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45. Notes on East African Tortoises collected 1921-1923,  
with the description of a new species of Soft Land  
Tortoise. By ARTHUR LOVERIDGE, C.M.Z.S., F.E.S.

(Plates I. & II.\*)

[Received August 14, 1923: Read November 6, 1923.]

The hundred tortoises dealt with in these notes were all taken in Tanganyika Territory (formerly German East Africa) by my native collectors; not more than half-a-dozen were found by myself. They represent three of the four families known to inhabit Eastern Equatoria.

For the convenience of other herpetologists a key to the species recorded from this region has been added to these notes. It is largely adapted from keys in Dr. Boulenger's 'Catalogue of Chelonia in the British Museum,' 1889, with the recently described species incorporated.

Taking them from East to West, the localities mentioned in the following pages are:—

*Morogoro District.*—Turiani, Mkata River, Uliya, Myombo, Ruaha, Godegode.

*Dodoma District.*—Pwaga, Kidenge, Ikikuyu, Dodoma, Kisaki, Kilamatinde, Mbonoa, Singida, Mjengo's.

*Kondoa-Irangi District.*—Mtali's, Zengeragusu, Ulugu.

*Tabora District.*—Tabora, Simbo, Tambali, Luguo, Wembere.

*Mwanza District.*—Sanga, Sagayo.

My thanks are due to Miss Joan B. Procter, F.Z.S., for advice and suggestions and the use of material in her charge, whilst writing up my field-notes. I have named the new species of soft-shelled land tortoise after her as some acknowledgment of her careful researches into the morphology and relationships of the strange group to which it belongs.

I am also indebted to Sir John Bland-Sutton for his gift of X-ray photos of the type which illustrate this paper and to Mr. Norman C. Miller, F.E.S., for making the water-colour drawing which forms the plate accompanying this article. Mr. Miller was staying with me at the time of the tortoise's decease and spared time from his work on the Orthoptera to make this sketch for me.

Mr. Stanley Hirst has also kindly named the few ticks found upon the tortoises. It is interesting to note that the four species of Testudinidæ, though coming from three widely separated localities, all bore the same tick, which I have never found on any other reptiles or mammals.

\* For explanation of the Plates see page 933.

## TESTUDINIDÆ.

## CINIXYS BELLIANA Gray.

Blgr. Cat. Chelonians, 1889, p. 143.

More than fifteen specimens from Turiana, Mkata River, Uliya, Myombo, Kilosa, Ikikuyu, Pwaga, Godegode, and Simbo.

Bell's Hinged Tortoise is very common at Kilosa, both on the swampy grasslands of the lower ground and on paths in the maiombo bush on the hillsides. They can live in water for days without drowning, apparently resting on the surface without effort. I was given one by an Indian who had dropped it down a well two days before, where it was when I found it, none the worse for its experience.

In the Kilosa sub-district, where the country is of the open maiombo-bush type with rank grass growing between the bushes, the shells are much deeper than in the rock-strewn or dense thornbush country such as Pwaga, where the thornbush covers many miles with a thick and impenetrable mat; rocks were found in the valleys and scattered here and there upon the hillsides, but those I came across did not seem to afford much cover for tortoises. The single Bell's Tortoise taken at Pwaga was very worn and depressed, as if it continually pushed its way beneath boulders. The Ikikuyu country is of a similar type to that at Pwaga, though there are more open, sandy, thornbush stretches on the low ground; the single specimen from this place was also depressed but not worn, the markings being distinct. Those from Simbo—similar country to Ikikuyu though a hundred miles or more west—were also worn and depressed, as has been remarked on elsewhere.

Locality.	Length.	Breadth.	Depth.	Depth.
Kilosa.....	190 mm.	125 mm.	90 mm.	47·5 per cent.
Pwaga.....	166 "	107 "	57 "	34·5 "
Ikikuyu ...	150 "	95 "	50 "	33·4 "
Simbo.....	148 "	95 "	57 "	33·5 "
" .....	145 "	95 "	57 "	39·4 "

My method of taking the depth was by placing the animal on its side between two blocks. Miss Procter measured with callipers at a given point, and as a depression in the plastron is frequent, our depths, and consequently depth per cent., are different, though both ways serve equally well to emphasise the depressed type of *Cinixys* inhabiting thornbush country.

The largest male (?) measured 190 × 125 × 90 mm. deep, the largest female 188 × 120 × 80 mm. The smallest example was taken at Uliya on 16.ii.21, and measured 50 × 46 × 25 mm. It is somewhat abnormal in that it has twelve instead of eleven marginals on either side.

On two occasions I have found several score of Lesser Stink Ants (*Paliothyreus tarsatus*) in the tortoise enclosure worrying

the reptiles. On the 23rd inst. two Bell's Tortoises were on their backs, and this morning another. This is either done in desperation or as a means of defence (24.ii.22). Nevertheless, two were dead yesterday; the two which I had found on their backs, I believe (Kilosa, 26. ii. 22).

Though there was plenty of grass in their enclosure one of the tortoises was found to be eating hard maize corn: it would pick up one in its jaws five or six times and drop it, then apparently swallowed it whole. Another was found nosing a large yellow carpenter bee (*Xylocopa nigrita*) and was munching something at the time. One of the hind legs of the bee was missing, and the insect itself was very freshly dead, having probably fallen from the beams above. I watched the tortoise return again and again to the bee, but it never bit it. One knows the preference of the Greek Tortoise for yellow flowers such as dandelions and buttercups. Is it possible that anything of a yellow colour attracts tortoises?

To judge by some of the damaged shells on tortoises which have been brought me, these creatures can sustain very severe injuries to the carapace and the latter heal up.

It is the rule rather than the exception at Kilosa for Bell's Tortoises to carry some half-dozen ticks (*Amblyomma marmoreum* Koch), each adhering to the fleshy portions of the hinge of their shells.

#### TESTUDO PARDALIS Bell.

Blgr. Cat. Chelonians, 1889, p. 160.

Thirty-three specimens were collected from Pwaga, Mbonoa, Singida, Mdjengo's, Mtali's, Zengeragusu, Ulugu, Tabora, Simbo, Tambali, Luguo, Wembere, Sanga, Sagayo.

The Leopard Tortoise is frequently found in grassy steppe country where there are scattered bushes, but it is also commonly met with on kopjes, and often at a surprising height, as in the case of one whose skeleton was found between two sloping rocks at the very top of what was practically a mountain. One wondered how many years it had taken to reach the summit, seeing that the mountain was largely composed of piled-up boulders; this adventurous individual would appear to have met its death by sliding down the smooth sloping rock and being unable to clamber up again (Mtali's, 9. x. 22).

At Pwaga, where I was only camped for one afternoon, a local native brought (in addition to the depressed and worn *C. belliana* already referred to) no fewer than five Leopard Tortoises whose depth of shell was in no way less than those inhabiting grassy savannahs, though here they were in the same dense thorn-scrub as *C. belliana*. The range of sizes was so varied that they are worth quoting. The largest tortoise was a male; the others would appear to be all females. (1) 250 × 150 mm., (2) 130 × 85 mm., (3) 88 × 65 mm., (4) 70 × 56 mm., (5) 47 × 40 mm.

The largest male collected measured 312 × 210 mm. broad.

Pairing took place daily during the rains (December to January) amongst specimens in captivity. The process of egg-laying was witnessed on 21. v. 22, and the following notes were made at the time:—

“The tortoise enclosure measures 20 × 20 feet, two sides are high walls supporting the grass roof, the other sides are netted in. On visiting this enclosure at 5.15 p.m. I observed a tortoise busily digging with its hind legs. The selected site was the angle formed by wall and wire netting and a post which carried the latter. The hole was about six inches from both wall and netting.

“The ground was very hard, but she had already excavated to a depth of about two inches in a rough circle of about four inches in diameter. Digging was accomplished by inserting one hind foot which was scraped round and brought up with a very small quantity of soil on it, which often fell back into the hole at the last moment. Nothing like the quantity was lost that might have been, however, had not the tortoise discharged a quantity of urine from time to time, which resulted in binding the light powdery soil and caking it to her feet. Both hind feet were used alternately for digging, with occasional pauses between changing them.

“At 5.30 p.m. she began to undercut the sides all round by a turning movement of the foot so that the claws cut deeply into the sides of the hole in a semicircle; the back part, as far I could see, was not much affected.

“At 5.50 p.m. the hole was approximately four inches deep and retained its original diameter. The urine was not discharged as at first but continued to drip fairly regularly and almost continuously. By treading with her feet the soil was well puddled, and yet again and again the caked soil would fall from her foot just at the moment when she was clearing the brink of the crater, and thus rendered her work much more laborious.

“At 6 p.m. she scooped round and round the hole, which now measured almost five inches in depth.

“At 6.30 p.m. darkness fell, and an acetylene lamp was brought.

“At 7.12 p.m. the first egg was laid in a membrane which lowered it quite easily and gently to the bottom of the hole.

“At 7.14.50 p.m. the second egg slid slowly down the membrane which connects the first egg with the mother. Yet it did not fall on the first egg but lies alongside of it.

“At 7.15.50 she put her right hind foot down and pushed eggs slightly to one side causing them to grind one against the other; we therefore felt and found them to be perfectly hard-shelled when laid.

“7.17.50 third egg laid.

“7.19.10 fourth egg laid.

“7.21 put her left hind leg down and felt around, a fifth egg was laid about this time.

“7.22 a sixth egg was laid.

" 7.22.50 put her right hind leg down and moved all eggs from the centre of hole to beneath the ledge of undercut.

" 7.24.10 seventh egg laid, which appeared to be slightly smaller than its predecessors. I have omitted to mention that she raised herself slightly before depositing each egg.

" 7.25 p.m. put down her right foot and pushed the eggs about quite forcibly till they lay in a semicircle, three-quarters of each egg being in the undercut.

" 7.26.10 put down her left foot.

" 7.27 put down her right foot.

" 7.27.50 put down her left foot. It now became obvious that she was scraping down the sides of the crater, using her feet alternately.

" 8 p.m. She now commenced a very definite treading movement with the object of pounding the soil. The action was very mechanical, and she dug two little pits with her hind feet to find sufficient earth to cover the eggs rather than utilise the earth already excavated which lay scattered about.

" Not once during three hours had she faced about to examine the result of her labours or inspect her own eggs, which she had buried without ever seeing. I was so struck by the mechanical nature of the proceeding that I picked her up and removed her a couple of feet away from the hole and on hard ground. There she continued trampling away without interruption—it was a sorry spectacle to see so much misplaced energy."

I replaced her over the original site and left her to trample it to her heart's content. In the morning she was resting motionless on the spot and remained so till I left at 9 a.m., how much longer I do not know. The next evening she returned and slept on the spot, and I noticed she did so many times, probably every night.

I had removed the fifth egg before she filled in the hole, and this measured  $35 \times 32.5$  mm. The shell was exceedingly hard, thin, and brittle, and took half an hour to drill. The albumen was turgid, coming forth in lumps. The yolk was an unpleasant ochre, very different from that of a fresh fowl egg.

On the 12th of June I made a note to the effect that, in addition to sleeping on the spot where her eggs were hidden, she relieves herself and makes her droppings on the site frequently, if not daily. I sent her away about the end of the month.

On July 8th it occurred to me that it might require her assistance for the young to escape from the "nest," as the surface of the ground above them had set as hard as cement. I therefore dug down to the eggs and found the top of the uppermost only  $2\frac{1}{4}$  inches below the surface. They had not hatched, so I left them till 21. viii. 22, *i. e.*, three months from time of laying and then dug them all up. They had not developed embryos (so I conclude that they were infertile), nor had they decomposed beyond a slight smell.

In no fewer than six of the localities mentioned for this species,

remains, generally of half-grown individuals, were found. One at Mbonoa had definitely been killed by a beast of prey or a man. The local natives (Wataturu) stated that they did not eat them, but this was probably untrue, as they ate agama lizards, rats, and other creatures.

The tick (*Amblyomma marmoreum* Koch) was found on a Pwaga specimen.

#### TESTUDO LOVERIDGII Blgr.

Blgr. C. R. Acad. Sci. Paris, 1920, t. 170, p. 264.

Love. Jour. E. A. & Uganda Nat. Hist. Soc. 1921, p. 50.

Procter, Proc. Zool. Soc. 1922, pp. 483-526.

Thirty-six specimens from Dodoma and Tabora; remarks on the habits of these have already been published as an appendix to Miss Procter's paper. A dozen of these tortoises escaped at Kilosa, and it will be interesting to observe if they survive the numerous carnivora without having any rock shelters under which they can seek refuge.

No ticks were ever found on wild specimens, the sandy soil of their habitat being unfavourable to these pests. A tortoise which escaped at Kilosa picked up a tick (*Amblyomma marmoreum* Koch) within twenty-four hours.

#### TESTUDO PROCTERÆ, sp. n. (Pl. I., II.)

? Two specimens from Ikikuyu and Kidengo in Dodoma District. The localities are about a hundred miles east of Dodoma, the type-locality of *T. loveridgii*. Ikikuyu, which is to be considered the type-locality of the present species, lies some fifty miles south of Igulwe (Gulwe) station on the Central Railway. The country is different from that of Dodoma in that there are no essentially rocky kopjes, though there are small hills with fairly numerous scattered boulders.

Within a mile of the spot where this specimen was found there are precipitous cliffs topping the mountains, and the slopes below are boulder-strewn and clothed with a dense thornbush thicket which is almost impenetrable. The more level country at the foot was, doubtless, similarly covered at one time but is now sandy thornbush steppe, amongst whose bushes the native-owned herds of cattle and goats wander. It was here that the tortoise was found eating a mushroom at 6 a.m.

Superficially it is very similar to *T. loveridgii*, but differs in the following points:—

- (i.) Greater degree of ossification of the bony exoskeleton, particularly the carapace (the diamond-shaped fenestration of the plastron is similar to that of *T. loveridgii*).
- (ii.) Greater depth of shell in proportion to length and breadth which may be best shown thus:—

Species.	Length in mm.	Breadth.		Depth.		Whereabouts.
		mm.	per cent.	mm.	per cent.	
<i>T. loveridgii</i> ...	85	77	90.5	19	26	Tring Museum.
<i>T. procteræ</i> ...	85	72	84.5	40	47	British Museum.

In the large series of *T. loveridgii* examined by Miss Procter the greatest depth per cent. of any specimen was 33.4 mm., and that was of the youngest example only 42 mm. long. The depth per cent. decreases with age, as has been shown by Miss Procter.

- (iii.) Presence of a strong vertebral keel on all five scutes.
- (iv.) Reversion of the marginals, which are turned up so that their outer edge forms an obtuse angle with their inner edge and in some an almost cup-like depression.
- (v.) Coloration.—The centre of each scale is dark sepia, almost black, surrounded by a broad yellow margin; the star-like radiations of *T. loveridgii* are absent.

Owing to its immaturity it is impossible to say definitely that it might not be referable to the genus *Cinixys*, as the characteristic hinge of the carapace in that genus is not developed in young individuals. I am confident that it is correctly assigned to the genus *Testudo*. *C. belliana* was taken at Ikikuyu on the same day as *T. procteræ*, and though depressed the ossification is fully developed. *T. tornieri*, it may be remembered, was originally mistaken for a pathological phase of *C. belliana* by Tornier\*.

*T. procteræ* I consider to be one stage nearer the typical box tortoises than *T. tornieri*.

Sex ?. Half-grown.

Type-locality. Ikikuyu, Dodoma Dist., Tanganyika Territory, 12. ii. 23.

This specimen was kept alive for three months in captivity, but unfortunately died, and decomposition had set in when it was found. The reptile was immediately preserved, but in poor condition. It has been presented to the British Museum.

The second specimen was found beside a small stone at the foot of a rock-strewn, scrub-covered mountain (Mt. Hundugula) at Kidenge. It was so young that I hesitate to refer it definitely to this species, excepting on the grounds of locality, as it was not twenty miles from Ikikuyu. It measured 40 × 37 × 17 mm. (greatest length, breadth, and depth of shell), and was taken back to Kilosa, where it was left in charge of a native who lost it in cleaning out the vivarium. So rarely are these creatures met with that the local chief said that during the thirty years of his residence he had never heard of a tortoise being found in the neighbourhood.

A tick (*Amblyomma marmoreum* Koch) was on the type-specimen when found.

\* Tornier, Kriechtiere Deut. Ost-Afrikas, 1897, p. 2.

## CHELONIDÆ.

## CHELONE MYDAS Linn.

Blgr. Cat. Chel. 1889, p. 180.

A carapace was obtained from fishermen at Dar es Salaam in 1922; these turtles are caught fairly frequently. A live one was seen alongside the ship in Tanga Harbour (27. v. 23); it thrust its head out of the water close alongside us, and could be seen to advantage as it swam about.

## PELOMEDUSIDÆ.

## PELUSIOS NIGRICANS (Donnd.).

Blgr. Cat. Chel. 1889, p. 195.

Three specimens from the Ruaha, Kilosa, and Kissaki in Dodoma District. These were adult, half-grown, and immature respectively, the smallest measuring  $47 \times 40 \times 13$  mm.

## PELOMEDUSA GALEATA (Schoepff).

Blgr. Cat. Chel. 1889, p. 197.

Ten specimens from Dodoma, Mahaka, Kilamatinde, Mtali's, and Luguu.

Of these the largest male weighed 2 lbs. and measured  $200 \times 135 \times 68$  mm., the largest female  $142 \times 112 \times 29$  mm., and a very young one from Mahaka on 10. iii. 22, measured  $49 \times 39 \times 18$  mm.

After two heavy rainstorms on the two preceding days, which heralded the advent of the rainy season, a *P. galeata* was found at 8.15 a.m. busily engaged in trying to dig itself into the middle of a sandy road. The rains had doubtless disturbed it and caused it to wander. (Mtali's, 20. x. 21).

My wife reported having seen a Lesser Stink Ant (*Paltothyreus tarsatus*), which had fallen into the water-tank, seized by one of these tortoises. This is remarkable, as the ant has a formidable sting, as well as good jaws and a protective smell. We therefore experimentally introduced three more, which were taken without hesitation by the tortoises, who snapped them in half. The head and thorax were first crunched up and then the abdomen picked up and eaten. Grasshoppers and spiders were also taken, one of the latter being warningly coloured in black and yellow.

A KEY TO THE TORTOISES OF TANGANYIKA TERRITORY, KENYA  
COLONY, AND UGANDA.

*Synopsis of the Families.*

- I. Shell covered with epidermal, horny shields.
- A. Pectoral shields of plastron in contact with the marginals.
1. Plastral shields 11 or 13 ..... TESTUDINIDÆ.
2. Plastral shields 12 as intergular present..... PELOMEDUSIDÆ.
- B. Pectoral shields widely separated from the marginals;  
limbs paddle-shaped, with one or two claws..... CHELONIDÆ.
- II. Shell without epidermal shields ..... TRIONYCHIDÆ.

## TESTUDINIDÆ.

Two genera.

*Synopsis of the Genera.*

Posterior portion of carapace hinged, movable in adult .....	<i>Cinixys</i> .
Posterior portion of carapace immovable .....	<i>Testudo</i> .

## CINIXYS.

Bell, Tr. Linn. Soc. xv. p. 398 (1827); Blgr. Cat. Chel. p. 140 (1889).

One species.

1. CINIXYS BELLIANA Gray. Bell's Hinged Tortoise.  
Blgr. *t. c.* p. 143.  
Tanganyika Territory, Kenya Colony, Uganda.

## TESTUDO:

*Testudo*, part., Linn. S. N. i. p. 350 (1766); Blgr. Cat. Chel. p. 149 (1889).

Four species.

*Synopsis of the Species.*

- I. Shell deep, box-like ..... *pardalis*.
- II. Shell depressed, yields to slight pressure.
  - A. Vertebral shields keeled ..... *procteræ*
  - B. Vertebral shields not keeled.
    1. Narrower. Breadth of plastron three-quarters the length in the type..... *tornieri*.
    2. Broader. Breadth of plastron greater than length in young to 13/16ths in adult..... *loveridgii*.

1. TESTUDO PARDALLIS Bell. Leopard Tortoise.  
Blgr. *t. c.* p. 160.  
Tanganyika Territory, Kenya Colony, Uganda.
2. TESTUDO PROCTERÆ Loveridge. Keeled Soft-shelled Tortoise.  
Love., present paper.  
Tanganyika Territory.
3. TESTUDO TORNIERI Siebenrock. Tornier's Tortoise.  
Sieb. S.B. Ak. Wiss. Wien, vol. cxii. p. 443, 1903.  
Tanganyika Territory, Kenya Colony.
4. TESTUDO LOVERIDGII Boulenger. Soft-shelled Land Tortoise.  
Blgr. Comptes Rend. Acad. Sci. t. 170, p. 264, 1920.  
Tanganyika Territory.

## PELOMEDUSIDÆ.

Two genera.

*Synopsis of the Genera.*

- Mesoplastra extending right across the plastron; front lobe of plastron movable in the adult ..... *Sternotherus*.  
 Mesoplastra small and lateral; front lobe of plastron without hinge in adult ..... *Pelomedusa*.

## STERNOTHERUS.

*Sternotherus*, part., Bell, Zool. Jour. ii. p. 305 (1825); Blgr. Cat. Chel. p. 191 (1889).

Three species. (*S. sinuatus* and *S. nigricans* doubtfully distinct and difficult of determination.)

- I. Beak notched mesially, with a very slight, obtuse cusp on each side of the notch; interorbital width considerably less than the longitudinal suture between the frontal shields ..... *sinuatus*.  
 II. Beak neither hooked nor bicuspid; frontal suture not or but slightly exceeding the width of the interorbital space.  
 A. The length of the outer border of the pectoral shields equals that of the humeral ..... *nigricans*.  
 B. The length of the outer border of the pectoral is much less than that of the humeral, and does not exceed the length of the inner border of the latter shield ..... *derbianus*.

1. STERNOTHERUS SINUATUS (Smith). Smith's Water Tortoise. Blgr. *t. c.* p. 194. Tanganyika Territory, Kenya Colony, Uganda.
2. STERNOTHERUS NIGRICANS (Donnd.). Black Water Tortoise. Blgr. *t. c.* p. 195. Tanganyika Territory, Kenya Colony, Uganda.
3. STERNOTHERUS DERBIANUS (Gray). Derby's Water Tortoise. Blgr. *t. c.* p. 195. Uganda.

## PELOMEDUSA.

Wagl. Syst. Amph. p. 136 (1830); Blgr. Cat. Chel. p. 197 (1889).

One species.

1. PELOMEDUSA GALEATA (Schoepff). Blgr. *t. c.* p. 197. Tanganyika Territory, Kenya Colony, Uganda.

## CHELONIDÆ.

Two genera.

*Synopsis of the Genera.*

- Costal shields in four pairs ..... *Chelone*.  
 Costal shields in five or more pairs ..... *Thalassochelys*.

## CHELONE.

*Chelonia*, part., Brongn. Bull. Soc. Philom. ii. p. 89 (1800).  
*Chelone* Blgr. Cat. Chel. p. 180 (1889).

Two species.

*Synopsis of the Species.*

Carapace unicarinate in young. Limbs usually with a single claw ... *mydas*.  
 Carapace tricarinate in young. Limbs usually with a double claw ... *imbricata*.

1. CHELONE MYDAS (Linn.). Green Turtle.  
 Blgr. *t. c.* p. 186.  
 Tanganyika Territory, Kenya Colony.
2. CHELONE IMBRICATA (Linn.). Hawksbill Turtle.  
 Blgr. *t. c.* p. 183.  
 Tanganyika Territory, Kenya Colony.

## THALASSOCHELYS.

Fitz. Ann. Wien. Mus. i. p. 121 (1835); Blgr. Cat. Chel. p. 184 (1889).

One species.

1. THALASSOCHELYS CARETTA (Linn.). Loggerhead Turtle.  
 Tanganyika Territory, Kenya Colony.

## TRIONYCHIDÆ.

One genus. (*Cycloderma* in neighbouring territories.)

## TRIONYX.

*Trionyx*, part., Geoffr. Ann. Mus. xiv. p. 1 (1809); Blgr. Cat. Chel. p. 242 (1889).

1. TRIONYX TRIUNGUIS (Forsk.) Freshwater Soft-Tortoise.  
 Victoria Nyanza.

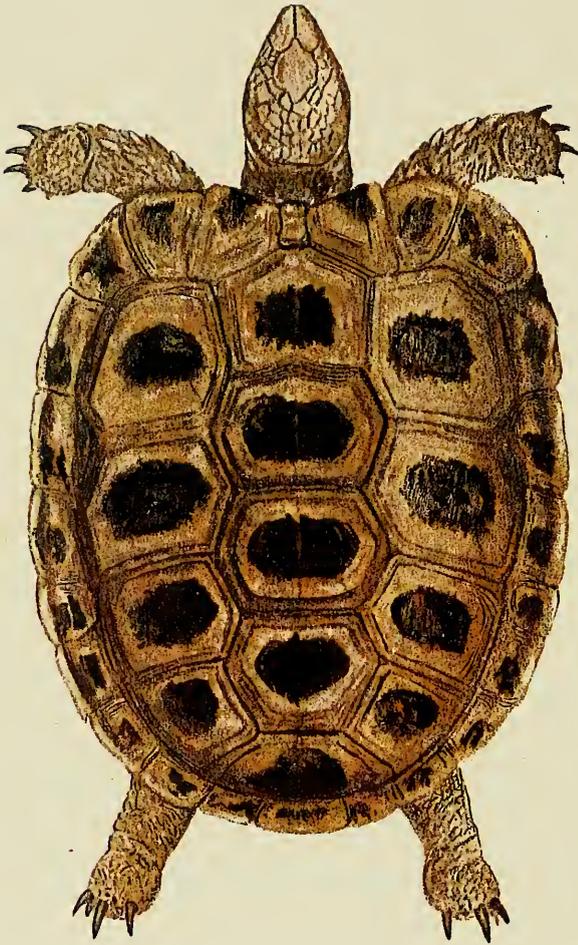
## EXPLANATION OF THE PLATES.

## PLATE I.

Type of *T. proctera*, sp. n., from a water-colour drawing made after death.

## PLATE II.

Type of *T. proctera*, sp. n., dorsal and ventral views from X-ray photographs.

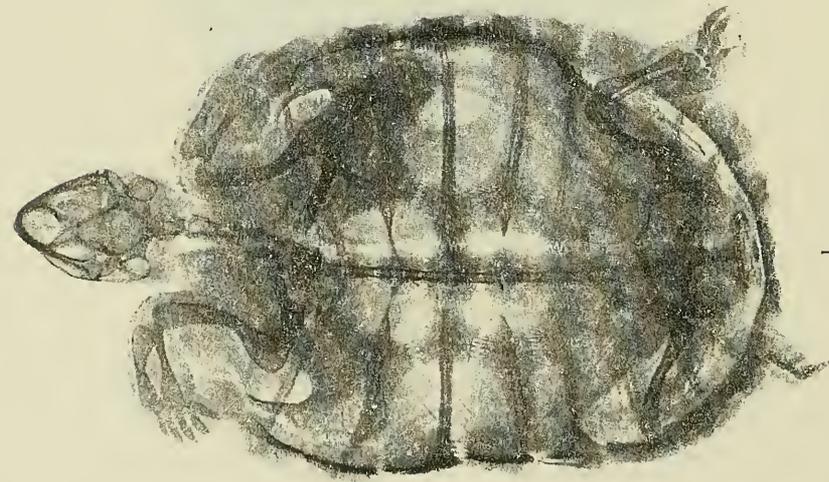


Norman C. Miller.

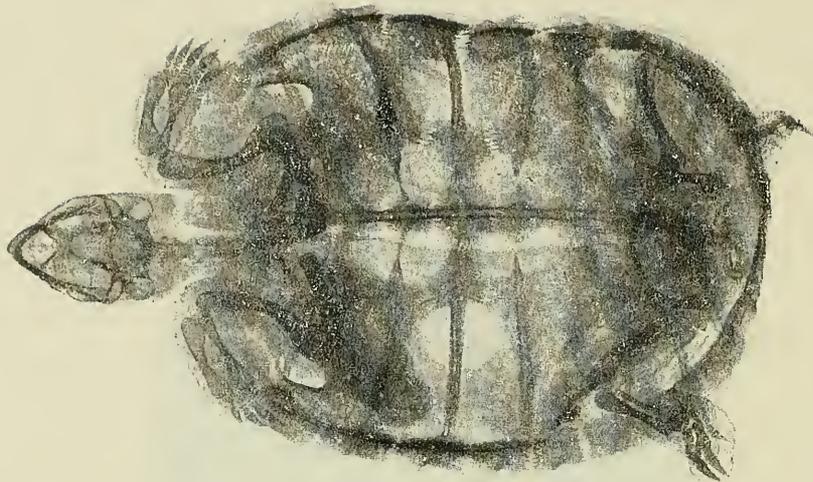
John Bale, Sons & Danielsson, Ltd.

*TESTUDO PROCTERÆ*, sp.n.

(natural size of type which is not adult)



1



2

TESTUDO PROCTERÆ. sp.n.