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V. THE TORTOISES OF CHOTA NAGPUR.

By N. ANNANDALE, *D.Sc., F.A.S.B., Superintendent, Indian Museum.*

(Plates v-vi).

The Chelonia, and more particularly the terrestrial tortoises of Chota Nagpur, the territory that lies between the Ganges and Orissa in the interior of the north-eastern part of the Indian Peninsula, have considerable interest of a geographical kind, for they appear to differ from those of the Ganges valley and to resemble those of northern Assam. In other words, this valley now separates the terrestrial Chelonian fauna of North-Eastern India into two distinct and widely parted sections, one inhabiting the wooded hills of the interior of the northern Peninsular area, the other found in northern Assam, where the jungle is even denser and has more of an "equatorial" character. No terrestrial tortoise of any species has hitherto been found either in the lower part of the Gangetic valley nor, so far as is precisely known,¹ in the country between it and the Himalayas. More detailed information, however, is badly needed as to the westward range in Assam and possibly northern Bengal of those tortoises that inhabit the foothills north of the Brahmaputra on the one hand, and the hills of Central India (to use the term in a geographical rather than a political sense) on the other.

As I believe that the collection of Indian Chelonia now in the Indian Museum, brought together largely by the exertions of Blyth, Theobald and John Anderson, is very much more nearly complete than any collection elsewhere, I have based the following notes upon it. They are confessedly of a tentative nature and are published largely in the hope of attracting attention to our ignorance and thereby appealing to naturalists throughout India to assist, by contributing specimens and information, in the preparation of a full revision of the Indian Chelonia. This work I have had in hand for nearly eight years; not only have constant interruptions occurred, but I have found it extraordinarily difficult to obtain specimens of many of the species. Large series of all but a few very common forms are still necessary, and the fact that our collection is so large makes it the more imperative to render it still more complete.

¹ Anderson was informed by Major Kinloch that the latter had found a living tortoise in the Jalpaiguri district that agreed with a figure of *Testudo elongata* (Anat. Zool. Res. Yunnan. p. 712, 1879). (See also foot-note on p. 74.)

I have to thank Dr. J. R. Henderson of the Madras Museum, Mr. N. B. Kinnear of the Bombay Natural History Society and Mr. B. L. Chaudhuri of the Indian Museum for assistance in preparing this paper.

Family TESTUDINIDAE.

Genus *Geoemyda*, Gray.

- Geoemyda*, Gray, *Proc. Zool. Soc.*, 1834, p. 100; Boulenger, *Cat. Chel.*, p. 135 (1889), *Fauna Ind.*, p. 23 (1890) and *Fauna Mal. Pen.*, p. 16 (1912); Stejneger, *Proc. Biol. Soc. Washington*, XV, p. 257 (1902) and *U.S. Nat. Mus. Bull.*, 58, p. 500 (1907); Siebenrock, "Synopsis der rezenten Schildkroten," *Zool. Jahrb. Suppl.* 10, Heft 3, p. 495 (1909); Henderson, *Rec. Ind. Mus.*, VII, p. 217 (1912).
- Nicoria*, Gray, *Cat. Sh. Rept.*, I, p. 17 (1855); Boulenger, *Cat. Chel.*, p. 129 and *Fauna Ind.*, p. 26; Annandale, *Journ. As. Soc. Bengal*, 1906, p. 205.
- Chaibassia*, Theobald, *Cat. Rept. Ind.*, p. 6 (1876); Anderson, *Anat. Zool. Res. Yunnan*, p. 718 (1879).
- Heosemys*, Stejneger, *Proc. Biol. Soc. Washington*, XV, p. 258; Siebenrock, *Zool. Jahrb. Suppl.* 10, Heft 3, p. 506.

The genus *Geoemyda* was originally described in 1834 by Gray, who designated as its type-species Gmelin's *Testudo spengleri*. Ten years later the same author described another new (or supposed new) genus, for which he coined the name *Nicoria*, again with *T. spengleri* as type-species. Mr. Boulenger in all his more important works has used the generic name *Geoemyda* for the little group of species that includes Gray's *Emys spinosa*, and has accepted the later name *Nicoria* for the group typified by *T. spengleri*; but Dr. Stejneger has pointed out, as is doubtless true in the strict letter of the law of priority, that this course is inadmissible and has relegated to *Geoemyda*, *T. spengleri* and its allies, inventing a new generic name (*Heosemys*) for the *Emys spinosa* group. This change has been accepted by Dr. Siebenrock in his valuable "Synopsis der rezenten Schildkroten" and also by Dr. J. R. Henderson in his description of a new Indian species recently published in these "Records." Mr. Boulenger's books are of such fundamental importance to all students of herpetology that I had proposed to follow his lead. The discovery, however, of a new species exactly intermediate between the two so-called genera and of certain anatomical facts in connection with described forms, renders it unnecessary to adopt either course, and I am forced to combine the two groups under the generic term *Geoemyda*, which is undoubtedly the older of the two names.

Between the groups *Nicoria* and *Geoemyda*, to use the terms in the sense adopted in the "Fauna," there was, at the time that work was written, every reason to believe, as indeed there still is

so far as published statements go, that a valid difference existed in the skull, *viz.* the presence or absence of a temporal arch. Two factors are concerned in the formation of this arch, the ossification of the quadrato-jugal and the production of a backwardly-directed (postorbital) process of the orbital ring in the formation of which both the postfrontal and the jugal bones take a part. If the arch is complete it is formed by a dovetailing of the forward process of the quadrato-jugal and the backward process of these two bones.

In the three species of *Geoemyda* (*s.s.*) (*i.e.* of *Heosemys*, Stejneger) it is probable that the temporal arch is always absent, the quadrato-jugal being absent or vestigial and the postorbital process of the postfrontal and jugal short and blunt. In one skull of Blyth's *Geoemyda tricarinata* (pl. vi, fig. 6*b*) from Assam the same condition occurs. This skull was removed from the head of a specimen preserved in spirit and only a very thin, almost membranous cartilage was found in the place of the quadrato-jugal. In two other skulls of the same species, including that of the type from Chota Nagpur (pl. vi, fig. 6*a*), there is a short postorbital process and the quadrato-jugal, although distinctly ossified, is very delicate and slender and barely meets it. In many skulls of the typical form and of both the races *thermalis* and *edeniana* of "*Nicoria*" *trijuga* the arch, although quite complete, is extremely delicate, being at any rate no thicker than the lower posterior part of the orbital ring. But in some skulls of these races the arch is as stout as any part of that ring: apparently it is always complete. It is also complete in the type-skull of *N. trijuga coronata*, but its condition much more closely resembles that found in the two skulls of *G. tricarinata* in which it is ossified. In the two skulls of the new species *Geoemyda indopeninsularis* as yet examined the postorbital process is well developed; but there is no quadrato-jugal. There is thus a distinct arch, but it is incomplete.

These facts leave, in my opinion, no course but to amalgamate the genera *Nicoria* and *Geoemyda* under the latter name; for I can find no real generic difference between the shells of species assigned to one group or the other.

A more difficult question is, Should Blyth's genus *Chaibassia* be recognized as distinct? The single species included in this genus exhibits considerable variation in skull-characters, but differs from all other Oriental species that can be assigned to *Geoemyda* (except the recently described *G. sylvatica*) in the vestigial nature of the digital webs and in the approximation of the hind feet to the type characteristic of the genus *Testudo* and its allies: it and *G. sylvatica* are true land-tortoises, whereas the other Asiatic species are amphibious. The American forms, however, most closely related to the Oriental "*Nicoriae*" show great specific variation in respect to the webbing of the fingers and toes. Until it has been possible to compare large series of specimens from the two continents, I think, therefore, that it is as well not to revive *Chaibassia* as a distinct genus.

The following key should make it possible to distinguish the Indian and Burmese species of the genus formed by joining together *Gcoemyda* (s.s.), *Nicoria* and *Chaibassia*.

- I. Species with flattened feet and distinctly webbed fingers and toes.
1. Carapace tricarinate.¹ Posterior orbital process elongate and slender. (Anterior margin of shell smooth).
 - A. Second vertebral shield considerably more than half as wide as first costal shield; quadrato-jugal ossified .. *G. trijuga.*
 - B. Second vertebral shield a little more than half as wide as first costal shield; quadrato-jugal absent *G. indopeninsularis.*
 2. Carapace with a single median carina. No temporal arch.
 - A. Anterior margin of shell serrated; second vertebral shield much broader than long, at least as broad as second costal shield *G. spinosa.*
 - B. Anterior margin of shell smooth; second vertebral shield not much broader than long, not as broad as second costal.
 - a. Vertebral region arched or tectiform in cross-section in the adult; the whole carapace flattened in the young *G. grandis.*
 - b. Vertebral region flattened .. *G. depressa.*
- II. Digital webs vestigial, hind feet more or less club-shaped. (Carapace tricarinate).
1. Upper jaw distinctly hooked; carapace flattened as a whole . *G. sylvatica.*
 2. Upper jaw distinctly notched; carapace domed *G. tricarinata.*

As can be seen from the key, the Indian and Burmese species fall readily into three groups, which perhaps may be ultimately recognized as subgenera.

- I. Amphibious species with a tricarinate carapace, fully webbed digits and a temporal arch, which, however, may be incomplete, = *Nicoria*. Gray.

¹ In the carapace of aged specimens the three keels may be almost completely obliterated

2. Amphibious species with a unicarinate carapace, with webbed digits but without a temporal arch, = *Geoemyda*, Boulenger (Gray), = *Heosemys*, Stejneger.
3. Terrestrial species with a tricarinate carapace, with the digits hardly webbed and the hind feet club-shaped; the temporal arch present or absent, = *Chaibassia*, Theobald.

The only other Oriental species [*G. spengleri* (Gmelin)] belongs to the first of these groups. There is some doubt as to the limits of its range, but it is supposed to be distributed over an area extending from Sumatra to Japan. The Indian species of this group have their head-quarters in India south of the Indo-Gangetic plain, but a race of one of them is found in Burma. Those of the second group are Burmese and in two out of three instances also occur in the Malay Peninsula. One of these two species is also found in Siam and Indo-China, the other in Sumatra and Borneo. The species of the third group are found in the Indian Peninsula and in Assam. A fossil form allied to them but perhaps specifically distinct is described by Lydekker from the Pliocene of the Siwalik Hills under the name *Nicoria tricarinata* var. *sivalensis* (*Journ. As. Soc. Bengal*, 1889, p. 333, fig. 2).

The American species assigned to *Nicoria* by Mr. Boulenger, and to *Geoemyda* (s.s.) by some recent writers, differ from the Oriental ones in having only a single keel on the carapace and at the same time possessing a complete bony temporal arch.

Geoemyda trijuga (Schweigg.).

1. *Forma typica*

Testudo trijuga, Schweigg., *Prodromus*, p. 41 (1814); Boulenger (*Nicoria*), *Cat. Chel. Brit. Mus.*, p. 121 and *Fauna Brit. Ind. Rept.*, p. 27; Siebenrock (*Geoemyda*), *Synops. Schildkroten*, p. 495.

Emys trijuga var. *madrassetana*, Anderson, *Anat. Zool. Res. Yunnan*, p. 729.

The descriptions given by Boulenger and by Siebenrock serve for the ready recognition of the species. I propose merely to lay stress on sub-specific characters, on which the large series of specimens at my disposal makes it possible to cast further light.

Shell.—Carapace broadly oval, usually of a warm brown colour, but sometimes nearly black, not more than about 22 cm. long in a straight line, moderately depressed, distinctly flattened on the dorsal surface in adults (as well as young) of both sexes; keels sometimes yellowish. Plastron moderately concave in the adult male, brown or blackish, sometimes with a yellowish longitudinal streak on each side.

Head of young dull olivaceous with yellowish and greenish streaks and veins (never very conspicuous) on the dorsal and

lateral surfaces: of adult much duller with small yellowish spots on the posterior part. Iris white.

Geographical distribution.—Common in the east-central parts of the Madras Presidency and found at an altitude of at least 3000 ft. on the Mysore Plateau. Also recorded (? correctly) from Chota Nagpur, from Poona and from the Jhelum canal in the Punjab. The exact limits of the range are unknown. Recently introduced into Calcutta, but not indigenous to the Gangetic delta.

Habits.—The Madras Pond-tortoise is mainly aquatic and vegetarian in habits. Individuals released in a pond in Calcutta left the water at night and made their way upstairs in a house near the edge.

2. Race *thermalis* (Lesson).

Emys thermalis, Lesson, *Cent. Zool.*, p. 86, pl. xxix (1830); Boulenger (*Nicoria trijuga* var. *thermalis*), *Cat.*, p. 122 and *Fauna*, p. 27; Siebenrock (*Geoemyda trijuga thermalis*), *Synops.*, p. 496; Robinson (*Nicoria trijuga*), *Quart. Journ. Micro. Sci.*, LV, p. 742 (1910).

Shell a little broader and distinctly flatter, in old individuals of both sexes, than in the *forma typica*, also larger (up to 26 cm. long) and as a rule darker.

Head black with conspicuous orange or orange-red spots and streaks scattered assymmetrically on the dorsal, lateral and ventral surfaces: spots and streaks less conspicuous in the adult than in the young but never absent. Iris (? always) chocolate.

Geographical distribution.—Ceylon (plains and hill-country up to at least 1600 ft.) and the district of Ramnad on the Indian shore of the Gulf of Manaar; also (probably introduced) in the Maldives and the Chagos Archipelago.

Habits.—The tortoises of this race exhibit remarkable individual variation in habits. In Ceylon they are abundant in ponds, sunning themselves, sometimes two or three deep, on stones and logs that project from the surface of the water. If disturbed they dive immediately and swim along beneath the surface. At night they are frequently found in ditches and among wet grass. In the lake at Kandy they frequent the mouths of drains that open into the lake. But, as Miss Muriel Robertson has noted, some individuals are much more terrestrial in their habits than others. In Ramnad I found both young and half-grown tortoises in the shade of xerophytic plants growing in the sand a long way from water. Mr. T. Southwell tells me that he has dissected many specimens in Ceylon and has never found remains of any but vegetable food in their stomachs.

3. Race *coronata* (Anderson).

Emys trijuga var. *coronata*, Anderson, *Anat. Zool. Res. Yunnan*, p. 729; Siebenrock (*Geoemyda trijuga coronata*), *Synops.*, p. 496; Henderson (*Geoemyda trijuga* var. *coronata*), *Rec. Ind. Mus.*, VII, p. 218 (1912).

Shell uniform black, otherwise probably as in the *forma typica*, but perhaps smaller.

Head black, a great part of the dorsal and lateral surfaces being occupied by a broad V-shaped pale yellow mark the point of which is directed backwards on the occiput; the tympanum and the surrounding skin black.

Geographical distribution.—Only known from the southern parts of the Malabar Zone (Travancore and Cochin) on the western side of the Western Ghats. Northern limits of range unknown.

Habits.—Henderson states that this race is aquatic in its habits.

Type (skeleton). Rept. Ind. Mus. No. 1012 (♀).

The type-specimen of this race is a skeleton, which could hardly be distinguished from one of the typical form. There is a large example in spirit in the British Museum, labelled *thermalis*. So far as colouration is concerned, this is perhaps the most easily recognized of the races of *N. trijuga*.

4. Race *edeniana* (Theobald).

Melanochelys edeniana, Theobald, *Cat. Rept. Brit. Mus.*, p. 12 (1876); Boulenger (*Nicoria trijuga* var. *edeniana*), *Cat. Chel. Brit. Mus.*, p. 123 and *Fauna*, p. 28; Siebenrock (*Geoemyda trijuga edeniana*), *Synops.*, p. 496.

Emys trijuga var. *burmana*, Anderson, *Anat. Zool. Res. Yunnan*, p. 723, pls. lvii and lviii.

Nicoria trijuga var. *edeniana*, Annandale (*partim*), *Journ. As. Soc. Bengal*, 1906, p. 205.

Shell black in the adult, with (except in very old individuals) conspicuous yellow keels on the carapace and lateral stripes on the plastron, in the young brown and less conspicuously marked. In very old shells in which the surface of the epidermal shields is worn, the colours are dull and inconspicuous. *The carapace is not known to exceed 29 cm. in length in a straight line.* It is not quite fully ossified when 19 cm. long. In the adult it is more strongly arched and deeper than in any of the races yet discussed and this is more conspicuously the case in the female than in the male, but the plastron of the male is only slightly concave.

Head.—“The head of the male above is nearly uniform brown, darkest on the upper surface over the nose, and destitute of any markings. In some females, the upper surface of the head is reticulated with olive-brown and orange-yellow An orange spot on the mandible below the angle of the mouth, leading interruptedly to the tympanum.” (Anderson).

Geographical distribution.—Upper Burma, Arrakan (hills and coast), N. Tenasserim. There is a stuffed specimen in the Indian Museum labelled “Assam,” but it is not quite typical, having the second vertebral shield much broader than usual: the skull is not present. Possibly it may represent a distinct race or species.

Habits.—Anderson states that this race feeds on water-plants, more particularly on *Vallisneria*.

Types (skeletons). Rept. Ind. Mus. Nos. 1369, 2589, 1010-11, 1097 and 830.

The same specimens form the types of Theobald's *Melanochelys edeniana* and of Anderson's *Emys trijuga* var. *burmana*. Apparently the latter name had priority in manuscript, and Anderson refused to resign it. Both in the British Museum "Catalogue" and in the "Fauna" there is an error as to the dimensions of this race. Mr. Boulenger informs me that the largest specimen in the British Museum has a carapace 29 cm. long by direct measurement. The largest carapace in our collection is 27.5 cm. long. It is that of an adult not yet aged, but two slightly smaller carapaces have the lines of growth on the epidermal scales completely obliterated and evidently belonged to very old tortoises. There is no specimen on record larger than the one in the British Museum. In a shell 19 cm. long the foramina between the costal and the marginal bones are not completely closed, as they are in one 19.7 cm. long. They have completely disappeared in much smaller shells of the other races.

In examining a large series of skulls of the different races of *G. trijuga* it does not seem possible to find any distinctive racial character, except that skulls of adult individuals of *edeniana* and *thermalis* are larger than those of the typical form, as might be expected from the greater size of the whole animal. The thickness of the bone that forms the temporal arch varies considerably; sometimes it is no thicker than that of the lower posterior part of the orbital framework, sometimes it is nearly twice as thick. In some of our older specimens of young skulls the arch appears to be incomplete, owing to the falling away of the quadrato-jugal, which is never firmly ankylosed to the tympanic frame except in old individuals. In such cases, however, it is always possible to detect on the outer margin of the framework a slight projection above the point which had originally corresponded with the antero-superior limit of the missing bone.

The geographical distribution of the species as a whole is a somewhat discontinuous one, extending all over Peninsular India south of the Indo-Gangetic plain and perhaps penetrating into that plain in the north-west, but not including the valley of the Ganges, although it does include the greater part of Burma. It is a little doubtful whether any race occurs in Chota Nagpur, in which *G. indopeninsularis* may replace *G. trijuga*, but Anderson states that the typical form occurs there.

Specimens in the Indian Museum.

I. GEOEMYDA TRIJUGA MADRASPATANA (ANDERSON)
(=*forma typica*).

831 (15b. A.S.B.), ♀	Madras.	Madras Museum.
(stuffed).		
1008-9, ♀ ♀ (skeletons)	„	„ „

40-1; 53, ♂ ♀ (spirit)	Madras	Madras Museum.
16723, ♀ (spirit)	Madras (town).	Dr. J. R. Henderson.
16722 ♂ (skeleton)	„ „	„

Nos. 831, 1008-9, 40-1 and 53 are co-types of *Emys trijuga* var. *madraspatana*, Anderson.

2. GEOEMYDA TRIJUGA THERMALIS (Lesson).

1400-4; 1389-91; 1357-63,	} ♂ ♂, ♀ ♀ (skeletons) Ceylon.	} Dr. Kelaart; Dr. J. Ander- son.
1382; 1384-5; 1638; 2906;		
1348; 1399; 1395; 832;		
933; 1373-4.		
18; 20-36; 54-69; 637.	♂ ♂, ♀ ♀, juv. (spirit)	Dr. J. An- derson.
	Ceylon.	
16691, ♂ juv. (spirit).	Anuradhapura, Ceylon.	Dr. N. Annan- dale.
16692, ♀ „ „	Kandy Lake, Ceylon; 1600 ft.	„
15435-8, ♂ ♀ juv. „	Mandapam, Ramnad, S.E. India.	„

3. GEOEMYDA TRIJUGA CORONATA (Anderson).

15534, ♀ (skeleton)	Travancore.	First Prince of Travancore.
17018, ♀ (spirit)	Chalakuudi, Cochin.	Dr. J. R. Hen- derson.

No. 15534 is the type of *Emys trijuga* var. *coronata*, Anderson.

4. GEOEMYDA TRIJUGA EDENIANA (Theobald).

1369, 2589, 1010-11,	♂ ♂ ♀ ♀ (skeletons)	Hon. A. Eden.
1018.	Burma.	
1097, (skull)	„	„
830 (15a. A.S.B.) ♀	Arrakan hills.	Dr. W. T. Blan- ford.
(shell)		
17112, ♂ (shell)	No history.	
178, ♀ (stuffed)	Assam.	Major Sladen.

Nos. 1369, 2589, 1010-11, 1018, 1097 and 830 are apparently all co-types both of *Melanochelys edeniana*, Theobald and of *Emys trijuga* var. *burmana*, Anderson.

Geoemyda indopeninsularis, sp. nov.

Nicoria trijuga var. *edeniana*, Annandale (*partim*), *Journ. As. Soc. Bengal*, 1906, p. 205.

Carapace dark brown or blackish without markings except for some yellowish blotches at the axilla and groin, relatively deep, flattened on the vertical region in the male and in the young female, strongly arched in the aged female, with three longitudinal keels which (except the median keel in its posterior half) become obscure in adult tortoises. Nuchal small, much longer than broad; first

vertebral shield at least as long as broad, octagonal, with a distinct notch in its posterior margin (which is the shortest), about half as broad as the first costal; second vertebral shield similar in shape and proportions but sometimes shorter; third vertebral shorter than either of the first two; fourth and fifth broader than long; fifth as broad as fourth costal; two caudals, the notch between them obscurely indicated. Posterior margin of shell smooth, somewhat retroverted, especially in the female; anterior margin smooth, barely retroverted in either sex. Lower part of marginal shields on the bridge very deep and approaching the vertical.

Plastron brown with paler margins, deeply concave in the male; the anterior lobe considerably, the posterior lobe distinctly shorter than the bridge; posterior notch deeply angulate; anterior extremity truncate. Epidermal shields in the following order of length: humerals, pectorals, anals, abdominals, gulars. Plastron firmly united by bone to the carapace, with axillar and inguinal buttresses as in *G. trijuga*. Axillary and (sometimes) inguinal shields present.

Head longer than tail, dark olivaceous or brownish without definite markings in either sex, but with a somewhat obscure dark mid-dorsal line running backwards from the snout in the male and narrowing posteriorly; throat dirty white. Skull resembling that of *G. trijuga*, but with the temporal arch incomplete owing to the vestigial condition of the quadrato-jugal bone; dorsal surface flat and horizontal; dorsal profile of squamosal bone much more strongly concave than in *G. trijuga* and supra-occipital bone more strongly produced backwards; upper jaw deeply notched at apex; tooth at apex of lower jaw very prominent and distinct. In the hyoid skeleton the posterior cornua are much broader and the median cornua longer and stouter than in the allied species. The iris is chestnut-brown.

Limbs powerful, black above, greyish below; feet flattened, with well-developed webs; claws long and powerful (especially in the male), sharply pointed, more or less curved, blackish; horny shields large and strong on both limbs, arranged as in *G. trijuga*.

Types. Nos. 17098 (♂) and 17100 (♀) *Rept. Ind. Mus.*

Geographical distribution.—The specimens in the Indian Museum are from the Singhbhum district of Chota Nagpur and there is one in the vivarium of the Bombay Natural History Society from the Dharwar district in the interior of the southern part of the Bombay Presidency. It was taken at Devikop, 26 miles south of the town of Dharwar.

Measurements of specimens of Geoemyda indopeninsularis.

	Type ♂.	Type ♀.	Bombay ♀.
Length of carapace (straight)	336 mm.	342 mm.	284 mm.
Breadth of ,, (,,)	231 ,,	236 ,,	..
Height of ,, 	130 ,,	148 ,,	135 ,,
Length of ,, along curve	350 ,,	350 ,,	..
,, plastron (notch to notch)	282 ,,	310 ,,	258 ,,

	Type ♂ .	Type ♀ .
Length of skull (to occipital condyle) ..	58 mm.	56 mm.
Zygomatic breadth of skull ..	38 ,,	38 ,,
Length of orbit ..	15 ,,	15 ,,
Height of nasal aperture (skull) ..	10 ,,	10 ,,
Breadth of nasal aperture (,,) ..	10 ,,	11 ,,
Interorbital breadth ..	14 ,,	14.5 ,,
Breadth of lower jaw (at symphysis) ..	4 ,,	4 ,,

In measuring the height of the male carapace I have not included the concavity of the plastron but have measured from the surface on which the shell rested to its highest point. The greatest depth of the concavity is about 20 mm.

This species is closely allied to *G. trijuga* and it is not improbable that confusion has occurred in the case of immature tortoises. Apart from the incompleteness of the temporal arch, there are apparently constant differences in the skull, and the shape of the carapace is different, although it is difficult to bring out this difference by means of measurements. One of our specimens was examined by the late Dr. J. Anderson, who apparently thought that there was some mistake about the label, but the capture of a second specimen from the same district makes this improbable, as there is no evidence against the authenticity of the recorded history except the fact that no other individual was known from that district. The first specimen was taken by the late Dr. V. Ball.

Very little is known of the habits of this species. Mr. Chaudhuri, who obtained the male specimen in our collection through Mr. B. C. Sen, I.C.S., from the Hos, an aboriginal tribe of Chota Nagpur, tells me that they regard it as a land tortoise. The female living in the rooms of the Bombay Natural History Society was, however, taken in a shallow tank, and I detected on its shell the remains of a colony of the polyzoon *Plumatella*, which cannot live long out of water. It is not improbable that tortoises of the species visit water in hot weather, but live habitually, without actually entering water, in damp places. The Bombay female laid several eggs in April and March and did not at that time of year show any inclination to enter water. The eggs were 148 mm. long by 30 mm. in transverse diameter.

Geoemyda tricarinata, Blyth.

Geoemyda tricarinata, Blyth, *Journ. As. Soc. Bengal*, 1856, p. 714 ; Theobald (*Chaibassia*), *Cat. Rept. Brit. Ind.*, p. 7 (1876) ; Anderson (*Chaibassia*), *Anat. Zool. Res. Yunnan*, p. 718 (1879) ; Boulenger (*Chaibassia*), *Cat. Chel.*, p. 139 (1889) ; Lydekker (*Nicoria*), *Journ. As. Soc. Bengal*, 1889, pp. 327, 330, fig. 1 ; Boulenger (*Nicoria*), *Fauna*, p. 28 (1890) ; Siebenrock (*Geoemyda*), *Zool. Jahrb. Suppl.*, x, Heft 3, p. 497 (1909).
Chaibassia theobaldii, Anderson, *op. cit.*, p. 718 ; Boulenger, *Cat. Chel.*, p. 140.

I have no doubt that recent authors are right in regarding these two species of Anderson (*tricarinata* and *theobaldii*) as specifically identical. There is little if any constant difference between skulls from the two districts (Chaibassa and northern Assam) in which the two species were supposed to live, but the individual variation between two skulls from Assam is not only considerable but also of great importance in the taxonomy of the genus. I have already indicated its nature (p. 65), which is clearly shown in fig. 6, pl. vi. No information is available as to the soft parts of specimens from Chota Nagpur.

The following measurements include those of the type of *Geoemyda tricarinata*, Blyth, and of two co-types of *Chaibassia theobaldii*, Anderson:—

	No. 816. (♂)	No. 1017. (♀)	No. 188. (♀)	No. 189. (♂)
Length of carapace (straight)	136 mm.	163 mm.	163 mm.	130 mm.
Breadth of carapace (straight)	91 ,,	101 ,,	97 ,,	83 ,,
Length of carapace along curve	165 ,,	197 ,,	190 ,,	159 ,,
Breadth of carapace along curve	145 ,,	163 ,,	160 ,,	132 ,,
Height of carapace	52 ,,	70 ,,	75 ,,	56 ,,
Length of plastron (notch to notch)	104 ,,	132 ,,	135 ,,	106 ,,
Length of skull	23.5 ,,	..	23.5 ,,	..
Breadth of skull	21 ,,	..	22 ,,	..
Length of orbit	10 ,,	..	10 ,,	..
Interorbital breadth	7 ,,	..	7 ,,	..
Length of snout	5.5 ,,	..	7.5 ,,	..
Height of nasal aperture	4 ,,	..	5 ,,	..
Width of nasal aperture	5 ,,	..	5 ,,	..
Breadth of lower jaw and of symphysis	4.5 ,,	..	5 ,,	..

The skull of No. 1017 was accidentally broken some years ago and that of No. 189 has not been removed from the specimen. Although exact measurements of the former cannot be given, sufficient of it remains to prove its close resemblance to that of No. 188.

*Geoemyda tricarinata*¹ has hitherto been found in the district of Singhbhum (Chaibassa) in the south of Chota Nagpur and at the base of the foot-hills north of the Brahmaputra. Anderson has shown that the locality "Naga Hills" was given in error. The species is apparently terrestrial in habits. Specimens are very difficult to obtain on account of the inaccessible districts in which it occurs.

¹ Since this paper went to the printer I have received a living specimen from Mr. Lancelot Travers, who obtained it in the neighbourhood of the Baradighi tea-estate in the Jalpaiguri district of northern Bengal.

Specimens in the Indian Museum.

816 (10a. A.S.B.), ♂ (shell and imperfect skeleton).	{ Chaibassa (Singh- bhum) district, Chota Nagpur. }	A.S.B. (Blyth).
189, ♂ (spirit).	Bisnath plain, N. Assam.	Capt. Godwin-Austen.
188, ♀ (spirit: skull separate).	Bisnath plain, N. Assam.	,,
1017, ♀ (skeleton).	Base of Daffa Hills, N. Assam.	,,

No. 816 is the type of *Geoemyda tricarinata*, Blyth, while Nos. 189 and 188 are co-types of *Chaibassia theobaldii*, Anderson.

Geoemyda sylvatica, Henderson, from Cochin is apparently related to this species, but only the external characters have as yet been described. Its depressed carapace, strongly hooked upper jaw, etc. separate it distinctly.

Genus **Testudo**, Linn.

Since Mr. Boulenger published his volume on the Reptiles and Batrachia in the *Fauna of British India* four species of this genus have been added to the Indian list. I have to add a fifth. The four additional species already known are:—

1. *Testudo latinuchalis*¹ (Vaillant) (Lower Burma and Malaya).
2. *Testudo travancorica*,² Boulenger (Western Ghats).
3. *Testudo horsfieldii*,³ Gray (Central Asia, Baluchistan).
4. *Testudo baluchiorum*,⁴ Annandale (Baluchistan).

The fifth species I propose to name *Testudo parallelus*. Its position among the Indian species will be shown by the following key:—

I. Species with five claws on the fore-feet.

1. Supracaudal shield single.

A. Forehead with large shields; carapace not marked with radiating pale lines; no spurs on hind thighs.

a. Nuchal shield (usually) present;
gular suture no longer than pectoral suture, which is at least nearly as long as humeral suture *T. elongata*.

¹ Boulenger, *Fauna of the Malay Peninsula*, vol. i, p. 15 (1912).

² *Id.*, *Journ. Bombay Nat. Hist. Soc.*, vol. xvii, p. 560, 2 pls.

³ *Id.*, *Cat. Chel.*, p. 178.

⁴ Annandale, *Journ. As. Soc. Bengal*, 1906, pp. 75 and 205, pl. 2, fig. 1.

- b. Nuchal shield present; gular suture as long as pectoral and humeral sutures together .. *T. parallelus*.
- c. Nuchal shield absent; gular suture no longer than pectoral suture, which is not more than half as long as humeral suture .. *T. travancorica*.
- B. Forehead with small, irregular shields; carapace with radiating yellow lines; spurs on hind thighs present or absent.
- a. Spurs on hind thighs well developed; plastron with dark radiating lines well developed on shields *T. elegans*.
- b. Spurs on hind thighs feeble; dark radiating lines absent from or poorly developed on plastron .. *T. platynota*.
2. Supracaudal shields two.
- A. Antero-lateral border of second and third vertebral shields not or but slightly shorter than postero-lateral *T. emys*.
- B. Antero-lateral borders of second and third vertebral shields much shorter than postero-lateral .. *T. latinuchalis*.
- II. Species with four claws on the fore-feet.
1. Carapace much depressed *T. horsfieldii*.
2. Carapace not depressed *T. baluchiorum*.

Testudo parallelus, sp. nov.

Testudo elongata, Anderson (*partim*), *Anat. Zool. Res. Yunnan*, p. 712 (1879).

The statement that *Testudo elongata* occurs in Peninsular India, which is repeated in several revisions of the Testudinidae, appears to rest on a passage in Anderson's account of that species cited above. He says that he obtained specimens from Chaibassa in Chota Nagpur from Colonel Dalton. None of these specimens can now be traced; another from the same district differs in so many characters from any individual in our long series of Burmese examples that it must be recognized as the type of a new but closely allied species, for which the name *Testudo parallelus* is proposed.

Carapace long and narrow, about $2\frac{1}{2}$ times as long as high and $1\frac{3}{5}$ times as long as broad; *sides parallel*; *costal region steep, not at all convex*; *vertebral region hardly flattened but by no means strongly arched longitudinally*; *posterior region convex backwards, descending abruptly*; anterior and posterior margins retroverted and somewhat feebly serrated. Nuchal narrow, with parallel sides, projecting strongly in front; vertebral shields as in *T. elongata*; supracaudal

undivided, strongly arched and curved inwards below. Shields of a warm golden-brown colour, some of them bearing small eccentric black marks; axillary and inguinal shields well developed.

Plastron large, of the same colour as the carapace, with a few scattered black spots; bridge longer than either anterior or posterior lobe; the former truncate and slightly retroverted in front, the latter deeply notched behind. *Gulars* very large, the suture between them equal to the median humeral and pectoral sutures together or to the median femoral suture; suture between the pectorals a little longer than that between the humerals; that between the abdominals much the longest; anals forming a short suture.

Head pale yellow (in spirit), of moderate size; a pair of very large praefrontals covering the snout, followed behind by a much smaller frontal with a pair of shields considerably longer than itself disposed symmetrically one on either side of it; occipital region covered with small irregular shields. Jaws by no means strongly hooked or prominent; upper jaw feebly tricuspid.

Limbs not very powerful. Fore limbs with five claws, covered with well-developed scales; those on the dorsal surface irregular in size, with three very much larger than the others; outer edge of the limb with strongly projecting, imbricate, claw-like scales. Hind limb devoid of femoral spurs; some relatively small projecting tubercles on the heels.

Tail moderate, ending in a claw-like spur.

Skull closely resembling that of *T. elongata* but with the terminal tooth of both jaws shorter.

Type (♀). No. 11379. Rept. Ind. Mus.

Habitat.—Chaibassa (Singhbhum) district, Chota Nagpur.

Closely as this species is related to *T. elongata*, it can be recognized by the straight and parallel sides and abrupt posterior region of its shell, the plane (non-convex) costal region and the large gular shields. The cephalic shields and the scales on the dorsal surface of the fore-feet are also different. The same characters will separate it from *T. travancorica*. The type is an adolescent female in spirit from which I have had the skull removed. Its shell is 185 mm. long. It is unfortunate that only a single specimen is available. I have been attempting in vain for some years to obtain more material; but our series of *T. elongata* is a large one and no confusion with any other species is possible. In *T. travancorica* the gulars are shorter than in *T. elongata* and the frontal shield is even larger, unless, as is sometimes the case, it is broken up irregularly into several scales.

Family TRIONYCHIDAE.

Emyda granosa intermedia, Annandale.

Emyda granosa intermedia, Annandale, *Rec. Ind. Mus.*, VII, p. 171, pl. vi, fig. 3 and p. 264 (1912).

This race is apparently common all over Chota Nagpur, except probably in the hills. I have recently obtained specimens from

Angul in the interior of Orissa from Mr. J. Taylor; other localities are given in the papers cited.

Although I can at present only put on record definitely five species of *Chelonia* as having been recorded from Chota Nagpur, viz. :—

- ? *Geoemyda trijuga* (amphibious),
Geoemyda indopeninsularis, nov. (amphibious),
Geoemyda tricarinata (terrestrial),
Testudo parallelus, nov. (terrestrial),
 and *Emyda granosa intermedia* (aquatic),

it is probable that the following species, at any rate, also occur:—

Testudinidae	{	<i>Kachuga lineata</i>	}	Aquatic species.
		<i>Kachuga dhongoka</i>		
		<i>Kachuga tectum intermedia</i>		
		<i>Batagur baska</i>		
Trionychidae	{	<i>Testudo elegans</i>	}	Terrestrial species.
		<i>Trionyx leithii</i>		
		<i>Trionyx gangeticus mahanad-</i> <i>dicus</i>		

These seven forms have been found on both sides of Chota Nagpur, and no reason why they should not be found in that division of the Province of Bihar and Orissa can at present be brought forward.

It would be idle, until we know more of the tortoises of the division, to discuss in detail the geographical distribution of those that have actually been found. It is, however, noteworthy that of the four Testudinidae, two should belong to previously undescribed species; while two, or possibly three, are closely related to, when not identical with, forms otherwise known only from territory east of the Gangetic delta, and quite distinct from forms found in the valley of the Ganges. The three species are:—*Geoemyda tricarinata*, which is specifically identical with a form only known to occur in Assam north of the Brahmaputra, *Testudo parallelus* (very closely related to *T. elongata*), found in Assam, Burma, Indo-China and the Malay Peninsula) and *Geoemyda indopeninsularis*, which is related to the Burmese (? and Assamese) race of *G. trijuga* and ranges westwards and southwards into the Bombay Presidency. *Testudo parallelus* is closely related not only to *T. elongata* but also to *T. travancorica*, which is only known from the Western Ghats,¹ and also to *T. forsteni* from Celebes; the four species together forming a very compact and distinct section of the genus *Testudo*.

¹ Dr. J. R. Henderson has recently sent me a specimen from the western slopes of that range in Cochin and Mr. F. Hannington one from Coorg.

EXPLANATION OF PLATE V.

New Species of Tortoise from Chota Nagpur.

FIG. 1. Female type of *Geoemyda indopeninsularis* (reduced).

FIG. 2. Shell of male type of *Geoemyda indopeninsularis* (reduced).

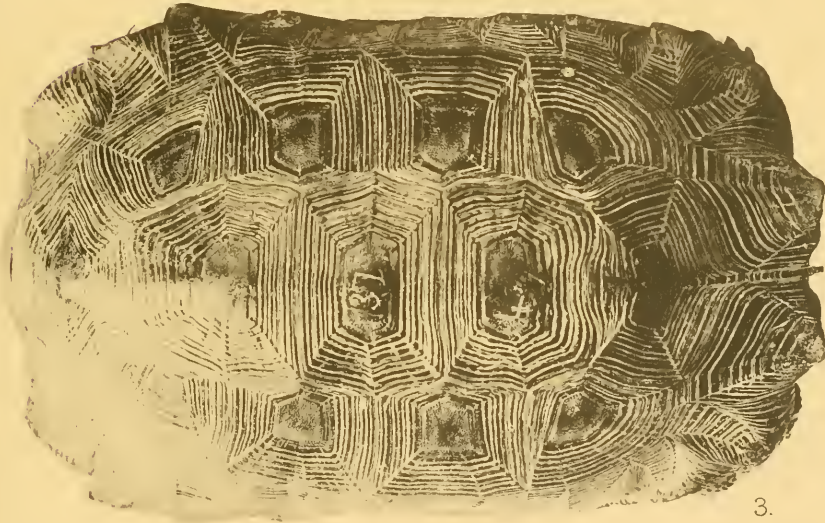
FIGS. 3, 3a. Type (female) of *Testudo parallelus* (reduced).



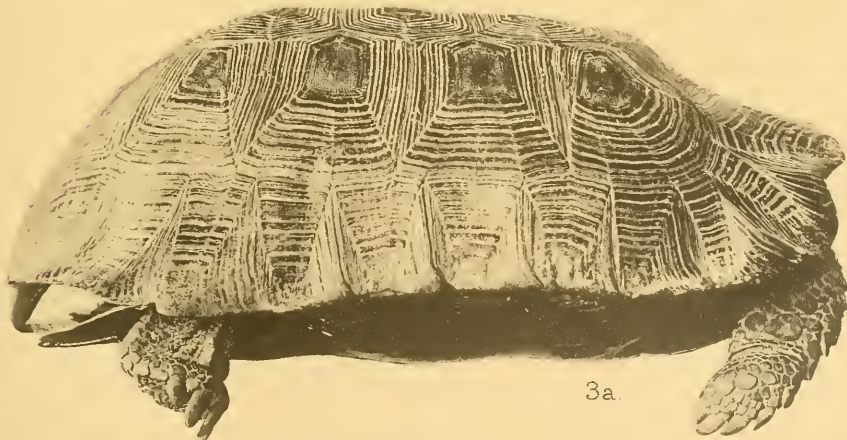
1.



2.



3.



3a.

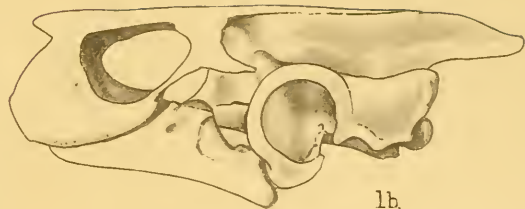
EXPLANATION OF PLATE VI.

- FIG. 1. *Geoemyda indopeninsularis*.
1, 1a.—Head of male type, $\times \frac{1}{2}$: 1b.—Skull of same specimen (nat. size): 1c.—Hind foot, $\times \frac{1}{2}$.
- FIG. 2. Head of typical form of *Geoemyda trijuga*: young female from Madras (nat. size).
- FIG. 3. Head of *Geoemyda trijuga coronata*: young female from Cochin (nat. size).
- FIG. 4. Head of *Geoemyda trijuga thermalis*: young female from Ramnad, S.E. Madras (nat. size).
- FIG. 5. Skull of *Geoemyda trijuga edeniana* from Burma (nat. size).
- FIG. 6. *Geoemyda tricarinata*.
6.—Hind foot of specimen from northern Assam (nat. size): 6a.—Skull of type of *G. tricarinata* from Chota Nagpur (nat. size): 6b.—Skull of one of the co-types of *Chaibassia theobaldii* from northern Assam.

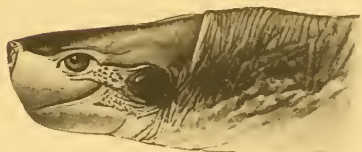
NOTE.—The head of *G. trijuga thermalis* is figured entirely from a specimen in spirit. The spots and streaks are much darker in life and the iris is rarely, if ever, white.



1a.



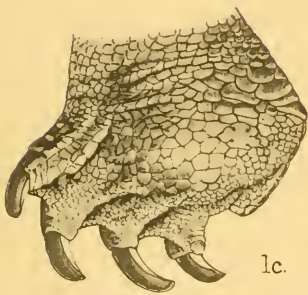
1b.



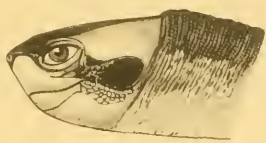
1.



3a.



1c.



3.



6a.



2.



2a.



6b.



4.



4a.



5.



6.

