

Holorhinal Birds.

1. Impennes.
2. Procellariidæ.
3. Colymbidæ.
4. Gallinæ (excl. *Pterocles* and *Turnia*).
5. Rallidæ (excl. *Parra*).
6. Otidæ (incl. *Ædicnemus*).
7. Cariamidæ.
8. Psophiidæ.
9. Opisthocomidæ.
10. Podicipidæ.

In his paper "On the Osteology of the Kagu," Mr. Parker, in speaking of the nasal bone, says, "this part of the face is thoroughly Gruine in both the *Eurypyga* and the Kagu; the long open nasal fossa, so sharp above at the bifurcation of the nasals, gives a character to the face common to large groups of Grallæ and Palmipeds." Otherwise he does not employ this character in classification, as is evident when it is seen that he places the Kagu close to *Psophia* and the Rails, which are holorhinal birds.

It may be mentioned that the external nasal process of the nasal bone is weak or obsolete in the struthious birds.

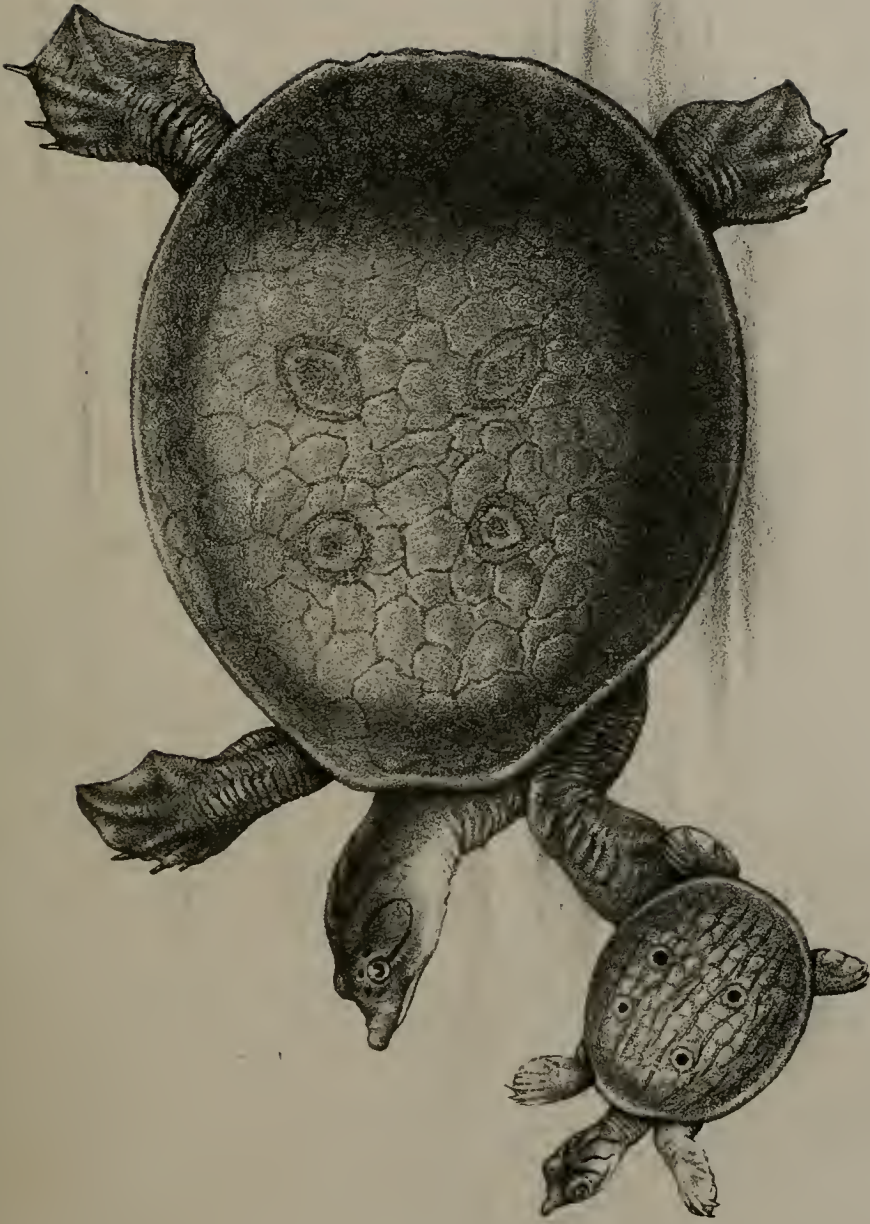
5. Notes on Mud-tortoises (*Trionyx*, Geoffroy), and on the Skulls of the different kinds. By Dr. J. E. GRAY, F.R.S. &c.

[Received Oct. 16, 1872.]

(Plate VIII.)

The distinction of the species of this group of Tortoises is attended with considerable difficulty, on account of the change of colour and of the development of bones and of the callosities on their surface during the growth of the animal. After considerable study, I am satisfied that the skulls, which appear to alter very little during the growth of the animal, are among the best characters for the distinction of the species, and division of them into groups; but the study of these parts has been attended with great difficulty, from the want of materials and so little being known of their development; and it was not until I had made one or two mistakes that I came to the conclusion that they afforded such good characters, and varied so little during the growth of the species.

The study of the skulls is attended with considerable difficulty, from the want of specimens; and the result has shown that the only safe way of comparing them is actually by skulls with skulls. I at first thought that it might be done by examining the mouths of animals in spirits or dry; but the skin on the side of the mouth hides so much of the skull, and gives the palate quite a different character from that which exists in the skull; and the examination of the mouth



Mintern Bros imp

TRJONYX GANGETIGA.

C. Berjeau lith

of specimens in this state only affords a general impression of the alveolar surface.

The skulls of the Mud-tortoises are so uncommon, and I was so disinclined to take the skulls out of the specimens, that I availed myself of the characters which the preserved heads afforded me : but I have now determined to extract the skulls in the most careful manner from the specimens themselves ; and this has given me a greatly increased knowledge of the species, and of the characters the skulls afford.

The examination of the skulls of the different specimens has had the effect of putting together specimens that had been considered not only distinct species but distinct genera, and has shown them to be only various ages of the same species, as *Dogania* and *Sarberia* ; and at the same time it has given more important characters for the separation of species and characteristics for the groups to which they belong.

In all the other groups of Tortoises I have only figured the skulls that belonged to skeletons ; but in this group of Mud-tortoises the number of skulls that I had was so small, that I was induced to figure and try to identify two skulls which Prof. Oldham had given to the Museum with two Asiatic species : and I am sorry to say that now we have been able to examine other skulls, one of them has been proved to have been wrongly identified ; that is to say, that which I figured for *Potamochelys* proves to be the skull of an *Emyda*.

In my former papers I had only the opportunity of examining the skulls of most of the species in the heads of the stuffed specimens, or of those preserved in spirits, and which consequently had the horny coat to the alveolar process of the jaws and palate, which are naturally very different from the bones which they cover. All the skulls described in this paper have been extracted from the specimens, and have had the horny coat of the alveolar surface removed. This explains why they differ from descriptions in former papers ; and those in this paper are to be considered the most correct.

There is a very great difficulty in comparing animals in spirits with prepared dry specimens. The living animals and the specimens in spirit have the bony disk of the back and sternum covered with a thick skin, which, perhaps with the exception of very old specimens, entirely hides the callosities on the surface of the back and part of the sternum, which are so prominent, and from which we take many characters in the dry preserved and stuffed specimens. The rugosity or callosities seem to cover the lateral bones of the sternum simultaneously over the whole surface, except the diverging rays by which the bones are united. In the hinder pair of sternal bones the callosities form a rounded or oblong spot near the internal side, and gradually enlarge themselves so as to cover the whole surface of the bone, leaving the diverging rays.

The genera and families have various relations to each other, which I think are well exhibited in the following Table, which shows in one view the alliance of *Heptathyra* to *Cyclanosteus*, and *Chitra*

to *Trionyx*, which have each different jaws, but common external characters.

I believe that, for the division of the *Trionychidæ* into tribes or groups, the formation of the dorsal disk affords the best character, and one which can be observed in the animal after it has passed its most juvenile state.

The following Table exhibits the affinities of the genera of the two families to each other:—

| | |
|--|---|
| Fam. CHITRADÆ. | Fam. TRIONYCHIDÆ. |
| The skull very thin, light; alveolar surface narrow. | The skull solid, thick; alveolar surface more or less wide. |

I. The hinder lateral edge of the sternum narrow, exposing the hind feet. The front pair of bones of the sternum without any callosities. The front odd bone of the dorsal disk without any bone before it in the margin.

CHITRAINA.

TRIONYCHINA.

II. The hinder lateral edge of the sternum with flaps to cover the hind feet. The front pair of bones of the sternum with callosities. The front odd bone united to the ribs of the dorsal disk, with an oblong free bone in the margin before it.

HEPTATHYRINA.

EMYDINA.

a. Dorsal disk without any posterior marginal bones.

Heptathyra.

Cyclanosteus &c.

b. Dorsal disk with posterior marginal bones.

Emyda.

There is great general affinity between *Heptathyra* and *Cyclanosteus*, between *Chitra* and the various genera of *Trionychina*; indeed the skull of *Callinia* has all the thinness of the skull of the *Chitradæ*, but retains the characters of the *Trionychina*. The animals of the *Chitradæ* must have very different habits and food (as proved by the form and lightness of the skull, and the weakness of the lower jaws) from the *Trionychidæ*, where the skull is generally solid, sometimes very much so, and the lower jaw very strong.

The latter must differ considerably in their food; for many have a broad expanded alveolar surface for chewing, and others, like *Tyrse*, have a sharp edge for cutting their food.

Those with the broad alveolar surface live on dead animals; the Gangetic species are said to be found often feeding on the dead Hindoos that are thrown into the river.

Family CHITRADÆ, Gray, Suppl. Cat. Sh. Rept. p. 89.

I. Chitraina. *Hinder lateral edge of sternum narrow, hind feet exposed; front pair of bones of the sternum without any callosities; front odd bone of the dorsal disk united to the ribs.*

CHITRA.

The skull is figured in the Cat. Sh. Rept. p. 70, t. 41; P. Z. S. 1864, p. 92, f. 11 & 12; and Suppl. Cat. Sh. Rept. fig. 28.

1. CHITRA INDICA. (The Sewteree).

Testudo chitra, B. Hamilton (Icon. ined.).

Trionyx ægyptiacus, var. *indicus*, Gray, Illustr. Indian Zool. i. t. 80, from Hardwicke's icon.

Trionyx indicus, Gray, Syn. Rept. p. 47.

Gymnopus lineatus, Dum. & Bibr. Erpét. Gén. ii. p. 491.

Sewteree, Hardwicke (icones ined. B. M.).

Chitra indica, Gray, Cat. Sh. Rept. B. M., p. 70, t. 41 (skull), P. Z. S. 1864, p. 92, figs. 11 & 12 (skull); Suppl. Cat. Sh. Rept. p. 89, t. 28 (skull); Ann. & Mag. Nat. Hist. 1872, p. 332.

Hab. India, Ganges, Nepal.

PELOCHELYS.

The skull figured, Gray, P. Z. S. 1864, p. 90, f. 9 & 10; Suppl. Cat. Sh. Rept. p. 91, fig. 29.

The odd bone in front of the disk very large and broad in the adult.

1. PELOCHELYS CANTORII.

Chitra indica, Blyth, J. A. Soc. 1863, xl. p. 77; Günther, Rep. Brit. Ind. t. (badly coloured).

Gymnopus indicus, Cantor, Rept. Malacca, p. 10.

Pelochelys cantorii, Gray, P. Z. S. 1864, p. 90, figs. 9, 10 (skull); Suppl. Cat. Sh. Rept. p. 91, fig. 29 (skull).

Hab. Malacca, Aracan.

2. PELOCHELYS CUMINGII.

Pelochelys cumingii, Gray, P. Z. S. 1864, p. 90; Suppl. Cat. Sh. Rept. p. 91.

Hab. Philippine Islands.

3. PELOCHELYS BIBRONII.

Trionyx bibronii, Owen, Cat. Osteol. Spec. Mus. Coll. Surg. p. 185, nos. 951-959.

Pelochelys bibronii, Gray, P. Z. S. 1864, p. 90; Suppl. Cat. Sh. Rept. p. 91.

Hab. Australia?

II. Heptathyrina. *The hinder lateral edge of the sternum with flaps to cover the hind limbs; the front pair of bones of the sternum with callosities; the front odd bone of the dorsal disk united to the ribs, without any small oval bone in the margin before it.*

HEPTATHYRA.

The skull figured, Gray, P. Z. S. 1864, p. 94, figs. 13, 14, 15; Suppl. Cat. Sh. Rept. p. 92, fig. 30.

The hinder sternal callosities large, rather far apart. A well-developed callosity on each side of the front pair of bones, and a small lunatic callosity on the odd bone in front of the sternum.

1. HEPTATHYRA FRENATA.

Aspilochelys livingstonii, Gray, P. Z. S. 1860, p. 6, t. 22 (shell).

Heptathyra frenata, Gray, P. Z. S. 1864, p. 93, figs. 13-15 (skull).

Heptathyra aubryi, Gray, Suppl. Cat. Sh. Rept. p. 93, fig. 30 (skull).

Hab. Western and Central Africa.

Fam. TRIONYCHIDÆ, Gray, Suppl. Cat. Sh. Rept. p. 94.

- I. Trionychina. *Hinder lateral edge of the sternum narrow, exposing the hind feet; the front pair of bones of the sternum without any callosities; the front odd bone of the dorsal disk more or less united to the ribs, without any bone in the margin before it.*
- A. *Dorsal disk with a broad transverse single or odd bone in front, which is united to the rest of the disk by a straight suture in the adult; lateral and posterior pair of bones of the sternum expanded, and covered with well-developed callosities on the whole surface.*

In the young specimens the odd bone is more or less separate from the dorsal disk, but is generally narrow and transverse. As this bone becomes more developed it expands in length and breadth, and becomes nearer to the anterior edge of the first rib. As it grows larger, there are usually a couple of circular vacancies between the odd bone and the front of the first pair of ribs; but these circular cavities diminish in size as the animal increases in age, and are entirely obliterated by the development of the bones.

Synopsis of the Genera of this Tribe.

* *The central palatine groove in front of the internal nostrils narrow, linear; alveolar surface wide.*

1. FORDIA. Skull depressed, broad; palate nearly flat. Africa.

2. NILSSONIA. Skull high; palate deeply concave. Asia.

** *Central palatine groove in front of the internal nostrils wide, shallow, nearly as wide as the front of the internal nostrils.*

† *Front of the alveolar surface of the lower jaw wide, flat or slightly concave, generally with a central longitudinal ridge.*

3. TRIONYX.

4. ISOLA.

†† *Front of the alveolar surface of the lower jaw deeply concave, with a narrow sharp edge, wider and concave behind; front groove of palate wide, shallow, narrower behind. The nose of the skull is conical, shorter than the diameter of the orbit.*

5. LANDEMANIA. Back convex, with a groove on each side of the vertebral line; skull elongate; lower jaw suddenly contracted in front.
6. IDA. Back keeled; skull short; lower jaw gradually tapering.
7. DOGANIA. Back flat, scarcely raised; skull elongate; lower jaw gradually attenuated.

*** *The central palatine groove in front of the internal nostrils broad, shallow, rather wider than, and forming a margin to, the sides of the internal nostrils.*

8. PLATYPELTIS. The alveolar surface of the lower jaw concave, with a sharp raised outer edge, much wider in front; hinder bones of the sternum with well-developed callosities.
9. CALLINIA. The alveolar surface of the lower jaw narrow, sharp-edged; front of lower jaw shelving on the inner side, erect on the sides.
10. AMYDA.
11. TYRSE. The central palatine groove in front of the internal nostrils broad, shallow, much wider than, and enclosing them; nose elongate.

1. FORDIA.

Skull very solid, rather broad, rounded in front; nose moderate, flattened on the sides; distance between the square nose-hole and the orbit about half as much again as the diameter of the latter, which is small; palate flat; alveolar surface very broad through the whole of its length, with a very narrow slightly impressed groove from the front edge to the septum between the internal nostrils, which are on a line with the front edge of the zygomatic cavity; lower jaw very strong and thick, depressed in front; alveolar surface broad and flat in front, narrower and deeply concave on the sides, with a slight central longitudinal ridge, and with a slight concavity and one or two small pits on the sides of the middle part. Length of the skull to condyle $4\frac{3}{4}$ inches; width at condyle $3\frac{1}{4}$ inches.

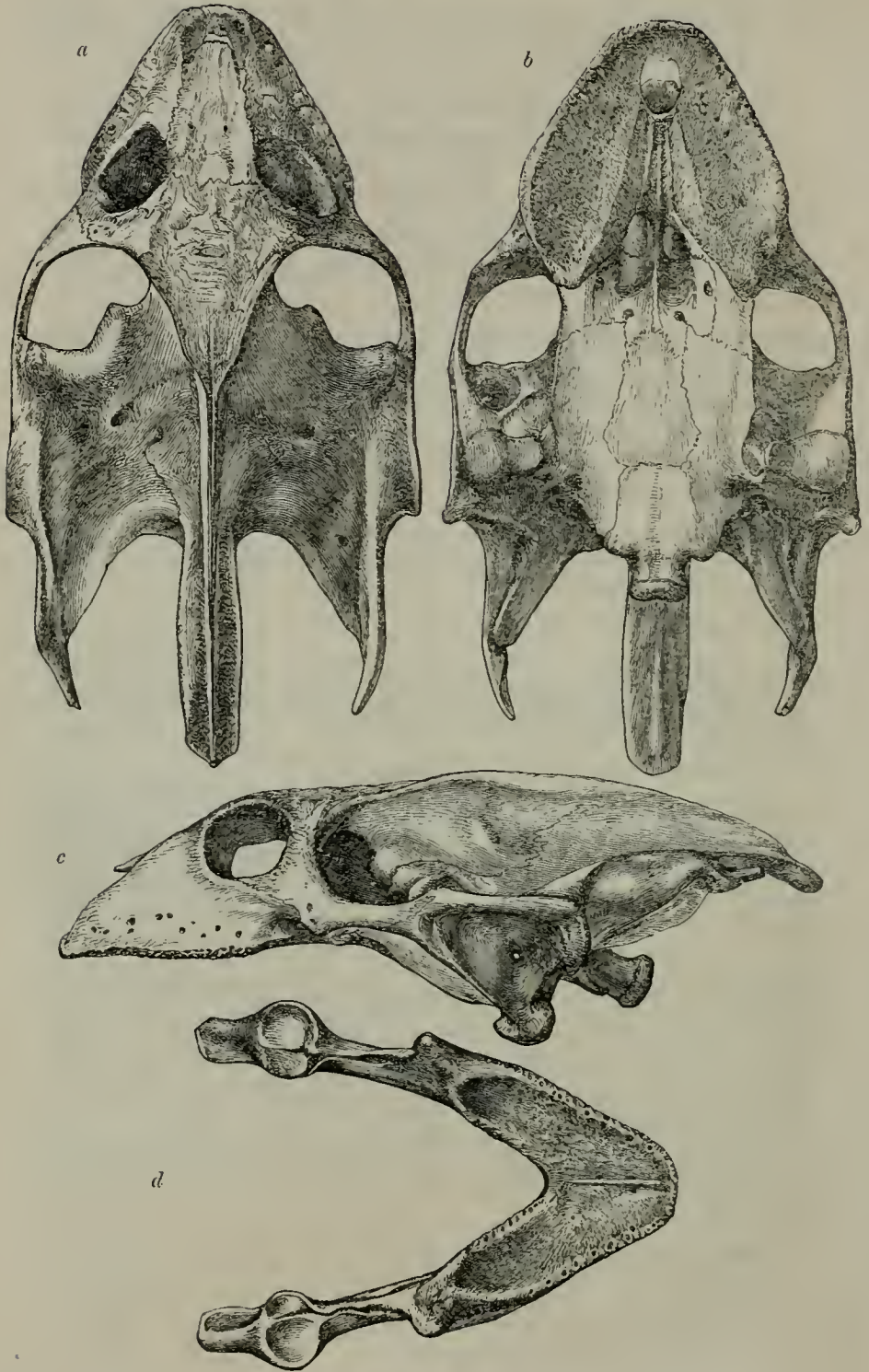
The skull is nearly as large as the skull of the *Baikiea* received from Western Africa, but is immediately known from it by being more conical in front.

1. FORDIA AFRICANA, Gray, P. Z. S. 1869, p. 119; Suppl. Cat. Sh. Rept. p. 100. (Fig. 1, p. 44.)

Tyrse nilotica, var., Gray, P. Z. S. 1864, p. 88.

Hab. Upper Nile (Chartum).

Fig. 1.

*Fordia africana.*

2. NILSSONIA.

Skull elongate, tapering on the sides in front, the forehead suddenly bent down; the nose of the skull between the orbit and the oblong four-sided erect nose-hole not more than half the diameter of the orbits. The front of the palate concave, with a narrow deep groove to the septum, between the internal nostrils, which is rather wider in front, and then about the same width behind, where it is very deep; alveolar surface very wide, gradually tapering off towards the front of the mouth; lower jaw very strong; alveolar surface much wider in front than at the sides, with a deep, short, longitudinal pit in the front half of the front edge, which is rather concave. Hinder part narrower, concave, with a strong prominence on the inner edge.

Nilssonia, Gray, Ann. & Mag. N. Hist. 1872, x. p. 332.

The skull from which this genus is described was received in 1865, probably from India; but I have not been able to find any Indian Mud-tortoise with which it could be identified.

The skull is three inches long from the end of the nose to the posterior condyle, and an inch longer to the end of the central longitudinal ridge, and is two inches wide just in front of the tympanic aperture, which is the widest part of the skull.

1. NILSSONIA FORMOSA. (Fig. 2, p. 46.)

Only young animal known. Back olive, with four large spots, with a black eye and a narrow white edge. Head with a spot behind each eye and at the angle of the mouth, and a large white transverse band on each side of the back of the head, interrupted in the middle of the upper part.

Skull shorter and broader than that of the adult.

Trionyx formosus, Gray, P.Z.S. 1869, p. 217, t. 15. fig. 1 (young); Suppl. Cat. Sh. Rept. p. 99.

Hab. India (Pegu, Theobald's coll.). B. M.

It appears that this and the other *Trionyx* marked "Pegu" do not really come from that place; for although the collection was sold as from "Pegu," it contained many specimens from other parts of Hindostan.

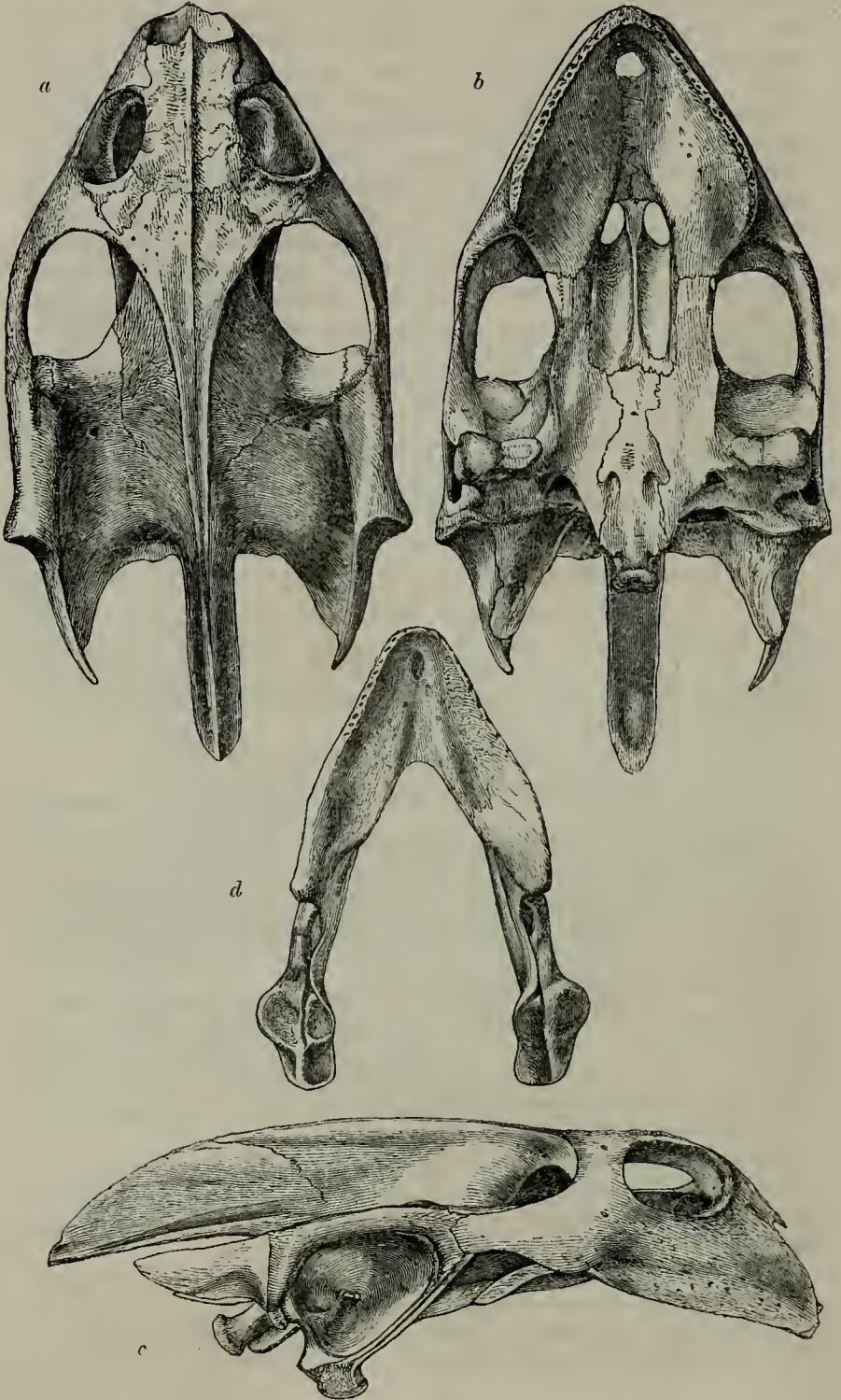
The skull of the very young animal described as *Trionyx formosus* (only $\frac{3}{4}$ inch long) in the British Museum, which has as yet no dorsal or ventral callosities, is very like the adult skull above described, but is shorter and broader, and the groove in front of the internal nostrils is deeper. I think that this is probably the effect of age, and that the skull becomes longer by growth.

I have named this genus after my old friend Dr. Sven Nilsson, of Lund, who has been working on zoology since 1816, and more lately on archæology, and is now, in his 86th year, in the full vigour of his intellect.

Two young specimens in spirits have no sternal callosities; but all the bones of the sternum are seen through the skin.

The back of the young is marbled, and has the four eyed spots like the young of the genus *Trionyx*.

Fig. 2.



Nilssonia formosa.

3. TRIONYX.

Trionyx, Gray, P. Z. S. 1864; Suppl. Cat. Sh. Rept. p. 88, fig. 32.

Palate of the skull with a broad shallow concavity to the internal nostrils, of the same width before and behind.

The alveolar surface of the lower jaw is usually more or less concave, and often marked with a central longitudinal ridge over the suture of the jaw.

The form of the alveolar surface, and the comparative width of various parts of it, and the various concavities and ridges on the different parts of its surface afford excellent characters for the species.

The dorsal disk in the young animals is generally marked with three pairs of black spots, which have concentric pale rings within. These spots often last, in a more or less perfect degree, through the life of the animal. Sometimes the anterior, and sometimes the posterior pair, and rarely a spot on one side of these pairs, are deficient. The crown of the head of the young specimens is generally marked with spots of various colours, which become more and more indistinct as the animal grows. I believe that these spots are characteristic of the species; and sometimes whole series of species have characteristic spots—that is to say, on the side of the crown and face.

The skulls of the species of this genus which we have in the British Museum may be divided into two sections:—

1. *Nose of skull broad, rounded in front.* *Trionyx gangeticus*.
2. *Nose of skull tapering, converging in front.* *T. sewaare*, *T. jeudii*, *T. leithii*.

* *Crown of head olive, with radiating black lines behind.*

1. TRIONYX GANGETICUS. The “Dekoolee.” (Plate VIII.)

Skull short, broad; nose suddenly bent down, with a rounded outline. Eyes within a very short distance of the cavity of the nostrils, which is not as long as the diameter of the orbit; alveolar surface of the lower jaw deeply concave, with a very slight indistinct central longitudinal ridge.

The Dekoolee, Hardwicke, icon. ined.

Trionyx du Ganges, Cuvier, Oss. Foss. v. pt. 2. p. 187, tab. ii. figs. 5–8 (skull).

Trionyx gangeticus, “Duvaucel,” Cuvier, Règne Animal, vol. ii. p. 16; Gray, Cat. Sh. Rept. B. M. p. 66, tab. 42. fig. 1; Suppl. p. 97, fig. (skull only).

Gymnopus duvaucelii, Duméril and Bibr. Erpét. Générale, vol. ii. p. 47.

Aspidonectes gangeticus, Wagler, Amphib. Taf. ii. figs. 13–22; copied from Cuvier.

Trionyx javanicus, Gray, Cat. Sh. Rept. p. 67 (not synonyma).

Potamochelys stellata, Gray, Suppl. Cat. Sh. Rept. B. M. p. 104 (animal only, not skull).

Variety? The black lines irregular.

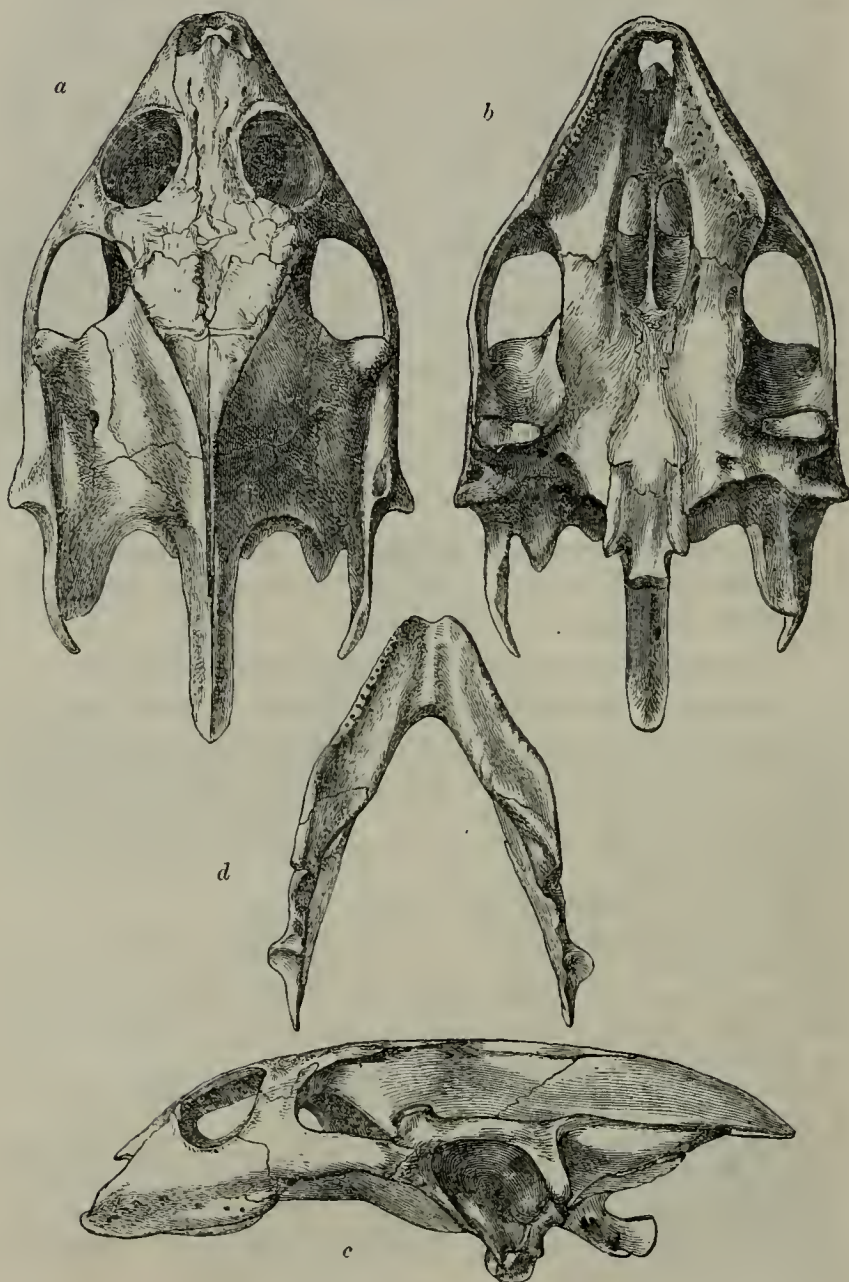
Jaank, Hardwicke, icon. ined.

Inhabits India.

See history of the species and skull, Ann. & Mag. N. H. 1872, x.
p. 334.

In a young specimen, with the sternal callosities partly developed,

Fig. 3.



Trionyx leithii.

the front odd bone of the dorsal disk is quite separate, with a transverse oblong pitted callosity; the front margin of the dorsal disk has a central prominence nearly reaching the back edge of the odd bone.

In young specimens the odd bone in the front of the dorsal disk is transversely elongate, rugose the whole of its width, separate from but very close to a central prominence in front of the dorsal disk.

2. *TRIONYX LEITHII*. The Poonah Mud-tortoise. (Fig. 3, p. 48.)

A small species, the shell about 10 inches long and $6\frac{1}{2}$ broad; the alveolar surface of the lower jaw nearly flat, with a very slight longitudinal ridge across the front end.

Trionyx leithii, Gray, Ann. & Mag. N. H. 1872, x. p. 334.

Hab. Poonah, *Dr. Leith*.

The history of this species is given in the Ann. & Mag. N. H. 1872, x. p. 334.

There are two other specimens in the British Museum, from Mr. Day. The older one has the dorsal disk suborbicular, concavely truncated behind. The odd bone in front about half the width of the widest part of the dorsal disk, and united to it.

The younger one has the dorsal disk with numerous, close, rather irregular, minute tubercles; the hinder edge is regularly arched; the front edge truncate, with a deep arched notch on each side of the central prominence; the odd marginal bone is rather broad, arched in front, and slightly concave on the sides of the inner edge, about $\frac{1}{4}$ as wide as the breadth of the broadest part of the disk.

** *The hinder part of the crown and sides of the head marked with pale spots.*

3. *TRIONYX HURUM*. The "Kaavez."

Crown of the head varied with irregular black lines; a yellow spot on each side of the crown and at the back angle of the mouth.

Kaavez, Hardwicke, icon. ined. B. M.

Trionyx hurum, Gray, Synopsis Rept. tab. 10, copy of Hardwicke; Gray, Ill. Ind. Zool. tab., copy of Hamilton's; Gray, Ann. & Mag. N. Hist. 1872, x. p. 335.

Testudo hurum, Hamilton, icon. ined.

The history of this large species is to be found in the Ann. & Mag. N. Hist. 1872, x. p. 336.

4. *TRIONYX JEUDII*.

Skull, with nose rather elongate, produced forward, with a rather tapering outline; orbit further from the cavity of the nostrils than the diameter of the orbit; alveolar surface of the lower jaw with a very distinct central longitudinal ridge in front, with a deep pit on each side.

Trionyx jeudii, Gray, P. Z. S. 1869, p. 217, fig. 19; Suppl. Cat. Sh. Rept. p. 97, fig. 32 (skull).

Hab. India.

The skull only is known, which probably belongs to *Trionyx hurum*, as it seems to come from a large species not uncommon in India, as is the case with *T. hurum*.

There is a second specimen of this skull, which was given to the British Museum by Mr. Theobald as the skull of his *Trionyx phayrei*. It certainly was not the skull of the species which he described under that name in the 'Journal of the Linnean Society,' and not that of the tortoise described under that name by Dr. Anderson.

5. TRIONYX SEWAARE. (Fig. 4.)

The upper surface of the head uniform olive, with a distinct yellow spot on each side of the crown.

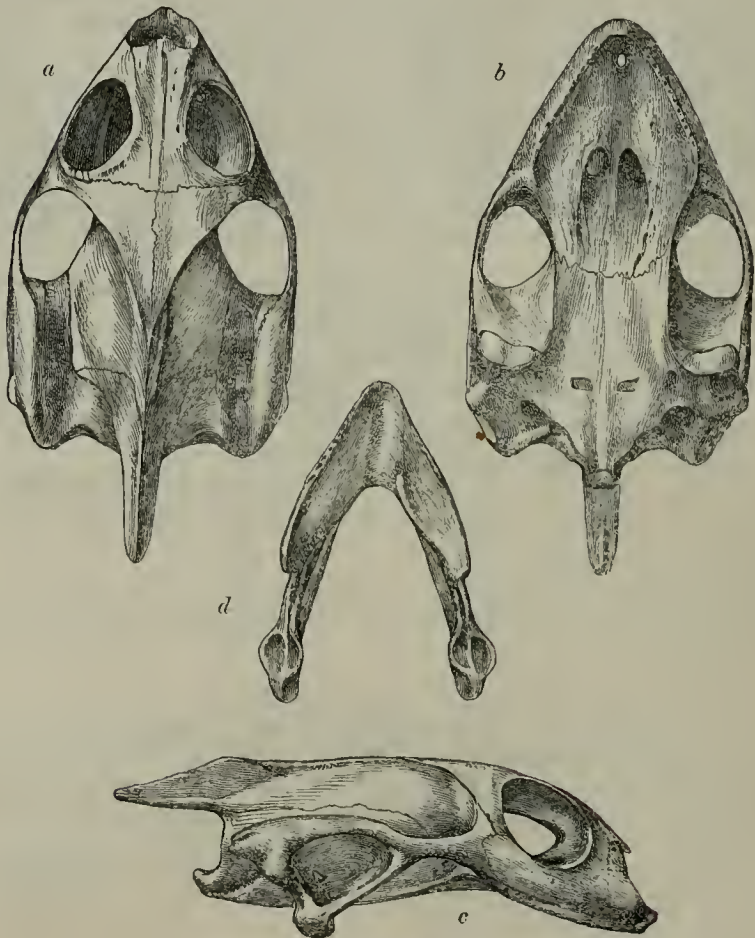
Sewaare, Hardwicke's icon. ined. in B. M.

Trionyx gangeticus, var., Gray, Suppl. Cat. Sh. Rept. p. 97.

Trionyx sewaare, Gray, Ann. & Mag. N. Hist. 1872, x. p. 336.

Hab. Bengal.

Fig. 4.



Trionyx sewaare.

The skull of a young species, tapering in front, the palatine groove rather wide, narrower behind. The lower jaw very broad in front, with a broad central longitudinal groove, nearly reaching the front edge, and a wide longitudinal groove on the inner part of the sides, with a narrow well-raised edge on the inner side.

The history of this species, and the account of the specimens in the Museum, is given in my paper on Indian Mud-tortoises in the *Ann. & Mag. N. Hist.* 1872, x. p. 336.

6. TRIONYX OCELLATUS.

Only known young; callosities not developed; nose before the eyes with a broad lunate yellow spot.

Testudo ocellatus, B. Hamilton, icon. ined.

Trionyx ocellatus, Gray, Ill. Ind. Zool. (copy of Hamilton); Gray, *Ann. & Mag. N. Hist.* 1872, p. 337.

Gymnopus ocellatus, Duméril & Bibr., *Erpét. Gén.* iv. p. 9?

Hab. India. B.M.

For the history of this species I refer to my paper in the *Ann. & Mag. N. Hist.* 1872, x. p. 337.

7. TRIONYX BELLII.

Only known from young; callosities not developed; upper part of the head black, white-spotted on the crown, with a red spot on the side of the temple and on the angle of the mouth.

“*Trionyx gangeticus*, Cuvier,” Bell’s MS.; Gray, ‘Tortoises, Terapins, and Turtles,’ p. 11, tab. 51.

Trionyx bellii, Gray, *Ann. & Mag. N. Hist.* 1872, x. p. 337.

Hab. Asia.

Only known from Mr. Bell’s figure. See observation on it and on *Trionyx stellatus japonicus* in the *Ann. & Mag. N. Hist.* 1872, x. p. 337.

4. ISOLA.

Palate of the skull with a broad shallow concavity to the internal nostrils, which is rather wider behind.

The skull of the head obtained from Mr. Theobald is rather elongate (4 inches long); the nose rather tapers on the side, and is rounded in front; nose at the eyes about two thirds the width of the orbit; the groove in front of the palate rather wide, shallow in front, gradually wider and deeper behind; the upper edge of the lower jaw flat behind, rather wider in front, and more concave, with a deep oblong impression on each side of the well-marked keel, which occupies more than half of the middle of the front end.

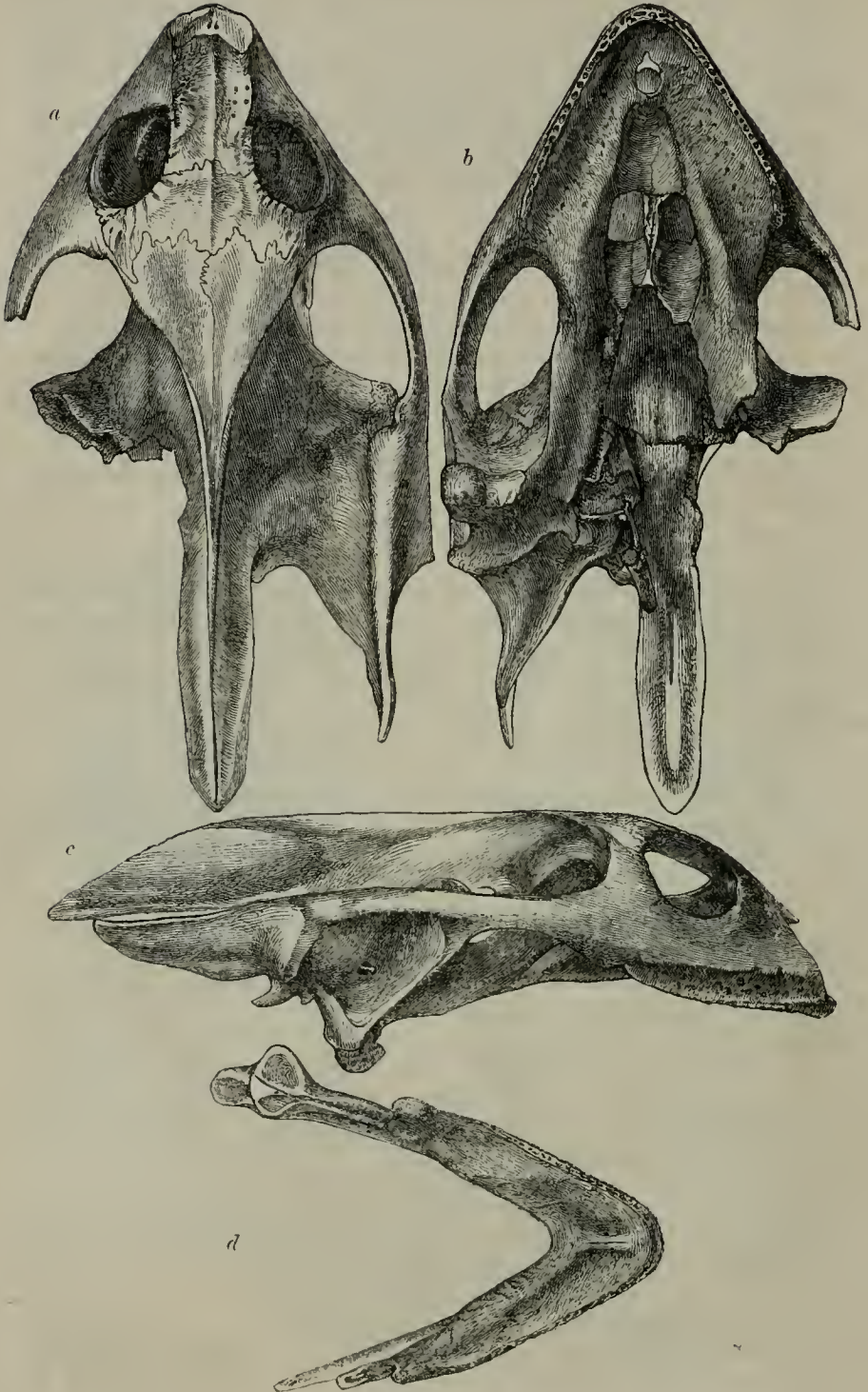
This skull is peculiar for the central palatine groove before the nostrils not being so wide as in *Trionyx*, and in being rather wider and much deeper before than behind.

1. ISOLA PEGUENSIS. (Fig. 5, p. 52.)

B.M.

Head pale olive above, minutely and closely punctate with black. Lips and beneath whitish.

Fig. 5.

*Isola pequensis.*

Trionyx? peguensis, Gray, Suppl. Cat. Sh. Rept. p. 99; Ann. & Mag. Nat. Hist. 1872, x. p. 337.

Hab. India (Pegu, Theobald's coll.).

5. LANDEMANIA.

Landemania, Gray, P. Z. S. 1869, p. 212; Suppl. Cat. Sh. Rept. p. 96.

Skull tapering in front; nose short; space between the square nose-hole and the orbit about half the diameter of the latter; the palate with a rather elongated, somewhat broad, deep concavity from the front to the internal nostrils, which are nearly on a line with the front end of the zygomatic cavity; alveolar surface gradually becoming wider and broader on the hinder part of the sides. Lower jaw much produced in front, contracted on the sides, with a deep concavity on the upper surface, which is very long. Hinder part of the sides with a deep concavity; edge with a convexity on the inner side, and a deep ridge on the outer side.

Length of skull $2\frac{1}{4}$ inches; width $1\frac{3}{8}$ inch.

The skulls from different specimens from China vary considerably. The nose in some is longer than in others; they show a gradual passage in this respect. The length of the under jaw shows a similar variation. In two of the specimens the front of the alveolar surface, which is deeply concave, is smooth; but in the other, which was from the half-dried specimen of *Landemania irrorata*, there is a slight indication of a central longitudinal keel. The hinder part of the alveolar surface on the side is not quite so concave; but I see no other appreciable difference. (See fig. 6.)

Fig. 6.



Landemania perocellata.

The genus *Landemania* was first described from a specimen that had been dried before it was placed in spirit; and the rugosity on the surface is very slight, if not produced by accident. At any rate, I think it wants confirmation. I believe, after comparing its skull with the skull of *Trionyx perocellatus*, also from China, that it is

identical with that species. The skin shows the white spots on the underside of the head.

1. LANDEMANIA PEROCELLATA. (Fig. 6, p. 53.)

Head olive above, with a black streak from the back edge of the eye, extending along the upper part of the sides of the neck.

Trionyx perocellatus, Gray, Cat. Tort. B. M. p. 48; Cat. Sh. Rept. p. 65, t. 31 (animal in spirit).

Potamocheilus? perocellata, Gray, P. Z. S. 1864, p. 86.

Landemania? perocellata, Gray, P. Z. S. 1869, p. 216; Suppl. Cat. Sh. Rept. p. 96; Ann. & Mag. Nat. Hist. 1872, x. p. 338.

Landemania irrorata, Gray, P. Z. S. 1869, p. 218, fig. 18; Suppl. Cat. Sh. Rept. p. 96, fig. 31 (sternum, from dried specimen).

Trionyx tuberculatus, Cantor's drawings, Gray, P. Z. S. 1861.

Potamocheilus tuberculatus, Gray, P. Z. S. 1864, p. 87; Suppl. Cat. Sh. Rept. p. 105.

Hab. China (Chusan).

The specimen figured in the Cat. Sh. Rept. has the head olive, with a few irregular black spots, with a long narrow streak from the back edge of the eye, and two or three streaks from the lower edge of the eye towards the lips; front extending towards the nostrils; lips and throat with large white spots; dorsal disk smooth (in spirit), the odd bone united to the rest of the disk; four sternal callosities distinctly marked, but the front odd bone is smooth.

The dorsal disk convex, with a longitudinal depression on each side of the central linear prominence; the odd bone large, transverse, united to the whole length of the dorsal disk.

There is a specimen in the British Museum with the sternal callosities not so much developed; and the odd bone in front of the sternum, which is V-shaped, has short arms, not so long as the breadth of the triangle. It is smooth, and not marked with callosities; but otherwise the two specimens are exceedingly alike.

The skull of the specimen described as *Landemania irrorata* is tapering in front; between the transverse nose-hole and the orbit about half the length of the diameter of the orbit; palate with a broad shallow impression between the front and the nostrils, which becomes narrower behind; alveolar surface broad, especially behind. Lower jaw produced in front, triangular, sides rather concave; alveolar surface concave, broad in front, with a slightly elevated central longitudinal ridge, rather narrower on the sides behind, and deeply concave, with a strong ridge on the outer side.

Length from nose to condyle $2\frac{1}{8}$ inches.

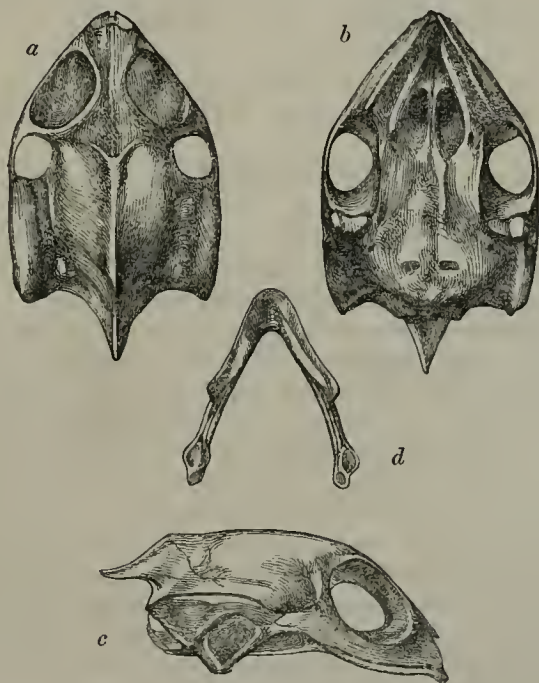
A skeleton of a specimen received from Mr. Swinhoe. The front bone of the dorsal shield very wide, nearly as wide as the second bone, united through its whole length to the second bone; front pair of bones to the sternum subcylindrical; the pair of lateral bones on the sternum united together by a minutely dentate suture.

Dr. Cantor's drawing, which I had described as *Trionyx tuberculatus* and *Potamocheilus tuberculata* in the Cat. Sh. Rept. p. 105, is most probably only a variety of this species.

6. IDA.

Animal only known in the young state, not exhibiting the dorsal bones. Sternal callosities not developed, but apparently like *Landemania*. Skull short, broad; nose very short, contracted in front, not one third the length of the large orbits, which are only separated by a very narrow forehead; palate with a rather broad and deep groove before the internal nostrils; alveolar process broad. The lower jaw slender, tapering, regularly rounded in front; alveolar surface broad and concave in front, with a sharp raised outer edge; sides narrow, concave on the inner side of the alveolar surface, with a raised inner and outer edge. This genus is at once known from *Landemania* and *Dogania* by its shorter and more rounded nose, and by the much weaker lower jaw, and especially from the latter genus by the lower jaw not being narrowed on the front of the outer edge.

Fig. 7.

*Ida ornata.*

1. IDA ORNATA. (Fig. 7.)

Young only known.

Back pale brown, with large irregularly disposed solid black spots, those on the dorsal keel and on the front of the sides largest; the head darker, with white spots of irregular size and form on the chin and lower side of the neck; legs dark, with small white spots on the front of the narrow edge.

Trionyx ornatus, Gray, P. Z. S. 1861, p. 41, t. 5 (young); Ann. & Mag. Nat. Hist. 1860, vi. p. 208, 1861, vii. p. 422.

Aspilus? ornatus, Gray, P. Z. S. 1864, p. 85; Suppl. Cat. Sh. Rept. p. 103 (part).

Hab. Camboja (*Mouhot*). Two specimens in the British Museum.

The specimens are without distinct sternal callosities; but the V-shaped front bone, the large triangular anal bones, and the lateral bones are seen through the skin, apparently indicating four sternal callosities, and probably the roughness of the surface of the V-bone, which is found in the species of *Landemania*; but it is very desirable to obtain adult specimens.

The skull of the young specimen is short and broad, with the nose shelving down rapidly in front; the orbits are very large, more than three times the length of the nose in diameter; the space between the eyes is very narrow; the palate has a rather broad and deep groove in front, rather wider behind; alveolar process broad. Lower jaw moderate, concave in front, with a sharp edge before and on the sides; sides much narrower, slightly concave behind, with a raised edge on the inner side.

7. DOGANIA.

Dogania, Gray, P. Z. S. 1864, p. 82; Suppl. Cat. Sh. Rept. p. 106, fig. 36 (skull).

Sarberia, Gray, P. Z. S. 1869, pp. 212–220; Suppl. Cat. Sh. Rept. p. 109 (adult).

Skull tapering in front. Nose very short; space between the square nose-hole and the orbit less than half the diameter of the latter; internal nostril opening halfway between the front, and in a line with the front of the zygomatic cavity; palate short, the space between the front and the front end of inner nostrils broad, concave, rather deep, and scarcely narrower behind. Lower jaw with a moderately broad alveolar surface, the front end deeply concave, leaving a sharp edge; the hinder part flattened, very slightly concave, narrow in front, and gradually wider behind. Length to condyle $2\frac{1}{8}$ inches; breadth at ears $1\frac{1}{2}$ inch. (Fig. 8, p. 57.)

When describing the genus *Sarberia*, I observed that it was in many respects allied to *Dogania*, but it appeared to have four callosities. "The upper surface of the beak is concave, narrow in front, and wider behind; but it is difficult to compare a head with the beak on with a prepared skull without a beak." When the skull was extracted it was found to be exactly like *Dogania*.

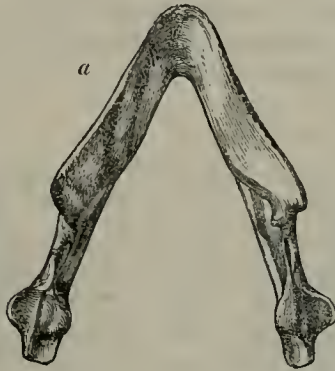
It is remarkable that of this Tortoise, which is sold in the markets, and is much esteemed for its flesh in Singapore, I have never seen, and do not believe that there is in Europe, an adult specimen.

Probably in this species the callosity and pits are developed later than is usual in the other kinds of the family.

The young specimens in the Museum have the odd or single bone of the back quite separate from the dilated ribs, as in the other young Mud-tortoises; and the surface is without any rugosity, or only shows obscure indications that it may become callous and pitted. In the specimen described as *Dogania güntheri*, which may be a small spe-

cies of the genus or an undergrown state of the animal, the upper surface of the odd bone is rather callous for a great part of its length, and with a few pits on its hinder margin; therefore I strongly suspect that, in the adult specimens, the bone is united to the ribs with a callous and pitted surface, as in the *Trionychina*.

Fig. 8.

*Dogania subplana*.

1. DOGANIA SUBPLANA. (Fig. 8.)

Head pale-spotted, with a dark streak from the side of the nose to the orbit.

Trionyx subplanus, Geoff. Ann. Mus. iv. p. 11, t. 3. fig. 2; Gray, Illustr. Ind. Zool. t., from Hardwicke's drawing (young).

Dogania subplana, Gray, Cat. Tort. B. M. p. 49, 1844; Ann. & Mag. N. H. xii. 1863, p. 158; Cat. Sh. Rept. p. 69, t. 33, in spirit; P. Z. S. 1862, p. 265, 1864, p. 83, figs. 1, 2, 3 (skull), 1869, p. 213; Suppl. Cat. Sh. Rept. p. 106, fig. 35 (skull).

Trionyx frenatus, Gray, Cat. Sh. Rept. p. 67 (part).

Potamochelys? frenatus, Gray, P. Z. S. 1864, p. 87.

Sarbieeria frenata, Gray, P. Z. S. 1869, pp. 212-220; Suppl. Cat. Sh. Rept. p. 100.

Hab. China and Formosa (*Swinhoe*); Singapore? (*Wallace*); not the Ganges, as erroneously stated by Duméril and Bibron.

Gen. Hardwicke's specimen, figured in his drawing, which is copied in the 'Illustrations of Indian Zoology,' is in the Museum. The front lateral bone of the sternum has indications of rugosity on the inner part of the hinder edge; but this rugosity is of an irregular shape, not like the linear lateral callosities of *Aspilus*. All the other sternal bones are smooth; but the animal is evidently immature, just noticed as a variety of *Trionyx frenatus*. The sternum of the specimen described in Cat. Sh. Rept. as *Sarbieeria frenata*, brought from Singapore by Mr. Wallace, is about half the size of the former. The front and hinder lateral bones are marked with a number of dots and inosculating lines, as if they were to have, when they become older, callosities covering the greater part of the central lateral portion, very unlike the linear callosities of *Aspilus*.

The hinder bones have some very indistinct inosculating lines on their surface, which I thought indicated that in a more perfect state they would have distinct callosities; and I am by no means sure that this may not be the character of the genus; and I think it very probable that the animal figured as *Trionyx subplanus*, which is the type of the genus *Dogania*, and *Sarbieria frenata* are the same species.

The chief difference between the two specimens is that the larger one has the back edge of the odd bone slightly rugose, forming an indistinct lunate cross band, whereas the surface of this bone in the smaller specimen is quite smooth.

2. DOGANIA GUENTHERI.

Dogania güntneri, Gray, P. Z. S. 1862, p. 264.

Trionyx güntneri, Günther, Rept. Brit. Ind. i. p. 49, t. 6. fig. 4.

The odd bone in front of the dorsal disk not quite so distinctly separated as in the other species; the greater part of its upper surface pitted and callous; a broad semiovate notch in the hinder margin. Inner part of the hinder edge of the lateral sternal bones rather rugose; and this is the case with the whole inner portion of the hinder lateral bone.

The whole surface of the hinder pair of bones is more or less rugose, indicating, I think, that the inner part of the lateral bones, and greater part of the hinder bones, are punctate and callous in the adult, as in *Trionyx*.

The animal from which this species is described has been dried without preparation.

8. PLATYPELTIS.

Platypeltis, Gray, P. Z. S. 1869, p. 214; Suppl. Cat. Sh. Rept. p. 107.

Skull [imperfect behind]; face tapering, rounded in front; nose-hole large, rather longer than broad, with the nasals acute and projecting above in front; space between the nose-hole and the orbits less than half the diameter of the orbit. Alveolar surface of the upper jaw moderate, gradually wider, and then of equal width its whole length, with a raised inner margin. Groove in the centre of the palate broad, rather deep, gradually broader behind, as wide as the front of the large inner nostril, and continued on the sides. Lower jaw strong; alveolar surface concave, with a sharp outer edge, broad and most concave in front, narrow and of nearly the same width to the base of the ascending rami.

1. PLATYPELTIS FEROX. (Fig. 9, p. 59.)

Upper part of the head brown, with a black streak from the base of the nose to the back of the eye, and continued from the lower part of the back of the eye. Back of the dorsal disk with a longitudinal series of small spines.

Testudo ferox, Pennant, Phil. Trans. xli. p. 266, t. 10. fig. 5 (copied in Shaw's Zool. iii. p. 64, t. 17. fig. 1); Gray, Cat. Sh. Rept. p. 68.

- Trionyx georgicus*, Geoffr. Ann. Mus. iv. p. 7 (from Pennant).
Trionyx ferox, Leconte, Ann. Lyc. N. York, 1830, iii. p. 393.
La Molle, Lacépède, Qu. Ov. et Serp. i. p. 137, t. 7 (from Pennant).
Gymnopus spiniferus (part), Duméril et Bibr. Erpét. Gén. ii. p. 477.
Aspidonectes ferox, Wagl. Syst. t. 2. figs. 34 & 35.
Platypeltis ferox, Fitz. Rept. p. 30; Gray, P. Z. S. 1869, p. 214; Suppl. Cat. Sh. Rept. p. 107; Agassiz, Contrib. t. 6, fig. 3 (young).
Trionyx frenatus, a, Gray, Cat. Sh. Rept. p. 67 (young).
Gymnopus javanicus, Bibr. MSS. Mus. Zool. Soc.

Fig. 9.

*Platypeltis ferox.*

The skull of a young specimen received from the Zoological Society has the head depressed; nose tapering in front; nose-hole large, wider behind, with the upper edge prominent in the middle; distance between the nose-hole and the orbit $\frac{1}{3}$ the diameter of the latter; orbits large, close together; alveolar surface narrow in front,

gradually wider behind ; central groove wide, rather deep, as wide as the front edge of the large internal nostrils. Lower jaw rather weak ; alveolar surface with a sharp edge, shelving inwardly ; front part widest, concave ; sides rather narrower, with a concave upper edge, gradually becoming narrower behind to the condyle. Length of the skull to condyle $1\frac{1}{8}$ inch ; diameter $\frac{3}{4}$ inch.

This specimen was named *Gymnopus javanicus* by Bibron, and was described by me as *Trionyx frenatus* in the Cat. Sh. Rept. p. 67, where I thought it was the same as a Tortoise I had received from Mr. Wallace, from Singapore : but the examination of the skulls has shown that the former is the young of the North-American *Platy-peltis ferox* ; and the latter proves to be merely a specimen of *Dogania subplana* approaching maturity, which I had named *Sarbieeria frenata*, an Asiatic species—showing the necessity of examining the jaws and skulls of these animals.

9. CALLINIA.

Callinia, Gray, P. Z. S. 1869, p. 221 ; Suppl. Cat. Sh. Rept. p. 108.

Head elongate, rather thin, produced in front ; nose-hole large, nasal bones projecting into its upper surface, acute ; orbits large ; palate with a wide shallow central depression, as wide as the large internal nostrils, and continued along its sides. Lower jaw weak, thin ; alveolar margin concave, much wider in front, narrower on the sides, especially behind.

* *The skull rather rounded in front ; nose-hole as broad as long ; lower jaw rounded in front.*

1. CALLINIA SPINIFERA. (Fig. 10, p. 61.)

Trionyx spiniferus, Lesueur, Mém. Mus. xv. p. 258, t. 15.

Aspidonectes spinifera, Agassiz, Contrib. p. 403, t. 6. figs. 1 & 2.

Gymnopus spiniferus (part), Dum. et Bibr. Erpét. Gén. ii. p. 477, t. 22. fig. 1.

Callinia spinifera, Gray, P. Z. S. 1869, p. 220 ; Suppl. Cat. Sh. Rept. p. 109.

Trionyx ferox (part), Gray, Cat. Sh. Rept. p. 63.

Trionyx ferox, e, Holbrook, Herpet. N. Amer. ii. t. 1.

Trionyx argus, Gray, Cat. Sh. Rept. p. 68.

Tyrse argus, Gray, Knowlesley Menag. t.

Young.—Back with dark rings.

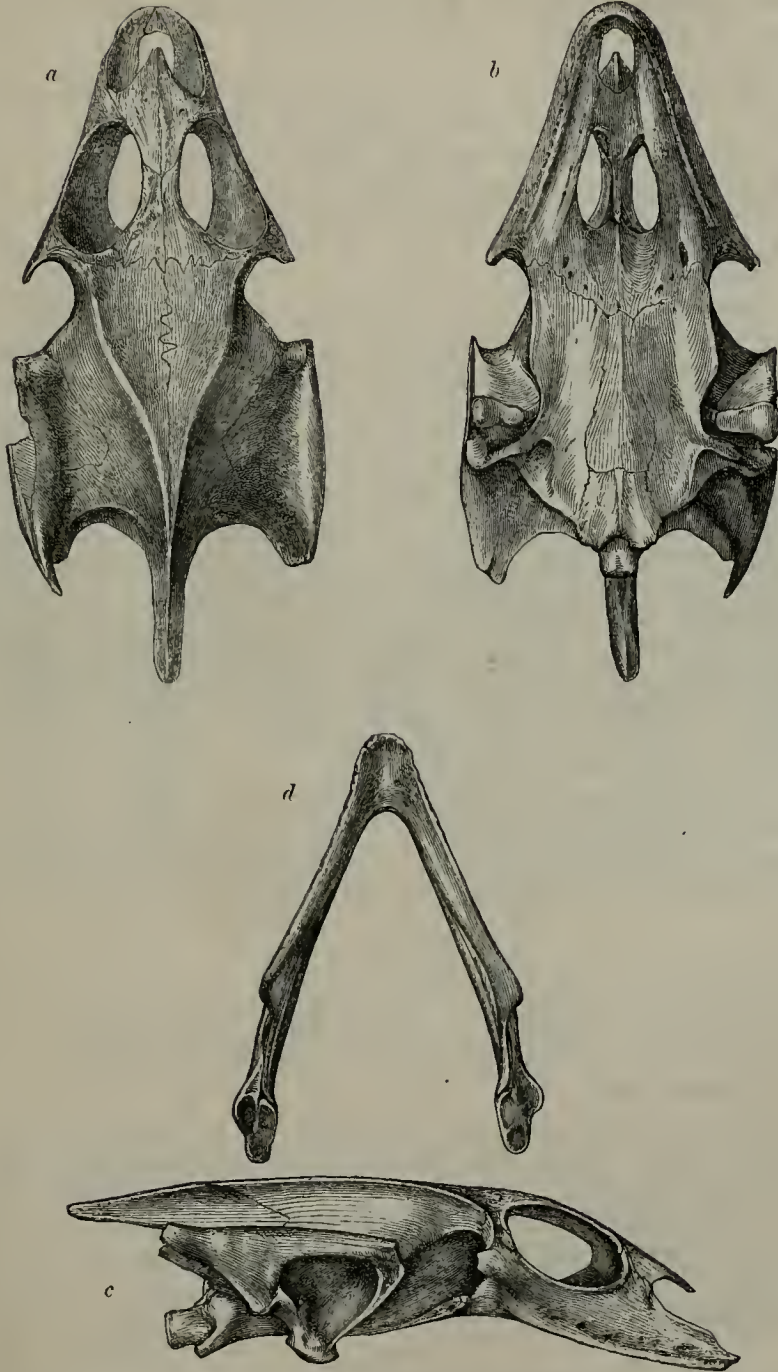
Trionyx ocellatus, Lesueur ; Wied, Voy. Amér. Sept. iii. p. 244.

Trionyx annulatus, Wied, Voy. Amér. Sept. iii. p. 242.

Hab. North America.

Skull elongate, produced in front, rounded at the end ; nose-hole large, as broad as long, with the nasal bones projecting into the upper surface, acute ; orbits very large ; palate with a wide, rather shallow, central depression, as wide as the front of the large nostrils, and continued round the sides of the nostrils, and rather wider than they behind. Lower jaw rather weak, regularly tapering in front, where it is rounded ;

Fig. 10.



Callinia spinifera, enlarged.

alveolar margin concave, much wider in front, narrower on the sides, and becoming narrower at the end. Length to condyle $1\frac{1}{2}$ inch; breadth at ears $\frac{7}{8}$ inch.

** *Skull very slender in front; nose-hole longer than broad; lower jaw contracted in the front of the side margin.*

2. *CALLINIA MICROCEPHALA.* (Fig. 11, p. 63.)

Potamochelys? microcephala, Gray, P. Z. S. 1864, p. 87.

Callinia microcephala, Gray, P. Z. S. 1869, p. 220; Suppl. Cat. Sh. Rept. p. 108.

Hab. Borneo, Sarawak.

Skull slender, rather thin; nose much attenuated and acute in front, not quite as long as the diameter of the orbit; nose-hole very large, with the nasal bones acute and projecting into the upper surface; space between the side of the nose-hole and the orbit very small, not a quarter the size of the diameter of the large orbit; forehead lozenge-shaped, elongate; palatine surface nearly flat, with a wide, rather shallow groove, which is as wide as the front of the large internal nostrils, and continued as a line along their outer sides. Lower jaw very slight and slender, rather produced in front, where the rami are united, about one third the length of the front part of the jaw to the condyle; alveolar surface narrow, acute in front, which is concave internally and on the sides, where the jaws are compressed. Length of skull $1\frac{1}{2}$ inch; breadth $\frac{3}{4}$ inch.

The skull is something like *Tyrse*; but the nose is shorter, nose-hole much larger and extending up the sides of the face; anterior central groove not so large behind.

The skull is very like *Callinia spinifera*, but is much more slender, and more sharp and attenuated in front; and the lower jaw is also much more attenuated and rather contracted on the front of the sides; the nose-hole is narrower and more elongate.

10. *AMYDA.*

Amyda, Gray, Suppl. Cat. Sh. Rept. p. 95.

This is one of the few Mud-tortoises that I have not seen.

Agassiz says, "The lower jaw is sharp-edged all round."

1. *AMYDA MUTICA.*

Trionyx muticus, Lesueur, Mém. Mus. xv. p. 237, fig. 7; Holbrook, Herp. N. Amer. ii. p. 19, t. 2; Gray, Syn. Rept. p. 46; Cat. Sh. Rept. p. 69.

Gymnopus muticus, Dum. et Bibr. Erpét. Gén. ii. p. 482.

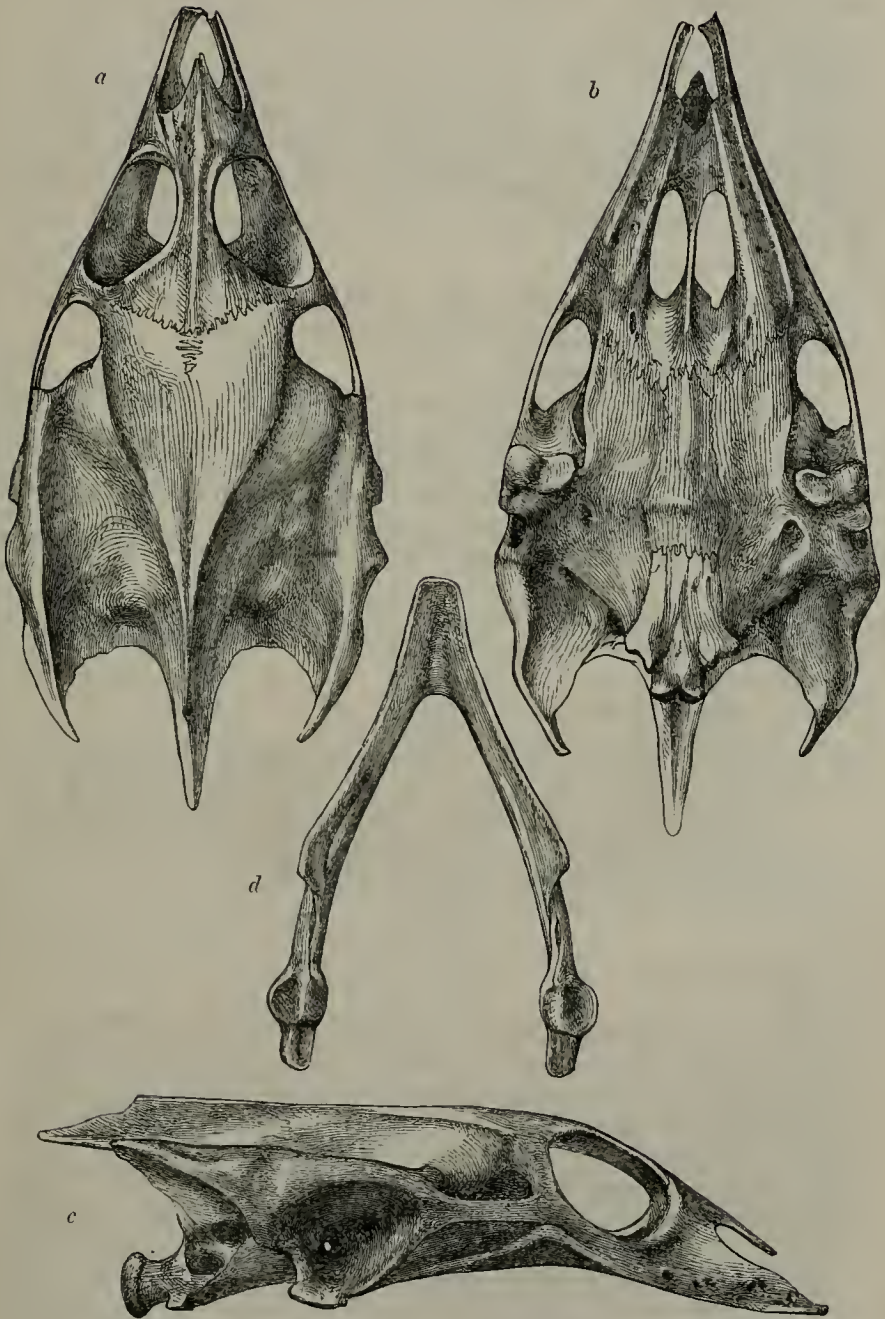
Amyda mutica, Agassiz, Contrib. p. 390, t. 6. figs. 6, 7 (very young); Gray, Suppl. Cat. Sh. Rept. p. 95.

Hab. N. America (*Lesueur*).

11. *TYRSE.*

Tyrse, Gray, P. Z. S. 1864, p. 87; Suppl. Cat. Sh. Rept. p. 107 (skull); Gray, Cat. Sh. Rept. t. 42. f. 2; Tortoises, Terrapins, and Turtles, tab. (skull and skeleton).

Fig. 11.



Callinia microcephala, enlarged.

Skull elongate; nose conical; the distance from the front of the orbit to the aperture of the nostril about half as long again as the diameter of the orbit; the groove in front of the palate very wide, rather shallow and very much wider behind, so as to include the outside of the internal nostrils.

In the skull of a smaller specimen brought from the Euphrates by Capt. Chesney, the length of the space from the front of the orbit to the aperture of the nostril is much less, not longer than the aperture of the orbit, which is larger for the size of the skull than in the larger Egyptian specimens.

2. TYRSE NILOTICA.

Head and limbs and shield covered with equal round white spots; chin and throat with larger white spots; beneath white.

Testudo triunguis, Forskal.

Trionyx ægyptiacus, Geoffroy, Ann. Mus. iv. p. 7, tab. (animal, good); Egypt. i. p. 116, t. 1.

Gymnopus ægyptiacus, Dum. et Bibr., Erp. Gén. ii. p. 484.

Trionyx niloticus, Gray, Syn. Rept. p. 46; Cat. Sh. Rept. p. 68, t. 42. f. 2 (skull).

Tyrse nilotica, Gray, Cat. Tort. B. M. p. 48; Suppl. Cat. Sh. Rept. p. 108.

Trionyx labiatus, Bell, Test. tab. (with skeleton).

Aspidonectes aspilus, Cope, Proc. Acad. Nat. Sci. Philad. 1859, p. 205 (adult).

Hab. River Nile.

- B. *Dorsal disk with a broad transverse odd bone in front, which is united to the rest of the disk by a straight suture in the adult; lateral bones of the sternum expanded, and covered with well-developed callosities on the whole surface; posterior pair of bones slender, not dilated, without callosities.*

RAFETUS.

Rafetus, Gray, P. Z. S. 1864, p. 81; Suppl. Cat. Sh. Rept. i. p. 103.

Skull broad, depressed; nose rounded; nose-cavity square, large; space between the nose and the orbits one third the diameter of the latter; palate rather concave; alveolar surface narrow in front, wider, and with an internal ridge on the sides behind; the groove in front of the palate very wide, rather deep, wider and deeper behind, rather wider than the front edge of the large internal nostrils, and forming a narrow margin to the outer sides of them. Lower jaw with a slightly convex chin; alveolar surface rather broader in front than on the sides, slightly concave, with a very indistinct central longitudinal line exceeding the whole width of the surface; hinder part of the sides narrower, with a longitudinal concavity, and with an elevated inner and more elevated outer edge. Length to occiput $3\frac{1}{2}$ inches; diameter at the front of the temple 2 inches.

The lateral bones of the sternum are entirely covered with callo-

sities, like the *Trionyx*, very unlike the narrow transverse callous band on the edges of the central suture in *Aspilus*. The hinder sternal bones are smooth.

The skull is exceedingly like that of *Trionyx*; but the front of the upper jaw is broader and rounded in front. The distance between the orbit and large quadrangular transverse nose-hole is not half the length of the diameter of the large orbit. The alveolar surface of the upper jaw is moderate, rather narrow in front, and gradually rather broader at the hinder part. The longitudinal depression in front of the inner nostrils is moderately deep, rounded in front, and rather broader behind.

1. *RAFETUS EUPHRATICUS*. (Fig. 12, p. 66.)

Testudo rafeht, Oliv. Voy. Pers. ii. p. 453, t. 41 (copied, Shaw's Miscell. t. 2. p. 907).

Testudo euphraticus, Daud. Rept. ii. p. 305 (from Olivier).

Trionyx euphraticus, Geoff. Ann. Mus. iv. p. 17 (from Olivier).

Gymnopus euphraticus, Dum. et Bibr. Erp. Gén. ii. p. 498.

Tyrse rafeht, Gray, Cat. Tort. Brit. Mus. p. 49.

Trionyx rafeht, Gray, Cat. Sh. Rept. Brit. Mus. p. 85, t. 30.

Rafetus euphraticus, Gray, P. Z. S. 1864, p. 81, 1869, p. 213; Suppl. Cat. Sh. Rept. p. 104.

Hab. Euphrates (*Chesney and Loftus*); Tigris (*Olivier*).

C. *Dorsal disk truncated in front, with the odd bone separate from it, and with a rounded central callosity in the adult; lateral bones of the sternum expanded, with a narrow linear callosity on each side of the central suture; posterior pair of bones slender, not dilated, without callosities.*

The dorsal disk is truncated or concave on the front edge; the front edge of the first vertebral bone is generally rounded and prominent in front towards the rounded callosity in the middle of the separate front odd bone.

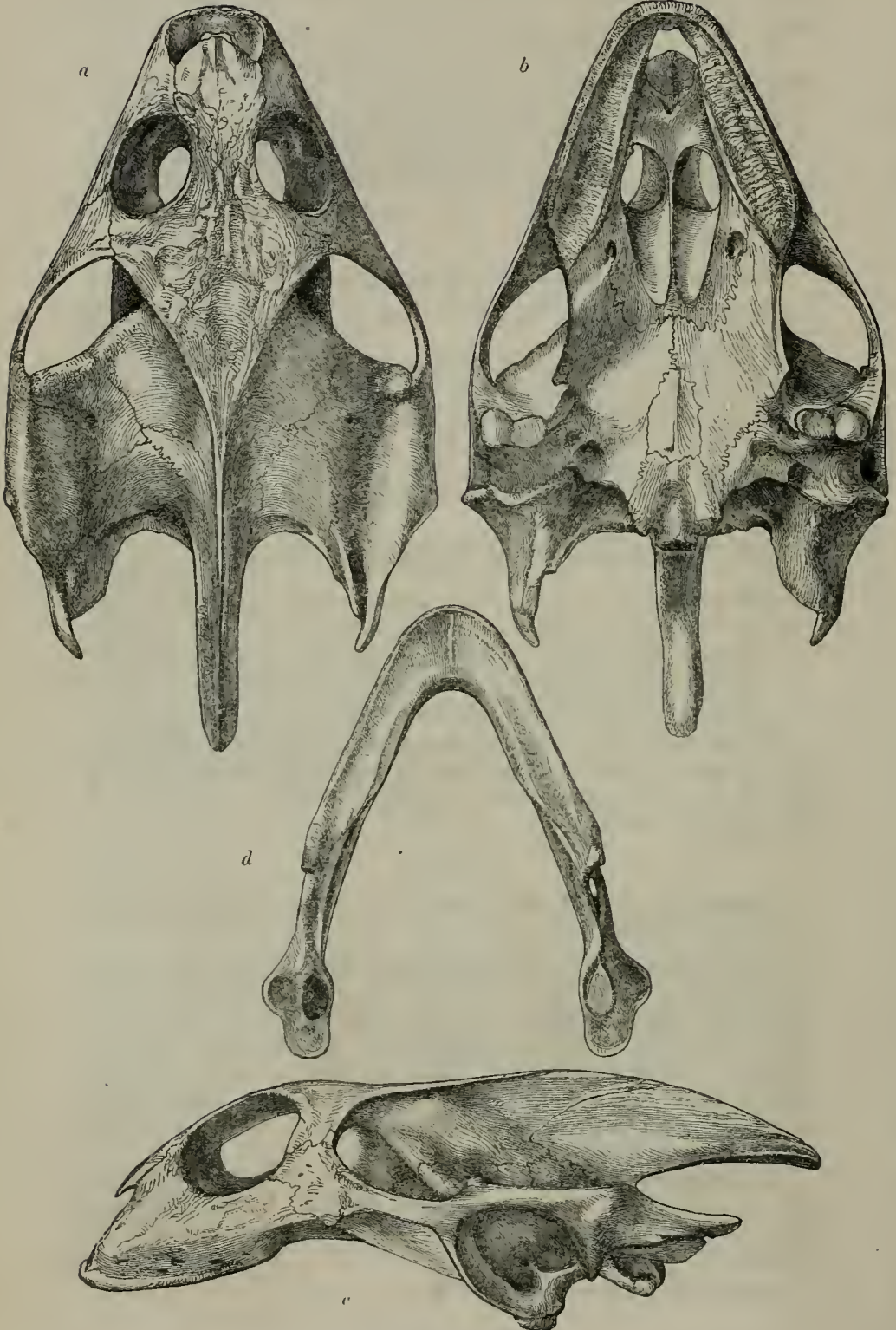
ASPILUS.

Aspilus, Gray, P. Z. S. 1864, p. 84, f. 4-6; Suppl. Cat. Sh. Rept. p. 102, f. 33 (skull).

Skull tapering in front; the short space between the square nose-hole and the orbits less than half the diameter of the latter, which are large and rather close; palate broad, rather deep, of the same width the whole length; alveolar process broad behind, gradually narrower in front. Lower jaw with a concave alveolar surface, rather broad in front, with a central longitudinal ridge, more prominent in the centre of its length, and with a somewhat deeper concavity on each side of the ridge.

The young specimens have the odd bone in front of the dorsal disk separate, smooth, and covered with the skin. In the older specimens it becomes nearer to the front edge of the dorsal disk, and has a small circular central callosity.

Fig. 12.



Rafetus cyphraticus.

* *Head and forehead with radiating black lines.*

1. ASPILUS GATAGHOL. The Gataghhol.

Testudo gataghhol, B. Hamilton, icon. ined.

Trionyx javanicus, Gray, Illustr. Ind. Zool. tab. (copied from Hamilton).

Aspilus gataghhol, Gray, Ann. & Mag. N. Hist. 1873.

Hab. India.

I have never seen a specimen of this species, but describe it on the authority of Dr. Hamilton's drawing.

The black radiations on the head are very like the rays on the head of *T. gangeticus*; but the original drawing and the copy in the 'Illustrations' show only two very narrow lateral callosities, which are characteristic of the genus *Aspilus*.

** *Head white-spotted.*

2. ASPILUS JAVANICUS. The Boulousse. (Fig. 13.)

Amyda javanica, Schweigger's MSS., quoted by Geoffroy.

Trionyx javanicus, Trionyx de Java, Geoff., Ann. d. Mus. vol. iv. p. 15, tab. iv. fig. 2.

Trionyx cariniferus, Gray, Cat. Sh. Rept. B. M. p. 67, t. 32 (from spirit).

Aspilus cariniferus, Gray, P. Z. S. 1864, p. 84, figs. 4-6 (skull), 1869, p. 213; Gray, Suppl. Cat. Sh. Rept. p. 101, fig. 33 (skull).

Aspidonectes javanica, Wagler, Amphib. Atlas, tab. 2. figs. 3-13 (fig. 3 copied from Geoffroy).

Gymnopus javanicus, Dumér. et Bibr., Erpét. Gén. ii. p. 493.

Hab. Java.

Fig. 13.



Aspilus javanicus.

Schlegel, in the 'Fauna Japonica' (tab. v. fig. 6), figures the head of a Mud-tortoise under the name *Trionyx stellatus*, var. *javanicus* which is mottled above and below; it probably represents this species.

A specimen in spirits, figured in the Cat. Sh. Rept. t. 30, received from Utrecht, with the dorsal disk about six inches long, does not show any indications of callosities, though it is quite as large as the two dried specimens in the British Museum (one from the same collection), which have these callosities well developed. This genus seems peculiar in having the front margin of the thorax rounded and its sides dilated so as partly to hide the feet when they are withdrawn.

A specimen from the Lao Mountains, collected by M. Mouhot (59, 7, 8, 8), mentioned under *Aspilus ornatus* (Suppl. Cat. Sh. Rept. p. 103), evidently belongs to this species.

Three young specimens from Ceram and Amboina have the callosities not developed. The white spots on the head and the large ones on the throat are so like those of larger specimens from Java in spirits in the British Museum, that I think they will prove to be only a younger state.

There is a young specimen in the British Museum, obtained from Mr. Bartlett, in spirits, the dorsal disk of which is pale brown, with large scattered pale spots, with ridges of lines, which are separated from one another, and larger in the hinder part of the disk.

There is a bleached specimen in spirits received from the Leyden Museum, which is very like a specimen figured in the 'Fauna Japonica.' Dorsal disk about six inches long and wide. It has no indications of the sternal callosities; and the form of the bones is seen through the skin. I think it most likely belongs to this species.

There is a rather smaller bleached specimen in the Museum, in spirits, received from Amboina.

II. *Emydina*. *The hinder lateral edge of the sternum with flaps to cover the hinder feet; front pair of bones of the sternum with callosities; the front odd bone of the dorsal disk united to the ribs, and sometimes with a small free bone in the margin before it.*

The similarity of the jaws and of the shape of the living *Cyclanosteus* which I had lately an opportunity of examining and figuring from life (P. Z. S. 1870, t. 43), to the animal of *Emyda*, is so great that I think they should be ranged in one group, and the family which I called *Emydidæ*, because the dorsal disk was armed with bones, should be abolished.

Some of the genera also have a rudimentary marginal bone in the front of the disk, as in *Emyda*, which has also posterior marginal bones.

These animals have the odd bone in front of the back united to the ribs in the adult age, so as to form a complete dorsal disk. The genera *Cyclanosteus*, *Emyda*, and *Heptathyra* of the former family have, in addition, a single bone in the centre of the front margin, which is distinct from the front of the odd bone; but the latter often has a notch in the front margin to receive part of it. This bone, I suppose, is a remnant of the marginal bones present in the other

families, like the bones on the hinder margin of the flexible edge of the shield, which is the peculiar character of the Indian genus *Emyda*. This bone is not to be observed in the young specimens of *Tetrathyra* and *Baikiea*.

Synopsis of the Genera.

* *The dorsal disk of adult without any marginal bones on the hinder lateral edge.* Africa.

† *The front and sides of alveolar edge of the lower jaw concave.*

BAIKIEA. Sternal callosities — ?

†† *Alveolar edge of the lower jaw sharp in front, wider on the sides.*

TETRATHYRA. Sternal callosities four—one pair anterior, and one pair lateral.

CYCLANOSTEUS. Sternal callosities nine—two pairs anterior, one pair lateral, one pair posterior, and a single one central.

** *The dorsal disk of adult with a regular series of internal marginal bones on the hinder lateral edge.* India.

EMYDA. Sternal callosities seven—a pair anterior, lateral, and posterior, and a single one central.

* *The dorsal disk of adult without any marginal bones on the hinder lateral edge.* Africa.

† *Front and sides of alveolar edge of lower jaw broad, slightly concave.*

BAIKIEA.

Baikiea, Gray, Suppl. Cat. Sh. Rept. p. 114, fig. 39 (skull).

The alveolar surface of the lower jaw flat, as wide in front as behind; margin of the dorsal disk in the very young specimen without any front central bone, and without any bones behind.

Hab. Africa.

The adult skulls in the British Museum received from Dr. Baikie are about five inches long; they are somewhat like the skulls of *Fordia africana*, but are much blunter and rounded in front.

1. BAIKIEA ELEGANS.

Cyclanosteus senegalensis (part), Gray, P. Z. S. 1864, p. 96, figs. 19–21 (skull only).

Baikiea elegans, Gray, P. Z. S. 1869, p. 222, t. (young); Suppl. Cat. Sh. Rept. p. 116, fig. 39 (skull).

Hab. Rivers of Western Africa, Dr. Baikie.

The adult state of the shell or bones of this species is not known with certainty, and therefore we cannot describe the sternal callosities; but I received some specimens of shells, with the jaws, which differed from the other specimens of *Cyclanosteus* in the relative size of the sternal callosities of this genus, and in their pro-

portional size as regards each other, which may be the shells of this genus.

In the Supplement Cat. Sh. Rept. p. 113, I thought that the variety with additional sternal callosities (fig. 38) might be a *Baikiea*; but since that time the British Museum has obtained a specimen with its head and limbs, and the examination of the jaws shows it is a true *Cyclanosteus*, and that the adult state of *Baikiea* is still a desideratum.

†† *Alveolar edge of the lower jaw sharp in front, wider and concave on the sides.*

TETRATHYRA.

Tetrathyra, Gray, P. Z. S. 1865, p. 332, fig.; Suppl. Cat. Sh. Rept. p. 110, fig. 36 (sternum).

Sternal callosities four, the lateral pair well developed, the anterior pair small and rounded, on the end of the front pair of bones. Hinder pair of sternal bones, and the odd anterior bone, small and without callosities. The flexible margin of the dorsal disk without any odd central bone in front, or any bones on the hinder margin.

The skeleton of this animal is only known in the young state; perhaps the front odd bone and the posterior bone may have callosities in the adult state.

The lower jaw is narrow and shelving internally in front, with a much wider concave alveolar edge on the side.

1. TETRATHYRA BAIKII.

Tetrathyra baikii, Gray, P. Z. S. 1865, p. 324, fig. of sternum; Ann. & Mag. N. H. 1865, xvi. p. 205, fig.; Suppl. Cat. Sh. Rept. p. 110, fig. 36 (sternum).

Hab. Rivers of Western Africa, Niger? (*Dr. Baikie*).

CYCLANOSTEUS.

Cyclanosteus, Gray, Suppl. Cat. Sh. Rept. p. 111, fig. 37 (skull).

Sternal callosities nine:—two pairs on the front pair of bones, the hinder pair generally the largest; a single semiovate callosity on the front central bone, generally longer than broad; one pair lateral, large, well-developed, deeply notched in the centre of the hinder edge; one pair posterior, on the separate simple posterior bones of the sternum: this pair is sometimes small and rounded, at others larger and ovate, placed obliquely as regards each other. The front part of the lower jaw is narrow and shelving, with a concave much wider alveolar edge on the side. The front bone of the dorsal disk short, broad, and transverse, differing in this respect from the much larger and longer first odd bone in *Heptathyra*. The front flexible margin of the dorsal disk with a well-developed central marginal bone.

1. CYCLANOSTEUS SENEGALENSIS.

Cryptopus senegalensis, Dum. et Bibr., Erpét. Gén. p. 505.

Emyda senegalensis, Gray, Cat. Tort. B. M. p. 47; Cat. Sh. Rept. p. 64; P. Z. S. 1860, p. 316 (junior).

Cyclanosteus (Cyclanorbis) petersii, Gray, P. Z. S. 1852, p. 135; Ann. & Mag. N. H. 1855, xv. p. 69.

Cyclanosteus petersii, Gray, Cat. Sh. Rept. p. 64, t. 29 (shield); P. Z. S. 1860, p. 315.

Cyclanosteus senegalensis, Gray, P. Z. S. 1864, p. 95, figs. 16–18 (skull); P. Z. S. 1865, p. 427; Suppl. Cat. Sh. Rept. p. 112, fig. 37 (skull), fig. 38 (sternum).

Hab. Rivers of Western Africa; Gambia, Senegal.

The different specimens of this species have the sternal callosities differing in shape and proportion as regards each other.

Thus the specimen figured as *C. petersii*, Cat. Sh. Rept. t. 29 (the skeleton in the Museum), has the central odd callosity half the width of the pair of bones before it, and the hinder pair of callosities small and roundish.

A second specimen in the Museum has the central odd callosity more than two thirds the width of the pair of callosities before it; and the hinder pair of callosities is ovate, nearly the whole length of the bones on which they are situated, and are diverging from each other. This specimen has an additional callosity on the right side of the odd callosity. There is another specimen in the Museum which has this additional callosity on each side of the central callosity (see Suppl. Cat. Sh. Rept. p. 113, fig. 38).

There is a third specimen, which differs in the odd central callosity being transverse and subtriangular, and nearly as broad as the pair of bones before it (see Suppl. Cat. Sh. Rept. p. 113, fig. 38a, where these callosities are figured). In this specimen the hinder callosities are entirely wanting or, rather, undeveloped.

** *The dorsal disk with a regular series of marginal bones on the hinder lateral edge, and with a single marginal bone in front, all callous and rugose externally.*—India.

EMYDA.

Emyda, Gray, Suppl. Cat. Sh. Rept. p. 117, and fig. 24, p. 105 (skull, as *Pelochelys stellata*); Ann. & Mag. Nat. Hist. 1872, x. p. 340.

Lower jaw with a narrow edge, and shelving internally in front, with a wide concave alveolar edge on the sides.

The dorsal disk with a central bone, callous on the outer side in the middle of the front margin, rather large and separate from but received into a notch in the front edge of the odd bone of the dorsal disk. A regular series of bones, which are callous externally on the hinder lateral margin. Sternum with seven callosities—one pair anterior, one pair lateral, and one pair posterior, and one single central callosity, which is generally of a roundish form.

1. EMYDA PUNCTATA.

Anal callosities oval, oblique, inner edge of each rounded.

Testudo punctata, Lacép. Qu. O. t. 171.

Testudo scabra, Latr. Rept. i. p. 194.

Testudo dura, B. Hamilton, icon. ined.

Testudo granulata, Daudin, Rept. ii. p. 81, t. 19. f. 2; Shaw, Zool. iii. p. 68, t. 14. f. 1.

Testudo granosa, Schœpf, Test. p. 127, t. 30 *a, b*.

Trionyx coromandelicus, Geoffr. Ann. d. Mus. iv. p. 16, t. 5. f. 1.

Trionyx granosus, Schweigg. Prod. p. 208; Wagl. Syst. Amphib. p. 134, t. 2. f. 2, 33; Gray, Illustr. Ind. Zool. ii. t. 64; Schlegel, Faun. Japon. p. 35, t. 5. f. 4 (not Cuvier).

Cryptopus granosus, Dum. et Bibr. Erpét. Gén. ii. p. 501.

Emyda punctata, Gray, Syn. Rept. p. 50; Illustr. Ind. Zool. ii. t. 62 (young); Cat. Tort. B. M. p. 46; P. Z. S. 1855, p. 201; Cat. Sh. Rept. p. 63; Suppl. p. 117; Tort. Terrap. & Turt. t.; Ann. & Mag. N. H. 1872, x. p. 340.

Emyda granosa, Theobald, Journ. Linn. Soc. 1868, x. p. 18.

Emyda vittata, Peters, Monatsb. 1854, p. 216.

Emyda scutata, Peters, Monatsb. 1868, p. 440; Gray, Suppl. Cat. Sh. Rept. p. 117. "

Potamochelys stellata, Gray, P. Z. S. 1864, p. 85, figs. 7 & 8 (skull only); Suppl. Cat. Sh. Rept. p. 105, f. 34 (skull only).

General Hardwicke figures a spotted example of this species from life, which is copied as *T. punctata*, junior, Gray, Illustr. Ind. Zool. tab. His drawings also contain the figure of a much larger specimen from Futtehghur, which he says is "Bungoma," the country name for the land Tortoise commonly called Terrapin. Back uniformly olive-green, upper part of head, neck, and limbs green, with two pale orange spots on each side of the crown of the head. Lower side with sternal callosities well developed. These figures are copied in my Illustr. Ind. Zool. under the name of *Trionyx granosus*.

It seems to be a very generally distributed animal in all parts of India; and the size of the tubercular plates on the sternum increases and alters in shape with age; and the Tortoise varies considerably in colour, both from age and also, perhaps, from other causes.

2. EMYDA CEYLONENSIS.

Caudal callosities angular, parallel; inner edge straight.

Trionyx granosus, Cuvier, Oss. Foss. v. p. 206, t. 12. f. 47.

Emyda ceylonensis, Gray, Cat. Sh. Rept. p. 64, t. 29*a*; P. Z. S. 1855, p. 201, 1864, p. 98; Suppl. Cat. Sh. Rept. p. 117.

Hab. Ceylon.

Dr. Peters, in the Monatsb. 1854, p. 216, describes an *Emyda vittata*, and in 1868, p. 440, of the same work, describes an *Emyda scutata*. I had thought that the former was the same as my *Emyda ceylonensis*; but in a letter which Dr. Peters wrote to me (on the 26th February, 1871), he observes, "my *Emyda vittata* is quite different from *Emyda ceylonensis*, having the abdominal plates much smaller, and being in this respect more like *Emyda punctata*. My *E. scutata*, on the contrary, more resembles *E. ceylonensis*."

Dr. Kelaart describes the Ceylonese species as marked with indistinct brown stripes on the back and head, characters which Dr. Peters gave to *E. vittata*.