper jaw. Nasal aperture undivided. Two pairs of temporal openings. Splenial bones do not enter symphysis. Osteoderms dorsal, carinate, juxtaposed, with some eutured; as numerous as the dorsal scutes, and in four or more longitudinal series.

Crocodylus palustris limbata sub-sp. nov.

- Crocodylus palustris* Lesson 1821 in *Delang Voy., Ind. Or. Zool.*, p. 225 (type loc. Ganges)
 Kelsart, 1853. *Prod. Faunae Zeylanicae* p. 163
 Tennent, 1861. *Nat. Hist. Ceylon*, pp. 224, 225
 Gunther, 1864. *Rept. Brit. Ind.* p. 61, pl. 8
 Annandale, 1919. *Rec. Ind. Mus.* VIII, p. 29
 Smith, 1931. *Fauna Brit. Ind.* I, p. 47
Crocodylus palustris Deraniyagala, 1920. *Ceylon J. Sci.* (B), XVI, pl. XIV
Crocodylus bombifrons Gray, 1844. *Cat. Tort. Croc., etc.*, p. 59 (type loc. India; Brit. Mus.)
 Kelsart, 1853. *Prod. Faunae Zeylanicae* p. 164
Crocodylus trigonops Gray, 1844. *Cat. Tort. Croc., etc.*, p. 62 (type loc. India; Brit. Mus.)
Crocodylus vulgaris var. *indicus* Gray 1831. *Syn. Rept.* p. 53 (nom. nud.)

Sinhalese names: Heli Kimbala, Ala Kimbala, Ali Kimbala.

Snout widens with age; its basal width is contained 1.3—1.5 in its length. A short ridge at times extends from anterior angle of each eye along snout for an orbit length or less. Premaxillary teeth 5, sometimes 4, maxillary teeth 14, mandibular teeth 15. Postoccipital scutes well developed, 4 sometimes 6. Nuchal in two rows, the first of 4 to 6 scutes in a crescentic row, the second of 2. Sometimes a well developed row of 6-8 prenuchal scutes between postoccipital and nuchala. Dorsal scutes subequal, an occasional one widened noticeably; they commence as two longitudinal contiguous series and rows increase to as many as eight posteriorly; usually 5 to 6 rows with their osteoderms sutured together in a series of 16-18 usually 17 transverse rows. About 35 large scutes and scales round body at eighth transverse dorsal row. Caudal crest becomes unicarinate from behind the thirty-fourth transverse row of dorsal scales. Cnemial fringe developed, toes three quarter webbed. Ventrally an enlarged collar of scales bordered anteriorly and posteriorly by scales only half as long. The two median scales of the collar usually partially separated from one another by an anterior and posterior scale. Skull with premaxillo-maxillary suture comparatively straight or feebly wavy. Pelatine bones sometimes do not project beyond the palatal vacuities; supratemporal fenestra rather circular, sometimes triangular, well developed, with bony rim and separated from the orbit by a wide postorbital bone. Mandibular symphysis ends at level of fourth tooth; the splenial ends under the sixth tooth. Animal attains to over 4 m. in length.

Colors. Dorsally a drab olive-green with a large A shaped dark mark near shoulders, followed by about three or four alternate broad, dark brown or black bands across body and nine to twelve on tail. Large oval spots on sides and limbs. Ventrally white with traces of brown cross bands, especially on throat.

Type. An adolescent, 127 cm. long, in the Colombo Museum.

Reproduction. Eggs about 6 to 25 hard-shelled eggs which vary in size and number according to the animal and range from 60 x 37 mm. to 63 x 53 mm. They are buried in the sand away from mud. Eggs removed from the original nest hatched in about three months.

Distribution. Found all over the low country of Ceylon, prefers slow-flowing or sedentary water. Not uncommon in salt lagoons, e.g., at Elephant Pass, Tumblegam, Mulhattivu and along the lagoons of

Paratypes in
Headband.

Could be (no. 12)
an adolescent

the south. Common at Mirigama (about 500 ft.) and at Kokare Vila¹. It is a gregarious form and often excavates burrows in the bank. During droughts it aestivates either in such a burrow or with others under rocks, deep in the jungle.

I wish to express my indebtedness to Mr. H. W. Parker of the British Museum for his kindness in sending me information on the collection of Ceylon crocodiles in his charge, and also to Dr. S. L. Hora of the Indian Museum, Calcutta, for enabling me to examine 13 embryos and young of the Indian swamp crocodile.

I am also indebted to the following gentlemen who very kindly helped me with specimens:—Mr. A. E. Christoffelaz of the Ceylon Civil Service, Ratamahatmayas L. B. Nugawela and J. H. Illangankilake, Messrs. J. R. P. Perera and R. D. Banduranayake and Dr. F. E. Pieris, Trade Commissioner.

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EXPLANATION OF PLATES.

PLATE XXXII.

Fig. 1.—*Crocodylus palustris kimbula* esp. nov. × $\frac{1}{15}$ (from Nikaveratiya) dorsal view

Fig. 2.—*Crocodylus palustris palustris* × $\frac{1}{15}$ dorsal view

PLATE XXXIII.

Fig. 1.—*Crocodylus palustris kimbula* esp. nov. $\frac{1}{15}$ ventral view showing collar

Fig. 2.—*Crocodylus palustris palustris* × $\frac{1}{15}$ ventral view showing collar

¹A lake 19 miles from the sea with an unusually high percentage of magnesium and calcium salts.