

Descriptions of some African Tortoises.

By

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With Plates XXXVI-XXXVIII, and 5 Text-figures.

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THE material dealt with in this review has been derived from various sources. A good portion of it is contained in the Albany Museum, and for the loan of specimens I am especially indebted to the Museums at Pretoria, Kimberley and Pietermaritzburg.

It may be said that the present study again illustrates the fact that the closer a group of organisms is studied and the wider the area from which they are obtained, the greater is the difficulty in formulating any clear diagnosis of specific characters. This fact is, of course, very confusing to the systematist, although of great theoretical interest.

Pelusios sinuatus (Smith). Pl. XXXVI, fig. 3.

Sternothærus sinuatus Smith, Ill. Zool. S. Afr. Rept., 1838.

The Transvaal Museum has specimens which I suppose should be referred to the typical subspecies from Malta, near Leydsdorp (G. van Dam), from Naboomspruit (F. L. Clarke) and from Koedoespoort, near Pretoria. The type-specimens of Smith's species came from "rivers to the north of 25° south latitude . . . between 24° and 25° they occurred in greatest abundance." This region is that of the headwaters of the Limpopo River, whence the above-mentioned specimens also came. These specimens, however, do not agree well with Smith's figures. The ventral parts of the marginals, especially V-VII, are broader in those specimens; the intergular shield and the anal shields are also broader. For comparison I now give an illustration of the plastron of the specimen from Naboomspruit. A dorsal view of the carapace of the Koedoespoort specimen is given in 'Records of the Albany Museum,' iii, pl. xxi, fig. 1.

The distinction of the subspecies *zuluensis mihi* described in 'Records of the Albany Museum,' iii, p. 372, rests especially on the more strongly developed protuberances of the vertebral shields. In *sinuatus* the sides of the carapace are more definitely arched above, and the margins postero-laterally are not so dentate and upturned as in *zuluensis*. In the Koedoespoort specimen, which is largest, the hinder margins are scarcely

sinuate, but in the two other examples decidedly so ; in the former only vertebra IV has a weak protuberance ; in the Malta example vertebrals III-IV have distinct protuberances, but much weaker than those of *zuluensis*. On the other hand, a very large example from Zululand (Transvaal Museum coll.), with plastron measuring 320 mm., has the hind margin of carapace well-dentate and vertebral protuberances well developed.

We have two small examples from Gravelotte, North Transvaal (V. Wager), which, on the geographical data, I take to be the young of *sinuatus*. These, with plastron measuring 102 and 57 mm. respectively, have strong protuberances on vertebrals III-IV and weaker ones on II, and the hinder margins of the carapace are strongly sinuate, but not upturned. A pair of small barbels occur just behind the symphysis of the mandible. On the head the hind margins of the frontal shields meet in an obtuse angle.

With regard to the ventral borders of marginals V-VII—unfortunately termed “costals” in error throughout my account of *Pelusios sinuatus* and *P. nigricans*—there is no difference between *zuluensis* and *sinuatus* as now understood.

Pelusios nigricans (Donnd.) *castanoides* *subsp. nov.*
Pl. XXXVI, figs. 1 and 2.

Testudo nigricans Donnd., Zool. Beitr., iii, 1798.

This is based on a large specimen in the Transvaal Museum from Richards Bay, Zululand, collected by Mr. H. W. Bell-Marley. It differs from *sinuatus* *Smith* in the general form of the shell, which is rather elevated and compressed laterally to such an extent that marginals V-VII show no division into upper and lower surfaces ; these are purely lateral shields, taking no part whatever in the formation of the ventral surface.

Abdominal shields not flattened throughout their breadth, but bent upwards laterally ; length very nearly equal to that of the femorals measured laterally. Femorals arched at their margins laterally. Outer margin of pectoral shield a little shorter than

the humeral (37 : 43). Intergular shield broadly pear-shaped (30 mm. long and 24 mm. broad), anterior half well rounded. Suture between humerals only very slightly shorter than the intergular. Vertebral shields all narrow and without any median prominences. Second vertebral with anterior and posterior portions of the lateral margin subequal on the left side, latter slightly longer on the right side; breadth very slightly exceeding the length. Third vertebral longer than second, measuring 40×36 mm. Costals well-arched above and taking a large part in the formation of the upper surface. Posterior margins of carapace not dentate, nor upturned. The surfaces of the carapace are all roughened and worn, showing very little concentric rings. Surfaces of plastron and of costals V-VII all smooth and polished, with more or less uniform chestnut tinge. Upper surface of head throughout very finely vermiculated. Hind margins of frontal shields meeting in an acute angle. Upper jaw with a very slight obtuse cusp on each side of the median notch, almost as in *sinuatus*. Lower jaw without barbels, but with three enlarged scales just behind the chin. Claws of digits powerful and sharp, all very pale in colour; on forelimb outermost is smallest, II-IV a little stronger than I; on hind limb II is strongest, I and III only a trifle weaker, IV still weaker, V quite small. A scaly fringe on the outer side of the fore-limb; this bears two or three somewhat enlarged flattish scales.

MEASUREMENTS.—Length of plastron 225, height of shell 98, breadth about middle 136, greatest breadth posteriorly 146 mm.

This subspecies is no doubt closely related to *castaneus Schweigg.*, which, according to Siebenrock, ranges from Natal to East Africa and Western Madagascar. I think it probable, however, that several forms have been confused under this name, and most of the records are based on quite young specimens which at present ought not to be identified subspecifically. The St. Lucia form seems distinguishable from that figured by Siebenrock as *castaneus* on the form of the intergular shield—a character ignored by Siebenrock in his descriptions, but evidently of considerable importance subspecifically. In

castaneus the outer margin of the pectoral shield is said to equal the humeral, and to be as long as, or even longer than, the inner margins of pectoral and humeral combined; in castanoides it is considerably shorter than combined pectoral and humeral internally, and is also shorter than the outer border of the humeral.

This St. Lucia form is also related to *rhodesianus mihi* from N. Rhodesia, more so than to the typical form of *nigricans*. In the intergular character, *rhodesianus*, *castaneus* and *castanoides* may be regarded as members of an evolutionary series. It would be permissible to separate them specifically from *nigricans*.

THE SOUTH AFRICAN FORMS OF *PELUSIOS* MAY BE DISTINGUISHED AS FOLLOWS :

1. On the chin a pair of tiny barbels, but no enlarged scales; shell not laterally compressed, marginals V-VII presenting a lateral edge separating dorsal and ventral surfaces; length of outer border of pectoral shield exceeding length of outer border of humeral.

Vertebrales III and IV with conspicuous median protuberances; two hindermost marginals on each side somewhat upturned, perhaps only slightly. Zululand.

P. sinuatus (Smith) zuluensis Hewitt.

Vertebral IV with a small median protuberance, III with a very weak one or none at all; posterior marginals not upturned. Headwaters of Limpopo River.

P. sinuatus sinuatus Smith.

2. No barbels on chin, but 3 enlarged scales just behind the symphysis; shell much compressed laterally, marginals V-VII having no lateral edge and no definite dorsal and ventral surfaces; length of outer border of pectoral shield a trifle less than or subequal to that of outer border of humeral.

Intergular shield broadly pear-shaped; inner border of humeral only very slightly shorter than the intergular; outer border of femoral moderately arched, measuring in a straight line only very slightly more than the abdominal or subequal thereto. St. Lucia Lake.

P. nigricans (Donnd.) castanoides subsp. nov.

Intergular shield pear-shaped but more elongate, decidedly longer than inner border of humeral; outer border of femoral slightly arched, and measured in a straight line it considerably exceeds the abdominal. Locality?

P. nigricans castaneus Schw.

Intergular shield more or less 4-sided, narrowing in front and behind; outer border of femoral not definitely arched, but lobed behind and measured in a straight line it considerably exceeds the abdominal. Mpika district, N. Rhodesia.

P. nigricans rhodesianus Hewitt.

3. Shell short, broad and depressed; marginals V-VII with dorsal and ventral surfaces gradually merging; intergular shield pear-shaped and longer than the inner border of humeral; outer border of femoral strongly arched. E. Africa.

P. nigricans nigricans Donnd.

Kinixys belliana Gray.

Kinixys belliana Gray, Syn. Rept., 1831.

According to the published records this is a very widespread species, being said to occur throughout the savannah regions of Tropical Africa; but certainly it is by no means constant in structural characters within that area. There is no doubt but that a number of allied species and subspecies can be recognized, although the data for sharply defining them are not yet available. One such form has been made known recently by Mr. J. H. Power from the southern part of the Bechuanaland Protectorate under the name of *lobatsiana* ('Trans. Roy. Soc. S. Africa,' xiv, p. 410, 1927). This is one of the intermediate forms between *erosa*, *homeana* and *belliana*. A less depressed carapace, larger anals and the presence of a nuchal shield seem to distinguish it from *erosa*, although the occasional absence of a nuchal is possible in *lobatsiana*. The general shape of the carapace and the shortness of the pectoral suture well remove it from *homeana*. Yet, in the upturned shell border, it appears to agree better with *homeana* and *erosa*; however, this character may occur, but less definitely so, in the South

African form now termed *australis*; in the latter the supra-caudal is apparently never upturned, whereas in the male of *lobatsiana* it is very definitely so. This character does not seem to be of specific importance; at any rate, upturned shells may occur in other genera of land and fresh-water tortoises (*Testudo* and *Pelusios*) without other modification in the species concerned. Another character of *lobatsiana*, also in the direction of *erosa*, is the rather large size of the first marginal; in the adult male this extends anteriorly a trifle in front of the second. The occurrence of this and the form *australis*, hereafter described, seems to nullify the importance of *Cinothorax* as a section distinct from *Kinixys*. For a recent account of the characters of those two sections reference may be made to K. P. Schmidt's paper on the "Herpetology of the Belgian Congo" ('Bull. Amer. Mus. of Nat. Hist.,' xxxix, p. 407, 1919). It appears to me, however, that the genus is completely continuous in its variation.

The specific characters in this genus are very elusive, and on the available material I have had to treat *lobatsiana* and some other South African forms as so many distinct species: I think it probable, however, that these South African local forms will eventually be grouped together with their allies from Tropical Africa under several wide-spreading and variable species. The high-shelled forms will probably be arranged under *belliana* and *erosa*, and the flattened forms under *spekei*. Unfortunately the distribution data are still very scanty; we do not know whether any two so-called species may live in the same locality; there are no records of any such occurrence.

The following allied species and sub-species of *belliana* may be indicated:

1. *Kinixys belliana* Gray, s. s.

The typical form from West Africa with high shell, border not reverted, gular shields small, suture between anal shields long. No detailed description of this form is available to me.

There is in the British Museum a specimen from Portuguese

Guinea (L. Fea) which I take to be a normal one of *belliana* s. s. The shell is rather long and narrow, not flattened; carapace shields ornamented with broad black radii, six on each shield; gular shields together form a triangle, not projecting; anal suture a trifle longer than the femoral; inguinal shield in contact with marginal VI, and having a rather pointed projection anteriorly; outer margin of humeral shield straight or nearly so; pectoral suture short.

Referring to Congo specimens, Schmidt tells us that the pattern in the young is typically zonary, becoming secondarily radiate in older individuals. In a specimen from Avakubi, Ituri, Belgian Congo (British Museum collection) there is considerable resemblance in pattern to that of the young of *zuluensis*, but apparently there are minor differences.

The humeral region of the plastron is bent as in that species, and the gulars are broad, although a little longer than in *zuluensis*; the anals are about as long as the femorals, or only a trifle shorter; the inguinal has an acutely angular anterior projection, but does not make contact with marginal VI.

2. *Kinixys nogueyi* (Lataste).

Homopus nogueyi Lataste, Le Natur., iii, 1886.

From Medina, Upper Senegal. This, according to Siebenrock's account ('Akad. d. Wiss. Wien.,' cxii, p. 442, 1903), has a short suture between the anal shields, and the carapace is more or less uniformly coloured light olive-green. This form is generally regarded as merely synonymous with *belliana*, for, as emphasized by Boulenger, the extent of the suture between the anal shields may vary considerably in specimens from one locality ('Proc. Zool. Soc. of London,' 1907, p. 483; see also his notes on specimens from Portuguese Guinea in 'Ann. Museo Civico Stor. Nat. Genova,' 3, vol. ii, 1906). For the present, however, I think the specific status should be maintained.

In the British Museum there are two specimens from Medina, Senegal. One, a juvenile, is the type of *nogueyi*; it has very short broad anals; the gular shields together form a triangle.

The other and larger example also has very short anals; gulars triangular and rather long, projecting only a little in front of the humeral region; hind margin of carapace a little upturned; carapace slightly depressed, relatively long and narrow, with a rather concentric pattern; first vertebral with a slight protuberance. The carapace is not so much depressed as in *australis*, hereafter described.

3. *Kinixys spekii* Gray.

Kinixys spekii Gray, Ann. and Mag. N. H. (3), xii, 1863.

From Central Africa ('Ann. Mag. Nat. Hist.,' 3, xii, 71, p. 381, 1863). The locality is presumed to be in some part of the country east of the lakes Tanganyika and Victoria Nyanza, where Speke travelled. This has a rather depressed pale brown shell; "the dorsal and upper part of the marginal plates yellow, deeply and distinctly concentrically grooved, with a black spot on the areola of each shield. Sternum yellow, varied with numerous black-brown rays which reach nearly to the margin." This also has been submerged in the synonymy of *belliana*, but the rather depressed carapace seems to distinguish it markedly therefrom. Gray remarks that it is most like *homeana*, differing in shape and in possessing "a very distinctly marked large square spot occupying the areola of each of the dorsal plates, and a smaller but equally distinct black spot occupies the upper part of the areola of each of the marginal plates."

The specific status is here maintained.

4. *Kinixys belliana zombensis* *subsp. n.* Pl. XXXVIII, fig. 4, text-fig. 1, c (p. 474).

This is founded on an adult female example from Zomba, Nyassaland, collected by Mr. L. Smith (24th Aug., 1906). Type in the Albany Museum collection.

The shell is high and rounded, resembling the typical form, but stouter; posteriorly it descends rather steeply, but anteriorly the upper surface passes down to the front margin of the carapace

quite gradually and with low obliquity, without any abruptness in the region of the first vertebral. Shields not raised, passing insensibly into each other.

Nuchal shield rather narrow, greatest width about 4.5 mm.; first vertebral shield 5-sided, with an acute angle anteriorly; fourth vertebral broader than long (49 × 37 mm.), and posterior margin as broad as the anterior one; margin of carapace only slightly upturned posteriorly, most noticeably so on eleventh marginal, and to less extent on the posterior median shield; anal suture rather short, shorter than femoral (13 : 22); pectoral suture of moderate length (18), although rather shorter than femoral; gular shields together forming an exactly equilateral triangle, the base of which projects in front only slightly beyond the anterior angles of the humerals, the median notch slight. Front margin of carapace well-recurved in the middle. Lateral keels on marginals V-VII weak and smooth.

The colour markings are conspicuously radial. The areolæ of the shields are yellowish at their margin, darker centrally; vertebrales II-V have each 6 broad, black rays radiating from the areolæ, the median rays being broadest; costals also with 5 or 6 black rays each. Margins with black radial markings. Plastron yellow with some black markings on all the shields; those on the abdominal shields are pronouncedly radial, although no long rays occur, the large central areolæ being yellow. Central parts of plastron yellow.

MEASUREMENTS.—Length of plastron 154, of carapace 172; breadth of carapace 113, height of shell 80 mm.

These figures, compared with those given by Schmidt for Congo specimens of *belliana*, show that the breadth of the carapace compared with the length of the plastron is decidedly greater in *zombensis*.

Of this sub-species the British Museum possesses a series of large specimens from Beira. The gular shields have much the same shape throughout as in the type. The anals, on the other hand, are variable in form, being either very long, or short and broad. One large specimen has no nuchal. Most of them have no raised shields on the carapace, but in one old and abnormal

specimen the last vertebral is slightly so. The inguinal shield is either in broad or narrow contact with marginal VI, or may be just separated therefrom in older specimens, which show thickening of the plastron; in these latter, marginal VI has an acute-angled anterior projection. In a single juvenile example the anals are rather short, and inguinal is just in contact with marginal VI.

5. *Kinixys belliana zuluensis subsp. nov.* Pl. XXXVIII, figs. 1-3, 5-10; text-fig. 1a, b (p. 474).

The Natal Museum has a large male example (fig. 2, type) from the sand-dunes of Richards Bay, Zululand (coll. Mr. G. Rump). This has conspicuous radial markings on the neural and costal shields. The black radii are nowhere so broad as in *zombensis*, but on the fourth vertebral are nevertheless all broader than the pale interspaces; in many places they tend to break up into much narrower radial streaks. On the plastron black markings are obsolete, and on the marginals they are broken up and indefinite. Neural and costal shields separated by deep grooves and sometimes more or less raised; vertebral V is most strongly raised. A long and narrow nuchal. Anal shields not very short, the suture subequal to that of the femoral. Pectoral suture moderately long, nearly half as long as abdominal (25 : 54), longer than the femoral, but shorter than humeral. Gulars subtriangular, broader than long (36 : 27), notched and deeply grooved in front; in front they project somewhat. Anterior lobe of plastron narrow, the sides only slightly curved. Inguinal in contact with marginal VI or VII.

MEASUREMENTS.—Length of plastron 182, breadth of carapace 132, height of carapace 94; fourth vertebral in front 35, behind 30 mm.

The Natal Museum has another large example (plastron 172 mm.) (Pl. XXXVIII, fig. 1) from Zululand which somewhat resembles the type of *zombensis*, but differs in possessing a distinct hump in the region of the first vertebral; and at this point the carapace is slightly higher than posteriorly. Carapace

only slightly depressed; vertebral IV distinctly broader than long, but narrower behind than in front; hind margin of carapace nowhere upturned; marginals V-VII with well-smoothed nearly obsolete lateral keels. Pectoral suture long, almost as long as the femoral; anal suture very short, gulars triangular, the base much longer than the sides (33.5 : 28). Plastron with pronounced radial markings on the abdominal shields, the black radii being numerous, long and slender.

Another smaller specimen (plastron 145 mm.) in the Albany Museum, of uncertain origin, but suspected to be from Zululand, has the following characters: the carapace shields are not raised, nor separated by deep grooves; the conspicuous radial pattern is like that of *zombensis*, but the lateral black rays of the neural shields are narrower, and the abdominal shields have a number of long black rays. The pectoral suture is longer than in *zombensis*, being only a little shorter than the humeral, the gulars are broader in front, and the fourth vertebral is narrower behind. The hind margin of the carapace is not in the least upturned.

The Transvaal Museum has two remarkable specimens (Pl. XXXVIII, figs. 8-10) from Matubatuba, Zululand, collected by Mr. H. Bell-Marley; the locality is a few miles inland from St. Lucia Bay and just north of the Umfolosi River. The female has the following characters: Gular shields together form a nearly equilateral triangle, base scarcely projecting in front, and a little longer than the side; lateral margin of pectoral shield arched, and presenting a slight salient in the middle; pectoral suture rather long, being almost half the abdominal; anterior and posterior lobes of plastron both broad and short; anal suture a little shorter than femoral; inguinal shield with acute anterior angle, meeting marginal VI; marginals V-VII with lateral keels, but they are not sharp; hinder marginals not upturned; carapace well-arched, highest behind, with conspicuous radial markings, but the black rays are much reduced in number, each shield being pale horn colour with only a few quite narrow, long, black rays, but no broad ones, and areolæ not infuscated; plastron pale, with very little infuscation, several

long, thin black rays being present on the abdominals. The carapace is relatively broader than the type of *zombensis*, and the vertebral and costal shields do not pass insensibly into each other, but tend to be slightly raised. No well-marked angle in the region of vertebral I, although that shield is slightly raised. Vertebral IV considerably narrower behind.

MEASUREMENTS.—Length of plastron 157, breadth of carapace 124, height of carapace 83, anal suture 15, femoral suture 18, pectoral suture 24·5, humeral suture 26, gular suture 20 mm.

The male is abnormal, having extensive thickenings of the bony plates and the horny shields of the carapace are altogether altered through fusion and exfoliation. In the plastron, also greatly thickened, the gulars project somewhat, but the outline remains nearly equilateral and the front margin is only faintly notched; anal suture short; inguinals pointed in front; lateral margin of humeral shield straight, not arched, the anterior lobe of the plastron being much narrower than in female; ventral borders of all the hinder marginals much thickened and rounded. Plastron quite without dark rays. Pectoral suture shorter than femoral or humeral (17, 20·5, 33 mm.).

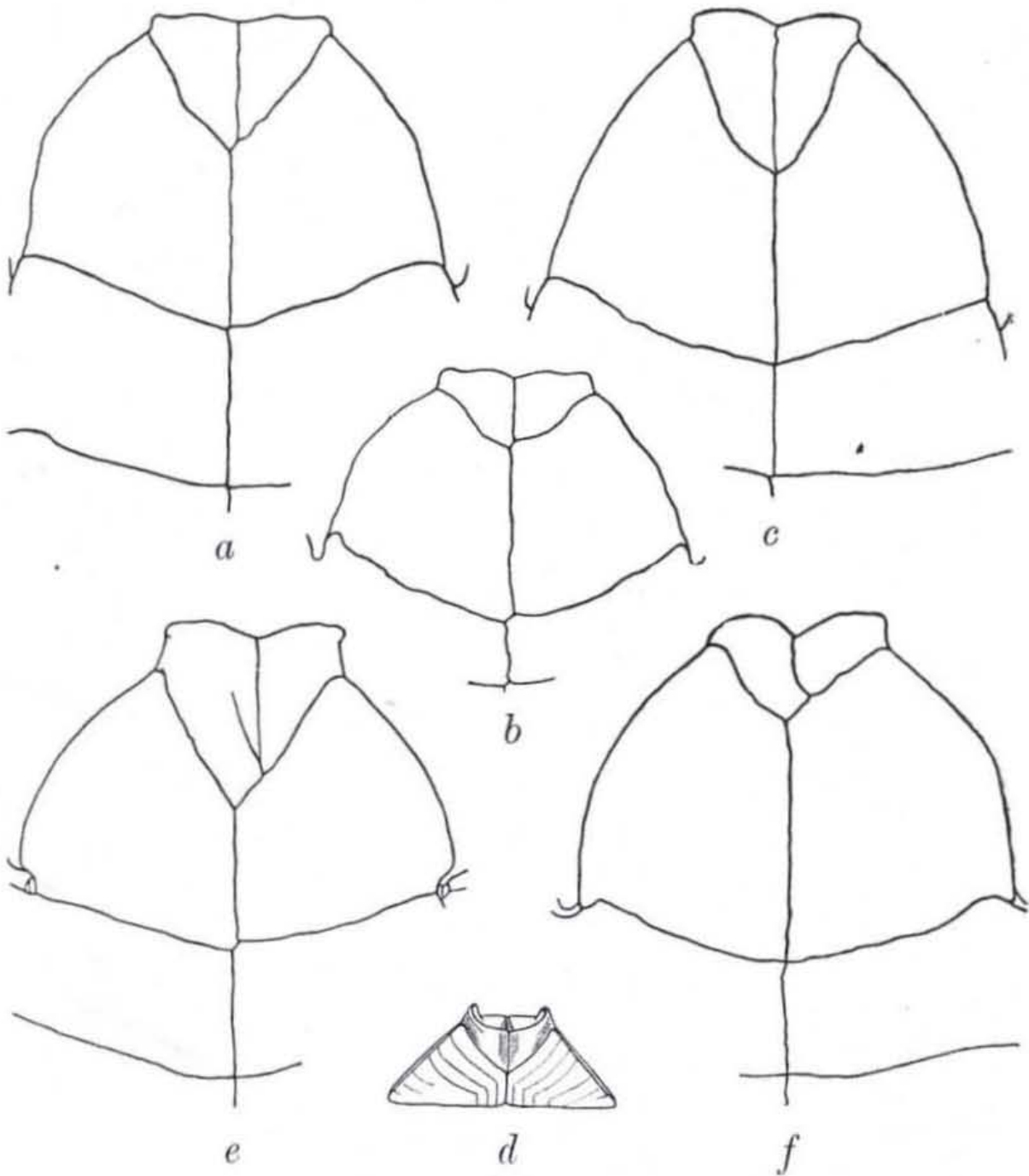
In general form the female from Matubatuba resembles somewhat that from Naauwpoort referred to *lobatsiana*, but is larger. There are, however, striking differences in the ornamentation, and the gular and anal shields are more projecting in *lobatsiana*.

The British Museum has a series of *Kinixys* from Umfolosi, Zululand (200 ft.), collected by Mr. C. B. Grant. These show great variation in the form of the gular shields, which it is presumed merely represents the normal variations of a single stock. The series is as follows:

An example with very broad gulars and anals, last vertebral slightly raised, first with a slight protuberance, a bend in the humeral region, but not an abrupt one; inguinal in broad contact with marginal VI, hind margin of carapace not reverted. There is a pronounced radial pattern on the carapace shields, about 5 or 6 broad black radii occurring on each shield.

Another, but larger, example, with triangular gulars; anals

TEXT-FIG. 1.



Anterior lobe of plastron showing variation in gular shields.
Kinixys belliana zuluensis *subsp. n.* a. Adult female.
 b. Young. *Kinixys belliana zombensis* *subsp. n.* c. Adult male.
K. youngi *sp. n.* d. Front view, male. *K. lobatsiana* Power. e. Old male. f. Female.

broad and short, last vertebral raised, nuchal very narrow, inguinal not meeting marginal VI; total length of plastron 155 mm.

Another large specimen, measuring 180 mm. in total length of carapace, has several raised shields in the hinder half of the carapace; nuchal almost obsolete, inguinal in contact with marginal VI; unfortunately the plastron is missing.

Besides the above are two very large abnormal and much thickened specimens like the abnormal male from Matubatuba already described.

What I take to be the young of this species is represented by a single specimen from Ntambanana, Zululand, presented to the Albany Museum by Mr. E. J. F. George; also another specimen from the same region, but not exactly located.

This differs from the adult in that both gular and anal shields are quite differently shaped. Also there is a pronounced tendency to elevation of the carapace shields, especially the posterior ones. These raised shields are flat-topped (not subconical as in *Testudo tentoria*). In the Ntambanana specimen all the vertebrae and costals of the posterior half of the carapace are raised and likewise also the first vertebral, but the second vertebral and costals I and II are only slightly so. The areolæ of many of the marginals are also somewhat raised. Anterior margin of carapace well-recurved in the middle; upper surface of carapace rounded, not depressed. Hind margins serrate and upturned except mesially. Nuchal shield narrow. No anterior hump or angle dorsally. Vertebrae II-IV each broader than long. Plastron with gular shields somewhat projecting, but the breadth of the pair much exceeds the length. Anal suture a little longer than pectoral, but decidedly shorter than femoral. Each anal shield tending to become oblong in shape, with longer axis nearly transverse, rather than triangular, as in the adult. On the anterior (upper) surface of the fore limb are a number of enlarged scales, as in other members of the genus; but one of these, the most distal, is a little larger than the rest.

With regard to colour the dark areola of each vertebral and

costal shield is narrowly bordered with yellow, and there is a broad, dark marginal band all round; this along the line of junction with adjacent shields is much interrupted with yellow. Plastron with black and yellow markings; on the abdominal shields the large yellow areola is completely surrounded by a broad marginal ring of black.

The second specimen is much stouter, and also differs in that the carapace shields are not so strongly raised; only in the posterior half of the carapace do these raised shields occur, especially vertebrals V and VI and costal III. On both carapace and plastron the black and yellow markings are strongly contrasting and the pattern is pronouncedly concentric.

Gular shields broad, small and scarcely projecting. Pectoral suture shorter than either femoral or anal. Humeral region of plastron not flat, but curving rather suddenly upwards in front. Greatest depth of carapace in region of third vertebral.

MEASUREMENTS.—Length of plastron 118, 110; greatest breadth of carapace (posteriorly) 89, 97; height of carapace 55, 57; gular shields together 24×13 mm.

There are also two young examples in the collection of the Natal Museum, one of them from Greytown, the other probably from Zululand. In the latter, which is small (plastron 95 mm.), the anal suture is longer than the femoral, as in *australis*, but differs therefrom in the shortness of the gulars, and also in that the last vertebral and last costal shields are raised.

The Natal Museum has also two immature specimens from Impanza, viâ Greytown, contributed by Mr. J. E. Knotwell, 29th Oct., 1908. The larger specimen differs from the others in that the hinder carapace shields are only faintly raised; upper surface of carapace very slightly depressed, not so definitely so as in *australis*; hinder margins of carapace, except supra-caudal, distinctly upturned; nuchal shield minute; vertebrals II–IV all broader than long; gulars short and broad; anals obliquely disposed, but anal suture shorter than femoral; humeral region of plastron curving upwards in front; length of plastron 120, width of carapace 100, height of carapace 63; gular shields together 24×10 mm.

The smaller specimen from Impanza is very similar thereto, but vertebrales IV and V are well-raised, the anal shields are obliquely disposed and anal suture is longer than the femoral. Nuchal shield minute, gulars broad and short.

In all four examples, as in specimen from Ntambanana, the inguinal and marginal VI are not in contact; in the one unlocated specimen those two shields are in contact on both sides, but not broadly so. In all six young examples, the shape of the inguinal differs from that generally found in the adults and in *australis*, having no well-marked acute angle anteriorly; in front it is either rounded or more or less obtusely angled.

The young of *zuluensis*, the most southern species of the genus, shows greater resemblance than any other *Kinixys* to the species of *Homopus* and *Pseudomopus* in the form of the gular and anal shields.

A large female specimen from Berbera, Somaliland (British Museum coll.) has considerable colour resemblance to the young of *zuluensis*. It is a stout, deeply pigmented form; the carapace shields have very broad black radii imperfectly separated from a concentric pattern; the gular shields are rather long, triangular in shape and projecting; the inguinal has a long anterior projection and is in contact with marginal VI; there is no bend in the humeral region; anals short; hind margin of carapace upturned. It represents an undescribed form of *belliana*.

6. *Kinixys australis* sp. n. Pl. XXXVI, figs. 4-6.

Based on a series of specimens from White River, Eastern Transvaal, presented to the Albany Museum by Mr. A. T. Cooke, Feb., 1911. It is evidently related to *darlingi* *Blgr.* from Mashonaland, a species based on a very young specimen without precise locality; as that specimen cannot certainly be identified sub-specifically, the name can be disregarded, or can be applied arbitrarily to one of the Mashonaland forms (*vide infra*).

The distinguishing characters of *australis* are as follows: Nuchal shield comparatively well developed, especially so in

adult males, the breadth in two male specimens being 9 and 5 mm. respectively, in type female 4 mm.; first vertebral shield sub-pentagonal in outline, the angle in front being obtuse, or in males the two front sides may be more or less rounded and without a median angle; fourth vertebral about as broad as long, often slightly broader, sometimes slightly longer; margin of carapace slightly upturned at the sides posteriorly, but not in the post-median region; anal suture long, apparently always longer than the femoral; pectoral suture of moderate length, generally longer than the femoral, sometimes (a male) subequal thereto; gular shields thick and rather broad in males, smaller in females, but in both sexes projecting well beyond the anterior angles of the humerals; their exact form may vary greatly in specimens from the same locality, and occasionally when the shields are short—the intergular suture only half the length of the humeral—they do not strongly project; in males they present a conspicuous median notch. Outer margin of humeral shield distinctly arched. Front margin of carapace shallowly recurved in the middle. The shell is distinctly depressed; in front the upper surface descends rather suddenly in the region of the first vertebral and first marginals, but the slope is not steep; posteriorly there is a fairly steep descent, but upper and hinder surfaces merge gradually as a rule; in one male example the descent is more abrupt, and a more or less distinct median prominence occurs on the upper portion of the fourth vertebral; otherwise the shields of the carapace are not raised.

Colour in males almost uniformly olive yellow, with light brown patches on the areolæ of vertebral and costal shields, and a brownish ring concentric therewith about half-way between the areola and the margin of each shield. Plastron without brown patches or only traces. Females are generally much more deeply infuscated. The areolæ of vertebral, costal and many of the marginal scales are blackish. The areola is surrounded by a broad yellow ring which is unbroken. There is a still broader marginal area, dark brown or blackish, which is generally somewhat broken by a few short, narrow, radial yellow stripes; this striping as such is not at all conspicuous. Plastron

mostly yellow with some dark brown markings radiating from the areolæ; the development of these markings varies, but in all specimens the centre of the plastron is free from dark pigmentation.

MEASUREMENTS.—Length of plastron, M. 134, F. 175; breadth of carapace, M. 96, F. 114; height of shell, M. 53.5, F. 67 mm.

Young specimens from White River have on each shield of the carapace a large blackish areola and bright yellow margin; the line of junction with adjacent shields is dark brown. On the plastron is a very pale area along the middle for a considerable distance, but not extending into the anterior lobe; adjacent to this is a dark area on each shield, the infuscation also extending transversely along the borders of the shields; a large central area on each shield is pale. The infuscation of the plastron is somewhat similar to that represented in the figure of *darlingi*, but is considerably less intense.

The nuchal shield is broad and nearly square in a specimen about 60 mm. long; anal suture long, posterior notch feeble, 5 claws on anterior limb.

We have other specimens much resembling this form from Sandown, South Rhodesia (collected by R. Williams). A female example therefrom is much paler than the White River females, each dorsal shield being mainly yellowish, with darker patch on the areola and some darker, radially arranged markings on portions of the marginal area; these markings are rather indefinite and inconspicuous. In these Rhodesian specimens the anal suture is relatively shorter than in the White River series.

In the Sandown series the sexual difference in gular shield development is very pronounced; the male gular extends forwards from the anterior angle of the humeral to the extent of 10 mm., but the female only 4 mm.

One female specimen is abnormal in several respects; the anal suture is considerable shorter than the femoral, the rather narrow gulars strongly projecting; the humeral shields are somewhat abruptly curved, as in young of *zuluensis*; carapace not quite so depressed as in typical *australis*, and the radial markings rather strongly pronounced, especially on

vertebral IV. This specimen I suspect to be a hybrid of *australis* by *zuluensis* or some other form.

There are also two specimens of *australis* in the Transvaal Museum, labelled N. Transvaal. One of them, a male, is uniformly yellowish; the nuchal shield is broad (8 mm.). The other, a female, coloured more or less like the type-specimens, has a short anal suture, this being subequal to the femoral suture. In neither specimen are the gulars deeply notched.

A third example, also labelled from N. Transvaal, is depressed as in *australis*, but the shell is long and narrow, almost oblong, but broadest at the middle of its length. Anal suture long; gulars deeply notched and acutely pointed antero-laterally; vertebral IV just as long as broad; hinge very weakly developed; carapace markings conspicuously radial, with very broad as well as very narrow dark rays; plastron infuscated as in *australis*. This specimen may also be of hybrid stock.

In all specimens referred to *australis* the inguinal shield is large and generally in contact with marginal VI; in eleven adult specimens and one juvenile there is good contact on both sides; in one large adult female from Sandown, South Rhodesia, such is the case on the right side, but not on the left, this example being abnormal in possessing only 10 marginals on the right side, 11 on the left; in a specimen from the Northern Transvaal also there is contact on one side only; in another example, a small male, they fail to meet on both sides, but an acutely angular portion of the inguinal is directed towards marginal VI; in one juvenile these two scales are just in contact on the left, but separated on the right side, the right inguinal having an acutely angled projection forwards. The shape of the inguinal shield varies considerably; generally there is an acute anterior portion, but when there is broad contact with marginal VI the anterior projection may be quite obtuse.

In *lobatsiana* there is generally good contact between the inguinal and marginal VI; in *zombensis* there is narrow contact, the inguinal having an acutely angular forward extension to meet the marginal; in the types of *jordani* there is broad contact in two larger examples, narrow contact in the smaller

one, but no acutely angular extension forwards of the inguinal; other specimens apparently referable to *jordani* show either wide separation or good contact between the two shields.

The indications are that the inguinal character may sometimes be of importance in distinguishing the species or subspecies, but is subject to individual variation.

7. *Kinixys darlingi* Blgr.

Kinixys darlingi Blgr., Proc. Zool. Soc. Lond., 1902, ii, p. 15, pl. iv.

There is in the South African Museum, Cape Town, a sub-adult male specimen labelled "Mazoe, Mashonaland, coll. Darling." This is probably the undescribed adult of *darlingi* Blgr. It has a rather narrow, elongated shell, only slightly wider behind, and slightly depressed after the manner of *australis*. The antero-dorsal angle on the carapace in the region of the first vertebral is rather more distinct than in *australis*. The inguinal shield is moderately large, but widely separated from the sixth marginal, and has no acute-angled projection anteriorly in the direction of the sixth marginal, being rounded or obtusely angular in front. The anal suture is not much longer than the femoral (17 : 13); this is variable in *australis*, but generally the disproportion is greater, and in one example is 23 : 6.5. Outer margin of humeral shield only very slightly arched.

The colour characters are not well-preserved, owing to long immersion in spirit, but the plastron was evidently more infuscated than *australis*. On the abdominal shield the central yellow areola is completely surrounded by a blackened ring which has radial extensions in all directions.

Greatest width of shell posteriorly 97.5, height 57, length of plastron 138 mm.

This specimen agrees with the type in the length and narrowness of the shell and in the colour characters; the type also has a long anal suture, but unlike the above-mentioned specimen, the inguinal shield is in broad contact with marginal VI on both sides. Other characters of the type are: Gular shields broad

and rather short, distinctly projecting but not conspicuously so; scales on fore limb rather long and pointed, not much flattened.

The Rhodesian Museum has three young examples presumably referable to *darlingi*. The smallest from Shangaani River (E. C. Chubb) has plastron length 68 mm., being smaller than the type. The inguinal is in narrow contact with marginal VI, and is obtuse in front; nuchal broad. Another has plastron length 87 mm.; inguinal shield in broad contact with marginal VI; nuchal moderate; carapace, as in preceding specimen, not markedly depressed.

The largest example, without data, has plastron length 105 mm.; inguinal shield widely separated from marginal VI; nuchal narrow; carapace depressed. In all three examples the inguinal is quite obtuse in front.

The largest example is approximately similar in size to two young of *australis* from White River. The following differences are noticeable: All three examples of *darlingi* have the enlarged scales on the anterior surface of the fore limb long and tapering, bluntly pointed at their apices; in the young *australis* these scales are much more flattened and rounded at their apices. The gular shields on the anterior lobe of the plastron are a little broader in *darlingi*; the sides of the humeral shields are nearly straight in *australis* and the surface flat, whereas in *darlingi* the sides are well-curved and the surface distinctly and rather suddenly bent upwards in front. In the two smaller examples of *darlingi* the bending of the anterior lobe of the plastron is only slight.

8. *Kinixys jordani* sp. n. Pl. XXXVII, figs. 1-3.

This form is based on two sub-adult specimens, male and female, from Isoka, N. Rhodesia, presented to the Albany Museum by Mr. E. Knowles Jordan. Isoka is on a plateau extending up to the Tanganyika Territory border; altitude about 4500 ft. Mr. Jordan reports that only very few tortoises are seen in N. Rhodesia, as the long grass hides them very effectively.

It considerably resembles *australis* but is less flattened, and

anteriorly the carapace is more pronouncedly humped in the region of the first vertebral. This angularity in the outline of the shell is especially marked in the male, but occurs also in the female; in the former the carapace rises both from in front and behind to its highest point at the angle. Carapace depressed. Nuchal shield narrow in both sexes (3 mm.). Vertebral shields all broad; fourth vertebral decidedly broader than long (M. 34, 28; F. 34, 29.5); first vertebral broadening out a little anteriorly; margins of carapace only feebly serrate and not upturned, or only very slightly so postero-laterally; anterior margin of carapace slightly recurved mesially in the male, scarcely so in female. Plastron with well-projecting gular shields in male, only slightly projecting in female; they are a little smaller than the anals, faintly notched mesially in female, more strongly so in male. Anal shields long, the suture much longer than the femoral, longer also than the pectoral, which again exceeds the femoral.

Female carapace with pronounced zonary coloration, each of the vertebral and costal shields with broad margins and large areola blackish, the latter surrounded by an unbroken yellowish border; plastron with a yellow area down the middle and some conspicuous dark brown or blackish markings, which on the abdominal shields radiate from the large yellow areola. The male is much less deeply infuscated, and the margins of the carapace shields are scarcely blackened; the pigmentation of the plastron is very indefinite.

MEASUREMENTS.—Length of plastron, M. 122, F. 131; of gular shields, M. 16.5, F. 18; breadth of carapace at hinge, M. 97, F. 96; height of carapace anteriorly, M. 58, F. 55; height of carapace posteriorly, M. 53, F. 57 mm.

From these specimens it would appear that *jordani* has the sexual differences unusually pronounced, the male having, in addition to the points already emphasized, a peculiar anterior lobe to the plastron; for the outer margins of the humeral shields are nearly straight instead of well-curved as in the female.

A third example from the same source, apparently a young male, has a poorly developed carapace hump; the gulars do not project more than in the female, although they are well-notched

mesially; and the hinge is ill-developed, the carapace being broadest anterior to the hinge. In all three examples the inguinal is in contact with marginal VI; in the two adults very broadly so, the inguinal being more or less rectangular anteriorly; in the young male very narrowly so, the inguinal having an acute anterior angle.

The three specimens just described are all relatively short and bear no striking resemblance to *australis*. A further series of five examples (four females and one possibly male), taken at a later date in the same district, differ somewhat therefrom, and the largest one is depressed, but not so much so as *australis*. Another large specimen has the anal suture a little shorter than the femoral; also a small male (?) has the femoral very slightly longer than the anal suture; in the other three the anal suture is longer than the femoral. In the small male (?), the anals have more or less distinct postero-lateral angles, which, however, are rounded off; angles are not present in the largest specimens.

The inguinal shield varies in shape; one large specimen with rather narrow carapace has a well-marked acute anterior extension of the inguinal, which meets or just fails to meet marginal VI; in the largest example the anterior angle of the inguinal is not very acute and is widely separated from marginal VI; the smallest example (male ?) has the inguinal acutely rounded in front and widely separated from marginal VI; a moderate-sized specimen, rather depressed, has the inguinal very obtuse in front and widely separated from marginal VI; in a small specimen it is moderately acute in front and meets marginal VI.

The two largest specimens have no indication of upturned margins posteriorly; an abnormally depressed specimen has the hinder margin of the carapace slightly upturned, and a small specimen has indication of the same.

The two largest examples have marginals V-VII without well-marked dorsal and ventral surfaces, the whole surface being almost in one plane and the lateral keels being very weak or obsolete. This character separates well the largest rather flat example from typical *australis*. However, the three type specimens have strong lateral keels on marginals V-VII, and

such is also the case in the three smaller examples of the series now described; in these specimens, also, ventral and dorsal surfaces of the lateral marginals are not in the same plane.

In this series the antero-dorsal angle on the carapace is not so conspicuous as in the types. In the largest specimen that angle is not more pronounced than in *australis*; the immature example with upturned posterior border of the carapace has the angle almost non-existent. The latter specimen is depressed in its anterior half and the vertebral shields are not so flattened as in *australis*, yet it might be referred thereto, but that the inguinal shield is well-separated from marginal VI and is obtuse in front.

A distinguishing character common to all members of these series is not apparent. However, the two largest specimens, presumably adult females, differ from the largest females of *australis* as follows: Shell not so much flattened and narrower, (plastron length 164 mm., width of shell 111.5, against plastron length 160, width of shell 120 in large female of *australis*); the gular shields scarcely project in front of the anterior angle of the humerals, whereas in *australis* there is generally a considerable projecting portion; also in the lateral marginals as above stated.

Lastly, a large adult male has no hump on the carapace, has a well-developed hinge, marginal VII being quite small, and the nuchal is long and narrow; plastron length 139, carapace breadth 98, carapace height 64 mm.

The British Museum has a specimen from Gatta Plain, British East Africa, which has resemblance to *jordani* and *australis*. The shell is depressed, but not so much as in *australis*, and is rather narrower than in that form. Gular shields large, considerably projecting, notched in the middle; anal short, the anal suture a little shorter than the femoral; brachial suture long, a trifle longer than the humeral; hind margin of carapace not upturned; first vertebral with dorsal angle, but not sharply defined; inguinal shield broadly rounded and in broad contact with marginal VI; scales on fore limbs all flattened and broad; carapace shields with concentric pattern.

9. *Kinixys youngi* *sp. n.* Pl. XXXVII, figs. 4, 5; text-fig. 1, *d* (p. 474).

This is founded upon three specimens from Nyasaland, two of them being taken near Livingstonia, on the shore of the lake, the third from a locality in Ngoniland about 120 miles away from Livingstonia. The former, the types, are apparently females and the latter adult male. These were presented to the Albany Museum by the Rev. W. P. Young.

They have considerable resemblance to *jordani* both in form, colour, and structural characters, but seem distinct on the following points: Carapace more depressed and broader than *jordani*; nuchal shield rather broad, instead of narrow as in *jordani*; gular region of plastron projecting and spout-like, being strongly hollowed above and the anterior margin well-curved in a vertical plane—the gular region is not hollowed above, or scarcely so in the seven specimens of *jordani* examined, but another specimen, a young male, has the character somewhat as in the female of *youngi*; in the male the gulars are relatively narrowed in front, and curvature more pronounced than in the female.

The inguinal is in broad contact with marginal VI in two specimens, just failing to meet on one side in the third specimen. Marginals IV–VII all with strong lateral keels. Front margin of carapace viewed from above well-recurved, rather more so than is usually the case in *jordani*. Postero-lateral margins of carapace well-upturned in the male, less so in the female, and scarcely at all in the young female; in male also the margin is upturned more or less distinctly antero-laterally.

Carapace shields not raised, but there is a slight angular protuberance on the first vertebral. Lateral margin of humeral shield well-curved. Anals moderately long, the suture in each case longer than the femoral suture. Pectoral suture only a trifle shorter than humeral in the male, considerably shorter in the two females.

In colour in the female each carapace shield has a large black central areola; this is surrounded by a narrow yellow ring and

then comes the broad black margin. The broad margin in places may be interrupted, showing rather vaguely a radial arrangement, the radii being very broad. Plastron of female with conspicuous black radial markings on all the shields except gulars, those on the abdominal shields not completely surrounding the central yellow areola; in younger female the pigmentation is more extensive, and the abdominal shield has a complete black starry ring round the central yellow areola.

The male is much paler, the pigmentation being both less intense where it occurs and much more limited in its occurrence. The pattern, as in female, is of the concentric type. Each carapace shield has a yellow margin and large pale areola, with a narrow brown ring intervening. On the plastron there is some brown pigmentation on most of the shields; on the abdominal shield it forms a relatively narrow ring imperfectly enclosing the large central areola.

MEASUREMENTS.—Breadth of carapace, M. 111, F. 103.5; breadth of nuchal, M. 8, F. 7.5; length of plastron, M. 146, F. 149; length of humeral suture, M. 22, F. 27; length of pectoral suture, M. 21, F. 17.5; of anal suture, M. 17, F. 17; of femoral suture, M. 14.5, F. 14.5; height of shell, M. 59, F. 61.5 mm.

In these three specimens the hinge is best developed in the male, and so weakly in the female that it seems doubtful if any appreciable movement was possible. In the two females the eighth marginal shield is about the same size as the seventh, and not very much smaller than the ninth; whereas in the male it is much smaller than the ninth. In the two largest females of *jordani* there is a good development of a hinge and the eighth marginal shield is noticeably small. The very poor hinge development in these female specimens of *youngi* may be an indication of immaturity; but I think such is not so, for Mr. Young writes that one of them contained fair-sized eggs.

It will probably be found that a feebly-developed hinge is normal in this form and also in *darlingi*.

A fourth specimen received is an adult male in which hypertrophy of the shell has already commenced. It agrees well

with the types in general form of shell, but in other respects there are differences: Lateral keels on marginals V-VII almost obsolete. The nuchal shield is reduced almost to vanishing point above, and the two first marginals meet in the mid-line; the nuchal is, however, quite well developed on its lower side; the gulars are much swollen and unusually large, but are only slightly curved upwards at the sides, and the anterior margin forms a slightly curved line; below, there is a narrow mesial groove which does not widen out in front; gular and humeral sutures subequal in length.

In an old male of *australis* from White River, the mesial groove of the gulars is broader and widens out considerably from behind to front; the suture is considerably shorter than the humeral. On the form of the gulars it is generally possible, even in females, to separate *australis* and *youngi*, those of *australis* being flatter ventrally, and the anterior margin in adults only shallowly curved or even straight.

A fifth specimen recently received, a large female, has a radiate pattern on the carapace shields; anterior and posterior margins slightly upturned, but not the supracaudal; hinge weak, but marginal VIII small; inguinal in very broad contact with marginal VI; gulars well-projecting, only slightly spout-like; length of plastron 163, width of carapace 122, height of shell 69 mm.

Lastly, a young male has large broad gulars which are not spout-like.

10. *Kinixys lobatsiana* Power. Pl. XXXVII, figs. 6, 7; text-figs. 1, e, f (p. 474), 2.

Kinixys lobatsiana Power, Trans. Roy. Soc. S. Africa, xiv, p. 410, pls. xix and xx, 1927.

Through the kindness of Mr. Power I have been able to examine all the type-material of *lobatsiana*. With regard to the sex of these specimens, I have arrived at different conclusions from those indicated in the original description.

There are three specimens, two large and one small. The

two former I take to be adult male, a stout specimen, and immature male decidedly narrower. The adult male, as now identified, was described as the female, and the immature male as male, although Power's figure labelled male is really that of the specimen mentioned in the text as juvenile. Thus, the following corrections should be made in the figures: Pl. XIX, fig. 1, and Pl. XX, figs. 1 and 2, represent the adult male; Pl. XIX, fig. 2, represents the juvenile specimen.

I make these corrections because there are indications that the adult female of *lobatsiana* may become very different from the male. Mr. Power informs me that his conclusions with regard to the sex were based on the observed behaviour of living specimens; at the time of capture the young individual was apparently attempting to copulate with the adult male. My own identifications are based principally on the characters of the plastron and the gular shields. In respect to the excavation of the plastron, a very common character of adult males in the genus *Testudo*, this occurs in both of the larger specimens from Lobatsi, but is more pronounced in the one now believed to be the adult male; this also has the surface of the front lobe of the plastron a little hollowed, not flat, as in the subadult male and the half-grown example. The gular shields of the adult male are small, but swollen, and rather deeply incised mesially; of subadult male longer but flat, scarcely swollen and not so markedly incised mesially, thus more closely resembling the immature specimen, which has flat and rather strongly projecting gular shields. I believe it will be found that swelling of the gular shields accompanied by a deep mesial incision is a character of maturity in adult males of this genus; in females and young those shields are flat, and generally, but not invariably, have a straight transverse anterior margin with only slight median incision.

With regard to the reverted marginal shields, there is peculiar variation; the young specimen, which might be expected to show a strongly reverted margin, has practically no reversion, the margin being merely dentated, but not sharply so; the two large specimens have a strongly reverted posterior margin,

which is even more pronounced in the narrow specimen, presumed to be subadult male, than in the adult.

A minor character that may be noticed is the form of the anal shields; the two large specimens have anals without a postero-lateral angle, the hind margin being lightly rounded throughout; whereas, in the immature specimen a postero-lateral angle is well-developed. In all three specimens the postero-median incision is shallow. The exact shape of these anal shields is probably of no specific importance.

In the genus *Testudo* it often happens that the supra-caudal shield shows sexual differences. The extremity of that shield in the adult male tends to be directed forwards, and in the adult female backwards; in the latter it may be broadly grooved on the inner side and more or less spout-like.

The two large specimens from Lobatsi have the supra-caudal shield very strongly thickened throughout, with well-rounded and smooth lower margin and no groove; the juvenile specimen has indications of a groove, and is not strongly thickened. On this character the indications undoubtedly favour the masculine interpretation of the two larger examples. A good series of specimens belonging to other species of *Kinixys* has been examined in this connection. It appears that a mesial groove is more or less distinctly indicated in juvenile examples, evidently denoting a double origin; in adult females the shield thins down somewhat mesially and there is often a broad shallow groove, but this is not a constant feature of the sex; males generally have a thickened shield and no groove, but sometimes there are distinct indications thereof.

More recently Mr. Power has obtained a series of adult and subadult specimens from the same region. This presents a considerable range of variation. In the male the hind margins of the carapace may be strongly upturned or only slightly so; the shell may be noticeably narrow or fairly broad—one male with total length of carapace 164 mm. has a width of 100 mm., whilst another with same carapace length has a width of 107.5. The hindermost vertebral shield sometimes presents a marked protuberance on the surface of the carapace; outer borders of

humeral shield always curved; suture between vertebrae IV and V generally narrow, sometimes even less than half the length of vertebral V; the anal suture is always longer than the femoral, sometimes very much so; the gular shields are usually markedly different from those of the type male, being larger, broad and always well-projecting, notched in front but not deeply so; sometimes they are very large (22×35), but the size varies, and in no case are they subtriangular, or triangular; inguinal shield in rather broad contact with marginal VI, or in the much elongated specimen and one other well-separated from VI, or in one specimen just in contact with marginal VI, the shape of the inguinal being variable, occasionally acute-angled in front, generally not so, although not broadly rounded.

A series of six females presents characters more or less like those of the males; the protuberance of the last vertebral shield is, however, obsolete; the hinder margins of the carapace less upturned; anal suture generally longer than femoral, or in one instance equal thereto; gulars projecting, in one instance only slightly, and in this case these shields approach the subtriangular, although the front margin is somewhat sinuous and notched in the middle. When the anal shields are specially large, so also are the gulars, and in one such instance the pectoral suture is almost equal in length to the humeral (18, 20), although the difference is generally much greater, in one instance 11.5, 32.

The females, on the whole, are a little stouter than males, but one is quite narrow, like the narrowest male.

All the specimens have a nuchal shield. Anal shields generally without postero-lateral angles, but occasionally in either sex such angles may occur. Marginals IV-VI with obsolete or weak lateral keels.

Dark pigment is noticeably absent. It occurs only at the margins of the carapace shields as remnants of broad and narrow rays. No dark colour on the plastron in most specimens, but in one instance there are infuscated patches on the abdominal, femoral and pectoral shields.

This species is probably more nearly related to *australis*

than to the other South African forms—that is, if the form of the anals and gulars is of any importance.

The Transvaal Museum has a series of specimens from Naauwpoort, about 40 miles south-east of Pietersburg, N. Transvaal, collected by Mr. G. van Son. These are evidently referable to *lobatsiana*, although certain differences from the types are traceable. The largest male has a long, narrow carapace, with all the hinder margins well-upturned. This specimen has gulars well-projecting and thickened, with deep mesial incision; margins of femoral and humeral shields well-arched; anals with well-marked postero-lateral angles, thus differing from the types; anal suture scarcely longer than femoral; pectoral suture very slightly exceeding half the length of abdominal suture; supracaudal thickened and with trace of a mesial groove; nuchal shield very narrow (2.5 mm.). Another male is shorter and relatively stouter, hinder margins slightly upturned, anals with rather indistinct postero-lateral angles, anal suture much longer than femoral; abdominal suture more than three times as long as the pectoral; supracaudal thickened and slightly grooved; nuchal shield relatively broad (7 mm.).

In both these specimens marginals V and VI have lateral keels; they are more pronounced in the larger specimen. A half-grown specimen (plastron 119 mm.) has hind margin of the carapace well-upturned, rather broad nuchal shield, anal shield with postero-lateral angle, but not well-defined, anal and femoral sutures subequal, gulars a little projecting, only slightly incised mesially, supracaudal double, anterior marginals large and directed horizontally.

The Naauwpoort series also contains a single large and stout female example (Pl. XXXVIII, figs. 1 and 2). This differs considerably from the males as follows: Hinder margin of carapace not upturned, only with slight indication of reversion; gulars small but projecting, no median incision; plastron quite flat; anal suture shorter than the femoral (14.5, 19), the anal with indistinct postero-lateral angles; supracaudal indications of a groove; marginals IV–VII with discontinuous keels; lateral margins of femoral and humeral shields only slightly arched.

The gular and anal shields are relatively a little smaller than in the males.

In all these Naauwpoort specimens the carapace is well-arched, not flattened. In the female and longest male a slight median prominence on vertebral I, not present in the second adult male. The inguinal shield is always acutely angular in front and in contact with marginal VI, except in the shorter male.

The colour pattern is essentially of radial type in the young specimen and in the largest male; there is a large central pale areola, but around the margin of each shield are arranged short blackish rays. These short rays tend to fuse together in the female so that the pattern becomes concentric more or less. The female has a few dark rays on the plastron, but these are almost or entirely absent in the males. On the carapace the colour contrasts are not pronounced in any specimen.

These specimens differ from the types of *lobatsiana* chiefly in the length of the anal suture; the three examples of typical *lobatsiana* agree in having that suture much longer than the femoral. Also the anal shields are more strongly projecting behind in the Transvaal series. This character may possibly seem of subspecific value, but more material will be necessary to justify the separation.

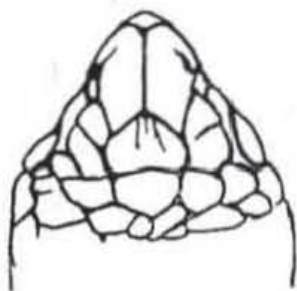
MEASUREMENTS.—Length of plastron, large male 145, smaller male 127, female 153; breadth of carapace, large M. 107, small M. 97, F. 111; height of carapace, large M. 65, small M. 65, F. 78 mm.

Another adult male specimen in the Transvaal Museum (no. 12758) is labelled indefinitely "N. Transvaal." It agrees generally with the narrower male from Naauwpoort, but the hinder margins of the carapace are not upturned, except slightly so on marginal X; the nuchal shield is obsolete; gulars considerably projecting; anal suture long; marginals V and VI with no lateral keel, as is also the case in the two type males, VI in contact with inguinal, which has an acute angle anteriorly. Length of plastron 138, posterior breadth of carapace 103 mm.

A very young specimen of *lobatsiana* was recently sent to me from Glentig, near Nylstroom, by Mr. John McCallum. This

has five well-developed claws on fore limb, four on hind limb; gular shields projecting, but very broad and short; anal suture longer than femoral, but without postero-lateral angles on anals; inguinal in broad contact with marginal VI; middle marginals all strongly keeled; marginal VII much smaller than VIII; whole hind margin of carapace crenate, the supracaudal notched;

TEXT-FIG. 2.



Kinixys lobatsiana
Power. Head scaling
of young specimen from
Glentig, nr. Nylstroom,
dorsal view.

enlarged scales on front surface of fore limb about 8, not contiguous.

This specimen has some resemblance in form to the species of *Pseudomopus* (*gen. nov.*); also in the size of the inguinal shield, and the form of the gulars agrees in a general way; but there are various differences—the scaling on the fore limb, enlarged scales all contiguous and overlapping in *Pseudomopus*; the absence of postero-lateral angles on the anals; abrupt change in size of marginals VII and VIII; large

head-shields (text-fig. 2) much better developed in *lobatsiana*. Thus generic differentiation is quite well-marked in juvenile specimens of this species of *Kinixys*.

Mr. J. McCallum informs me that this species will readily take to water. He happened to place a specimen on the ground near to a pool of water on the farm Glentig, whereupon the tortoise voluntarily entered the pool and swam for several yards to the opposite bank.

THE SOUTHERN SPECIES AND SUBSPECIES OF THE GENUS *KINIXYS* MAY BE DISTINGUISHED AS FOLLOWS:

- A. 1. Shell considerably flattened; anal suture generally longer than the femoral; marginal VI generally in contact with the inguinal, but if separated the inguinal has an acutely angular projection anteriorly; hinge well-developed; nuchal of female narrow. White River, E. Transvaal.

australis sp. nov.

2. Resembling *australis*, but shell relatively longer and narrower, more deeply pigmented, and (?) marginal VI widely separated from inguinal in adult, the latter being rounded or obtusely angular in front. Mashonaland.
darlingi *Blgr.*
3. Shell not so strongly flattened as in *australis*; nuchal narrow; gulars in female only slightly projecting; a well-marked antero-dorsal angle sometimes present on carapace. Isoka, N. Rhodesia. *jordani* *sp. nov.*
4. Carapace flatter and broader than in *jordani*: gulars well-projecting in both sexes, often strongly hollowed above in female; nuchal of female relatively broad; hinge ill-developed in female, marginal VIII sometimes almost as large as VII or IX. Livingstonia.
youngi *sp. nov.*
- B. 5. Shell not depressed and without well-marked prominences: anal suture generally longer than the femoral; posterior marginals more or less strongly upturned in males, less strongly so or even not at all in adult female; gulars more or less strongly projecting in front of the humeral. Plastron with dark pigmentation, or only a little. Lobatsi, Bechuanaland Prot. *lobatsiana* *Power.*
- c. 6. Shell well-arched, without prominences, gular shields not projecting, relatively long and narrow, together forming an equilateral triangle; anal and pectoral sutures shorter than femoral; fourth vertebral as broad behind as in front; colour pattern pronouncedly radial. Zomba, Nyassaland. *belliana zombensis* *subsp. nov.*
7. Similar to *zombensis*, but gulars broader, not equilateral; vertebral and costal shields more or less distinctly raised, not passing insensibly into each other; pectoral suture rather long, generally (?) longer than the femoral; fourth vertebral narrower behind. Zululand.
 Adult of *belliana zuluensis* *subsp. nov.*
8. Gular shields relatively short and broad; anal suture generally shorter than the femoral; inguinal shield either rounded in front or more or less obtusely pointed; posterior vertebrals and costals more or less raised, sometimes only slightly so. Colour pattern on shields for the most part arranged concentrically.
 Young of *belliana zuluensis* *subsp. nov.*

Homopus Wahlb. and *Pseudomopus gen. nov.* ;
text-figs. 3-5.

As remarked by Dr. J. E. Duerden in his account of the genus as then understood ('Records Albany Museum,' ii, p. 409), "each species of *Homopus* has clearly defined distinctive characteristics: . . . and, except perhaps in the case of the femoral tubercles, there is little or no evidence of intergrading. This is in marked contrast with the conditions prevailing in the *geometrica* group of *Testudo*."

As to the femoral tubercles, the present view is that they have no bearing on the question of intergrading; highly variable as they are in a single species, and found sporadically in various genera of tortoises, their evidence on questions of affinity seems untrustworthy.

The species hitherto referred to this genus fall into two very well-defined groups. The one group including *areolatus* and *femoralis*, the former being the genotype, is well marked off from all allied forms through the small size of the inguinal shield, which does not meet the femoral. Also, there are only four claws on the fore limb. Other characters are: Anal shields large, the anal suture always longer than the femoral; line of junction between fourth and fifth, or ultimate and penultimate vertebral very narrow; nuchal shield fairly long, often pointed or tapering; on the snout a large prefrontal shield imperfectly divided, or a pair of large prefrontal shields which in front almost border on the nostrils. In this group apparently the males do not show any marked hollowing of the plastron posteriorly.

The other group, including *signatus* and *boulengeri*, has the following principal characters: Inguinal shield large, meeting the femoral; fore limb with five claws. Perhaps of less importance are: Line of junction between fourth and fifth vertebrals fairly broad; on the snout a pair of moderately sized prefrontals and also a few other small scales well-separating them from the nostrils, one pair of which may be about as large as the prefrontals (text-fig. 5).

It may be remarked that in *Kinixys* the nostril is situated

in some relatively soft membrane a little below the anterior margin of the prefrontals; there are no small scales intervening between it and the anterior margin of the prefrontals. In *Homopus areolatus* and *femoralis* the nostril is within a small horny patch intervening between prefrontal and beak proper, and this patch shows very faint indications of sutures, as if composed of two or three fused scales; the fusion is almost complete.

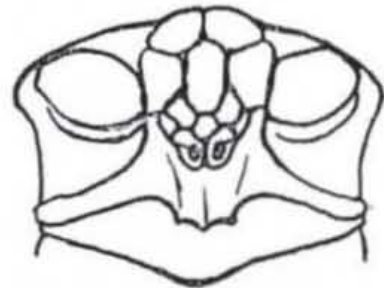
The size of the anals is variable; in *boulengeri* the anal suture is shorter than the femoral, but longer than the femoral in *signatus*. Nuchal shield apparently always very short, the anterior margin of the carapace being rather deeply excavate. In the skull the squamosal is raised somewhat higher than in true *Homopus* and the tympanum is rather large.

Adult males in *boulengeri*, at any rate, have the characteristic convexity of the plastron.

The characters above mentioned are not necessarily all of generic importance. The number of claws on the fore limb is known to be variable in *Kinixys* (see Schmidt in 'Herpetology Belgian Congo,' p. 407). The nuchal character also is not a very constant one in such genera as *Testudo* and *Kinixys*. The scaling of the head is said to vary considerably in *Testudo*; but this genus is doubtfully natural, and it may be noted that in the species of the characteristic *geometrica* group there is much constancy, the upper head-shields being small and irregular; in this character *signatus* and *boulengeri* come nearer to the geometric tortoises than to *Homopus* proper or *Kinixys*.

On account of these differences it would appear to be desirable to recognize a distinct genus for the two species *signatus* *Wahlb.* and *boulengeri* *Duerd.*, and the main divergence from *Homopus* is the large size of the inguinal shields. In this respect the new genus agrees with *Kinixys*, which, however,

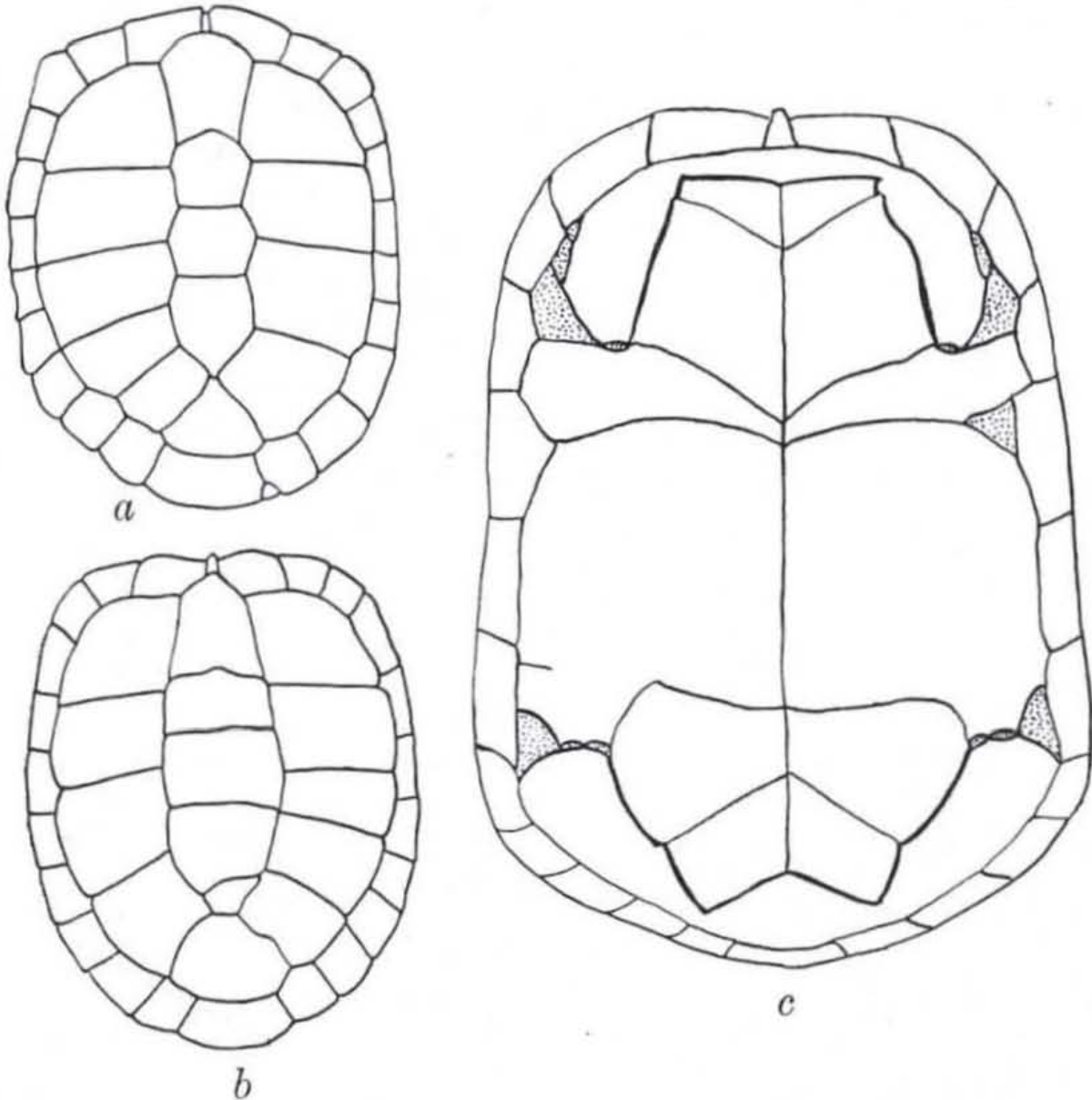
TEXT-FIG. 3.



Pseudomopus boulengeri (*Duerden*). Front view of snout showing small scales around nostrils.

is separable on the carapace hinge. The name proposed is *Pseudomopus*, the genotype being *signatus* *Wahlb.* Whether the sum total of the distinguishing characters be

TEXT-FIG. 4.



Homopus femoralis *Boulenger*. *a.* Carapace of specimen from Hanover, C.P. *Homopus areolatus* *Thunberg*. *b.* Carapace of specimen from Carlisle Bridge, nr. Grahamstown. *c.* Ventral view of Grahamstown specimen showing inguinal and axillary shields, remnants of the infra-marginal row of certain other families.

accepted as of generic importance or not, it seems certain that *signatus* and *boulengeri* are more closely related to each other than either is to *areolatus* or *femoralis*.

As regards the genus *Homopus*, as now restricted, the small inguinal shield separates it from any other South African genus. In other genera only very rarely does the inguinal fail to meet the femoral; I have once noted it in *Testudo oculifera* (from Quickborn, Okahandja, R. D. Bradfield), and in a very young specimen of *Testudo pardalis*. The shortness of the suture between vertebrae IV and V will also usually separate it from *Kinixys* as well as *Pseudomopus*, and gives it resemblance to some of the geometric tortoises, such as *Testudo tentoria*, with which there is also agreement in the obliquity of the humero-pectoral suture and the coloration of the plastron. The length of the vertebral suture above mentioned is nearly always decidedly less than half the length of vertebral V, and in a specimen of *femoralis* from Hanover the two shields are only just in contact. However, although the tendency to reduction of this suture is very pronounced, there is considerable range of variation amongst individuals of the genus, and in one specimen of *femoralis* its breadth just exceeds half the length of vertebral V.

A noteworthy feature of *Pseudomopus* is the pronounced tendency to the production of supernumerary vertebral and costal shields. Out of nine specimens of *boulengeri* examined only four have the normal 5·4 arrangement. A somewhat similar instability is found in *Homopus*, but *Kinixys* is much more stable. According to our material, supernumerary vertebrae and costals are rare in South African material of *Kinixys*. Out of a series of twenty-one specimens only two show abnormalities of this nature, in each case one additional costal.

In *Homopus* again there are usually supernumerary shields in the inguinal and axillary regions. These are considerably smaller than the inguinal and axillary shields proper, but clearly belong to the same series. It may be said that a series of three inguinal shields extends between femoral and marginal shields, the most anterior one being the largest. In the axillary region there is also a series of 3, 4 or even 5 shields, of which the one adjoining marginals III and IV is largest, and the hindermost is generally smallest. It is on this latter character that

K. P. Schmidt has endeavoured to distinguish between *Kinixys* and *Homopus*. It is true that one of these supernumerary shields, referred to as the submarginal shield beneath the anterior border of the carapace, is generally better developed in *Kinixys*, but the difference between *Kinixys* and *Homopus areolatus* in this respect is not great.

Pseudomopus is not altogether devoid of these additional small shields, but there is generally only one shield in the axillary region; as an abnormality, this may occasionally be accompanied by a granular shield posteriorly and one or more anteriorly; in the inguinal region the single large shield is bordered by a smaller one posteriorly in *boulengeri*, but apparently not in *signatus*. So, in respect to these shields, which are presumed to be remnants of the infra-marginal row of certain more primitive families of *Chelonia*, *Pseudomopus* has suffered greater reduction in number than either *Homopus* or *Kinixys*.

Regarding the mutual relationships of these three genera: *Homopus* and *Kinixys* are evidently closely related, the former being smaller in bodily size and simpler in the complete absence of the carapace hinge; *Homopus*, however, shows signs of degradation in the reduced number of claws on the hand, and of secondary changes in the hinder portion of the carapace, causing the narrow junction between the fourth and fifth vertebral shields; the complete separation of the large inguinal shield from the femoral is also probably a secondary character in *Homopus*, and likewise the enlarged scales over the exposed surface of the fore limb.¹ The vertebral shields of

¹ On the dorsal surface of the fore limb closely packed large scales occur down to the bases of the claws. Accordingly, the wrist-joint is ill-developed and little used. When walking, *Homopus areolatus* is unable to rest the palms on the ground; it walks on the tips of the claws. When at rest the palms are turned upwards and the dorsal surface of the fore limb is on the ground. On the other hand, *Kinixys lobatsiana* puts the palms on the ground at every step and can remain standing on the palms, the carapace being raised a little from the ground. In that genus the large scales above mentioned are scattered and interspersed with small ones. I have observed *Homopus* behaviour in a single specimen of *Pseudomopus signatus*.

Homopus are relatively narrower than those of *Kinixys*; in the former, vertebral II is narrower than costal II, rarely subequal thereto; in the latter, vertebral II is broader than costal II in both adult and very young specimens. Actually, this character is very distinctive of *Kinixys*, and will generally serve to distinguish it from any other genus of land-tortoises in South Africa. I have only found a single specimen, a half-grown *K. zuluensis*, in which costal II is very slightly broader than vertebral II. The character is, however, more variable in *Homopus* and in the *geometrica* group of *Testudo*. For instance, in *T. oculifera* vertebral II and costal II are subequal in length, or the former slightly narrower; in *T. tentoria* and *T. verreauxi* vertebral II is often very much narrower than costal II. In *Homopus areolatus*, again, I have seen a very young example with vertebral II very slightly broader than costal II; but this seems to be a very rare condition in the species, amongst either adult or very young specimens.

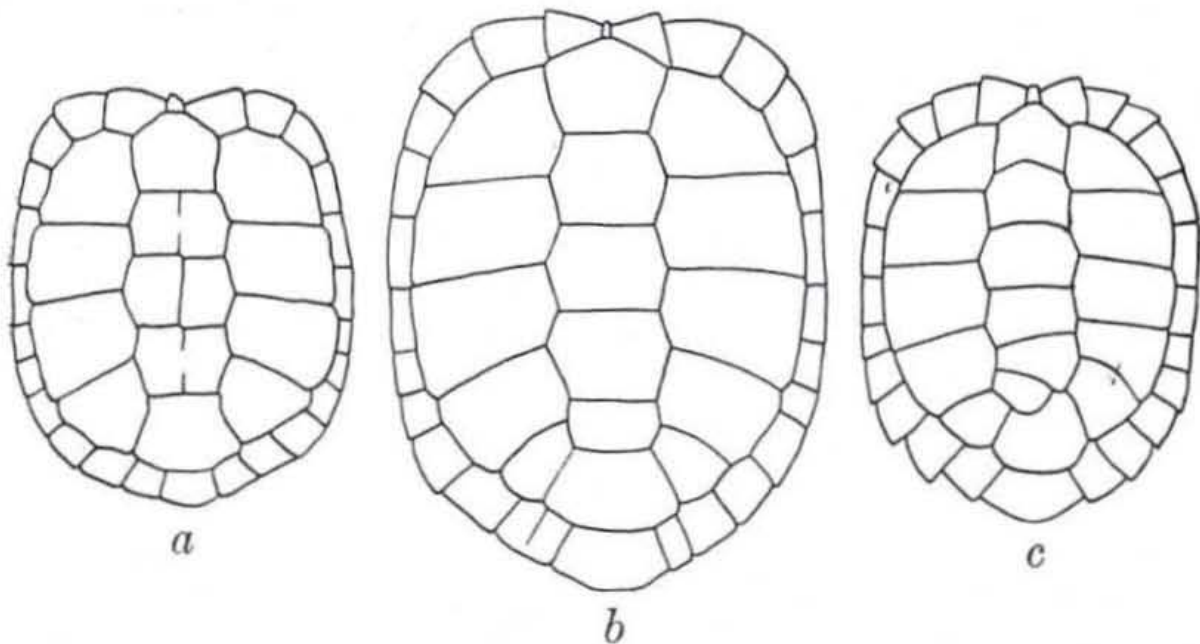
The several characters above mentioned show that *Homopus* is not by any means merely a small and hingeless *Kinixys*; nor does it appear at all probable that *Homopus* is derived from *Kinixys*.

The genus *Pseudomopus* may not be so directly related to *Homopus* and *Kinixys* as these are to each other, judging from the characters of the axillary shields and the head-scaling. On the latter character it seems related to the *geometrica* group of the genus *Testudo*.

There are, however, some suggestions of direct relationship between *Homopus* and *Pseudomopus*; for instance, the rather small and not projecting supracaudal shields, and especially the scaling of the fore limb, which differs from that of any other S. African genus. Also *Pseudomopus boulengeri* generally has rather narrow vertebral shields, approaching the *Homopus* condition, vertebral II being narrower than costal II, occasionally subequal thereto; this may also be the case in *signatus*, but there is considerable variation as to the vertebral characters in that species. So, having regard to both.

structural and geographical data, the probabilities are that *Pseudomopus*, *Homopus* and *Kinixys* are derived from a common ancestor, which was essentially a simplified *Pseudomopus*; for, assuming that the original armature on the head of a tortoise was made up of small scales, more or less like the scales on the tail, then *Pseudomopus* becomes the most primitive member of the *Kinixys*-*Homopus* group. Possibly

TEXT-FIG. 5.



Pseudomopus boulengeri (Duerden). *a* and *b*. Carapaces with shield abnormalities. *Pseudomopus signatus* (Walbaum). *c*. Carapace with shield abnormalities.

there is secondary reduction in the number of axillary shields, and the limb scaling may be a specialization.

The ancestral form must have been much like the ancestor of the geometric *Testudos*. These small species, characteristically South African, cannot easily be explained as dwarfed derivatives of any larger African species, such as the widespread *T. pardalis*. Their head-scaling is apparently the most primitive of all existing South African tortoises. In this respect the large *Testudo pardalis* is more or less at the *Pseudomopus* stage and *Testudo angulata* at the *Kinixys* stage.

The characters separating *Pseudomopus* from the *geometrica* group of *Testudo* include the following: Carapace more depressed; gulars very broad and short, straight or only shallowly incised in front; supracaudal relatively small, not so broad as the distance between the hinder corners of the anals, generally much narrower; pectoral suture relatively long, generally longer than the gular suture, but occasionally a little shorter. In these respects *Pseudomopus* has more resemblance to some of the species of *Kinixys*, such as *zuluensis*.

According to Boulenger, there are generic differences between *Testudo* and *Homopus* in the nature of the neural plates. In the former octagonal and tetragonal plates alternate, whilst in *Homopus* and *Kinixys* the plates are mostly hexagonal. This character again is not at all satisfactory as a basis for generic distinction. A specimen of *Homopus femoralis* has neural plates much like those of a typical *Testudo*. On the other hand, *Testudo oculifera*, *tentoria* and *verreauxi* have mostly hexagonal neural plates; tetragonal plates may also occur, but apparently not octagonal ones. *Pseudomopus signatus* is more or less intermediate between the two extreme conditions; the series of plates is tetragonal, octagonal, hexagonal and tetragonal. *Testudo pardalis*, however, is more or less typically testudinine, and *Kinixys jordani* has mostly hexagonal plates, with one or two tetragonals. Lastly, *Testudo angulata* has neural plates of the hexagonal type when adult, but a young specimen has alternating hexagonal, tetragonal, octagonal and tetragonal plates.

It may be noted that another character which Boulenger has indicated as separating *Testudo* from *Homopus*—the alveolar surface of the upper jaw possessing one or two median ridges in *Testudo*, but no ridges in *Homopus*—is not applicable in the *geometrica* group, for ridges do not occur there. It is probably for this reason that one species has been variously referred by its author both to *Testudo* and *Homopus*, viz. *T. bergeri* (*Lindholm*) from South-West Africa; this, as figured by Werner, is undoubtedly a *Testudo*.

Neotestudo gen. nov.

It is no longer desirable to retain such widely differing types as the geometric tortoises and *Testudo angulata* in one genus. The latter, on the characters of the single gular shield, is well-separable from any *Testudo*. The head-scaling is an important supplementary character of more than specific significance. For this remarkable species a new generic name, *Neotestudo*, is now proposed. It is probably a near relative of *Testudo*; the presence of a median ridge on the alveolar surface of the upper jaw and the character of the supra-caudal shield is in favour of that view. Otherwise, there is more resemblance in form and structural characters to a high-shelled *Kinixys* than to any South African *Testudo*; in head-scaling it agrees better with the former, and there is a flattened, nail-like claw at the end of the tail, as in some species of *Kinixys*; on the other hand, the vertebral shields are constantly narrower than the costals.

Only in one instance have I seen the slightest indication of duplication in the gular shields of *Neotestudo*. An adult male from Penrock near Grahamstown has the gulars distinctly paired on the lower surface, but the median suture does not extend quite to the end of the gular lobe, and the upper surface thereof shows no signs of duplication. Apparently, this individual commences life with a single gular shield, which subsequently split along the midline.

The growth lines on the single shield of *Neotestudo* strongly suggest homology with the intergular shield that occurs in some other families of tortoises; and it does not seem to be formed by the fusion of two such gular shields as occur in *Testudo*.

So, this genus like *Homopus* and *Pseudomopus* testifies to the occurrence in South Africa of relatively ancient types, related to, but not directly derived from the other modern genera of the Old World.

KEY FOR SUBGENERA AND GENERA OF S. AFRICAN TORTOISES.

1. A number of small nasal scales at the end of the snout.
 No large head-shields.
 Subgenus including *Testudo geometrica* and allies.
 Two prefrontals, but no frontal :
 Nuchal lacking. Subgenus including *Testudo pardalis*.
 Nuchal present. Pseudomopus.
2. Nasal scales only faintly indicated.
 Prefrontals more or less fused into a single shield. A
 divided frontal or otherwise small scales. Homopus.
3. No small nasal scales.
 Two prefrontals and a single frontal ; vertebral II generally broader than costal II ; 2 gular shields ; carapace hinged. Kinixys.
 Two prefrontals, and an imperfectly fused frontal :
 vertebral II narrower than costal II ; a single gular. Neotestudo.

DESCRIPTIONS OF PLATES XXXVI-XXXVIII,

Illustrating Mr. John Hewitt's paper, "Descriptions of Some African Tortoises."

PLATE XXXVI.

FIG. 1.—×·33. *Pelusios nigricans* (*Donnd.*) *castanoides subsp. n.*, dorsal view, type.

FIG. 2.—×·33. Ventral view of same specimen.

FIG. 3.—×·29. *Pelusios sinuatus sinuatus* (*Smith*), ventral view of specimen from Naboom Spruit.

FIG. 4.—×·58. *Kinixys australis sp. n.*, ventral view of male, type.

FIGS. 5, 6.—×·46, ·42. Ditto, dorsal and ventral views, female, type.

PLATE XXXVII.

FIG. 7.— $\times \cdot 57$. *Kinixys jordani* *sp. n.*, ventral view, female.

FIG. 8.— $\times \cdot 66$. Ditto, side view, male.

FIG. 9.— $\times \cdot 57$. Ditto, dorsal view, female.

FIG. 10.— $\times 1$. *Kinixys youngi* *sp. n.*, anterior lobe of plastron viewed from above, female. Livingstonia.

FIG. 11.— $\times \cdot 83$. Ditto, anterior lobe of plastron viewed from below, male. Ngoniland.

FIGS. 12, 13.— $\times \cdot 50, \cdot 50$. *Kinixys lobatsiana* *Power*, dorsal and ventral views, female. Naauwpoort, N. Transvaal.

PLATE XXXVIII.

FIG. 14.— $\times \cdot 40$. *Kinixys belliana zuluensis* *subsp. n.*, dorsal view, adult male.

FIG. 15.— $\times \cdot 43$. Ditto, dorsal view, adult male. Zululand.

FIG. 16.— $\times \cdot 43$. Ditto, ventral view, female. Albany Museum.

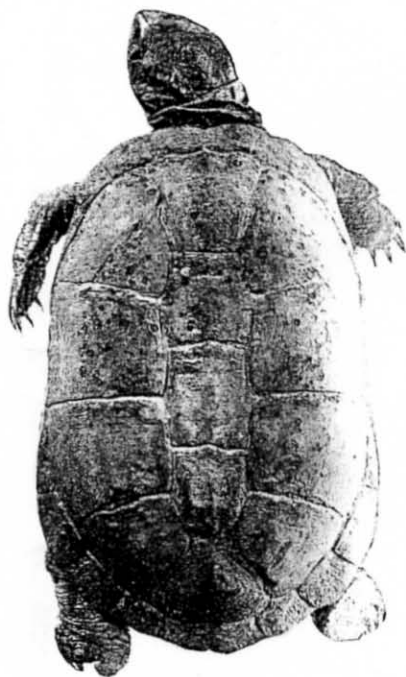
FIG. 17.— $\times \cdot 43$. *Kinixys belliana zombensis* *subsp. n.*, dorsal view, female, type.

FIGS. 18, 19.— $\times \cdot 50, \cdot 80$. *Kinixys belliana zuluensis* *subsp. n.*, dorsal and ventral views, young.

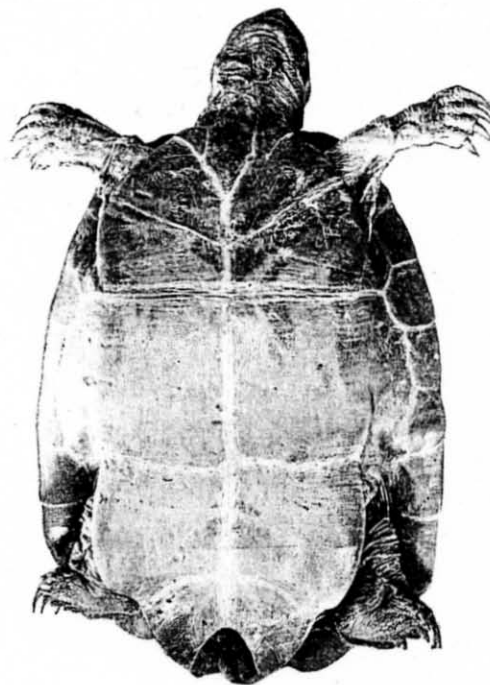
FIG. 20.— $\times \cdot 57$. Ditto, dorsal view, young, abnormal. Ntambanana, Zululand.

FIG. 21.— $\times \cdot 50$. Ditto, ventral view, old male, hypertrophied plastron. Matubatuba, Zululand.

FIGS. 22, 23.— $\times \cdot 50, \cdot 50$. Ditto, dorsal and ventral views, adult female.



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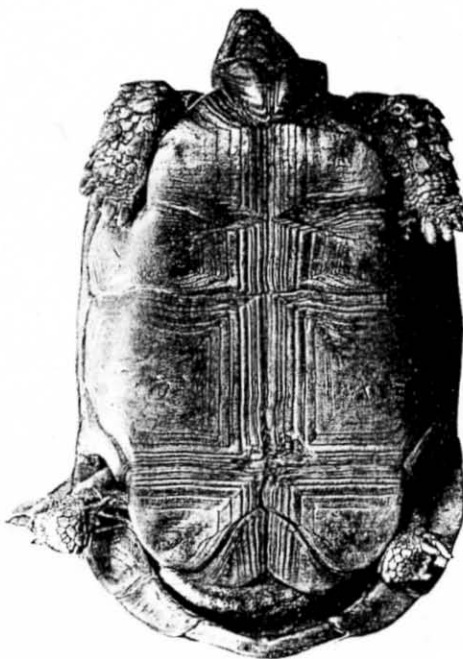
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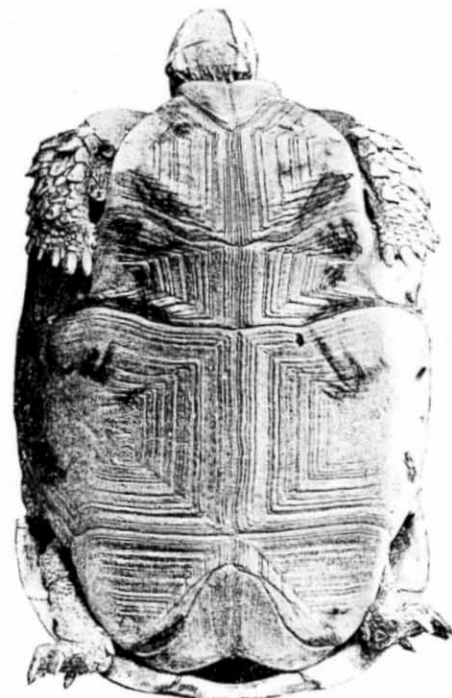
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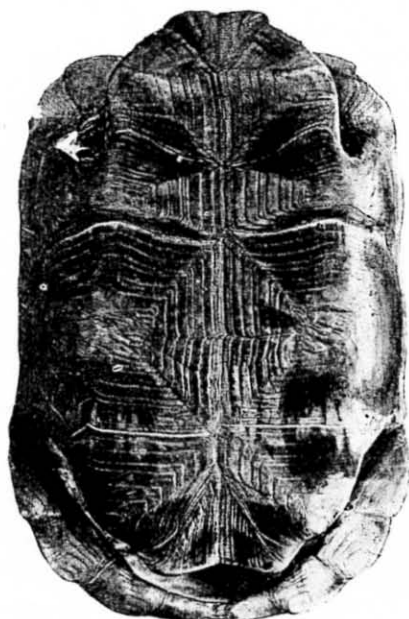
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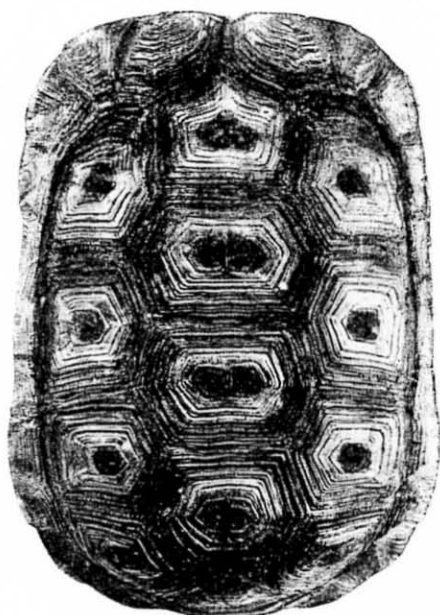
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FIGS. 1, 2.—*PELUSIOS NIGRICANS* (Donnd.) *CASTANOIDES* subsp. n. FIG. 3.—*PELUSIOS SINUATUS SINUATUS* (Smith).

FIGS. 4-6.—*KINIXYS AUSTRALIS* sp. n.



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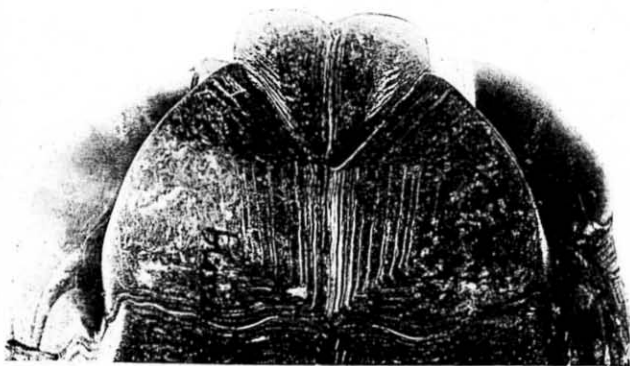
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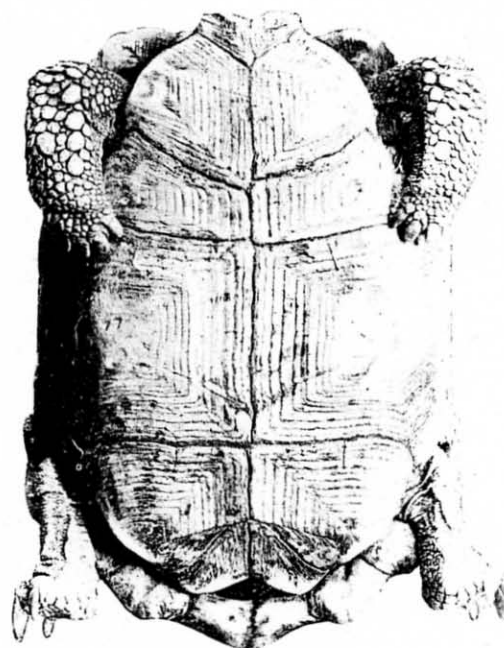
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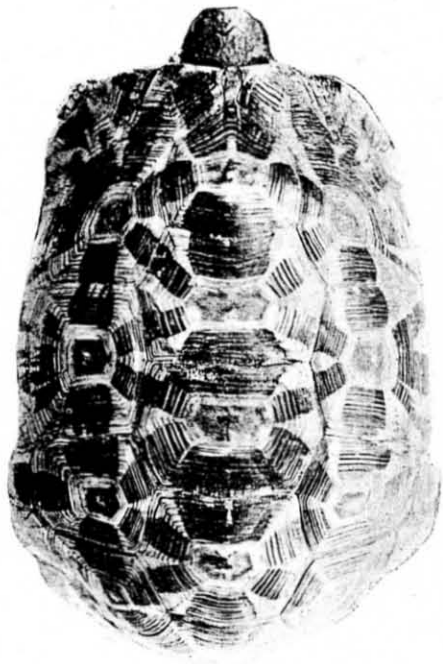


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Figs. 7-9.—*KINIXYS JORDANI* *sp. n.*

Figs. 10, 11.—*KINIXYS YOUNGI* *sp. n.*

Figs. 12, 13.—*KINIXYS LOBATSIANA* *Power.*



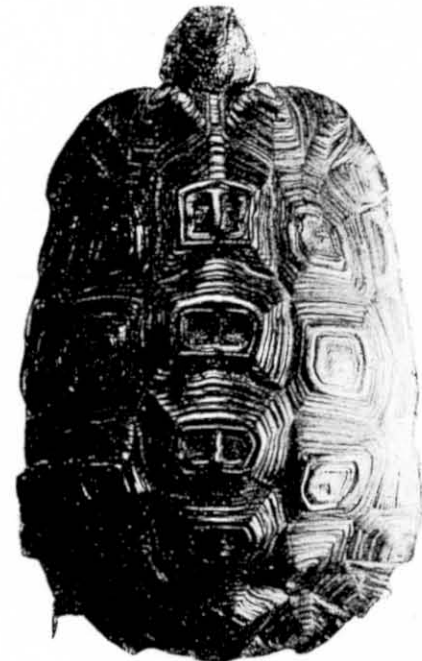
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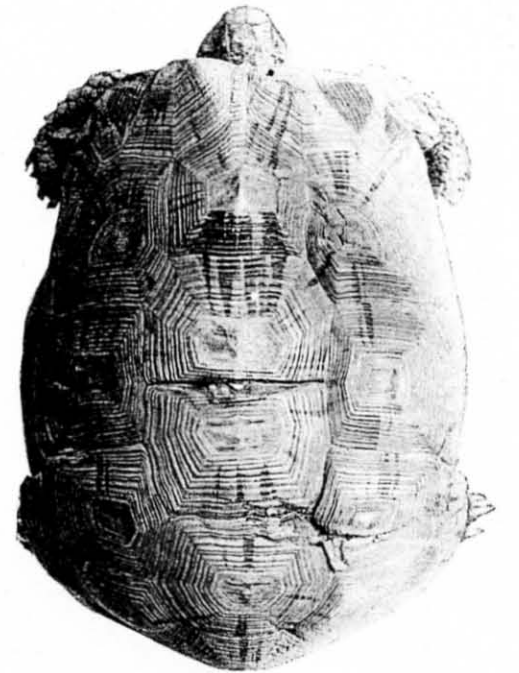
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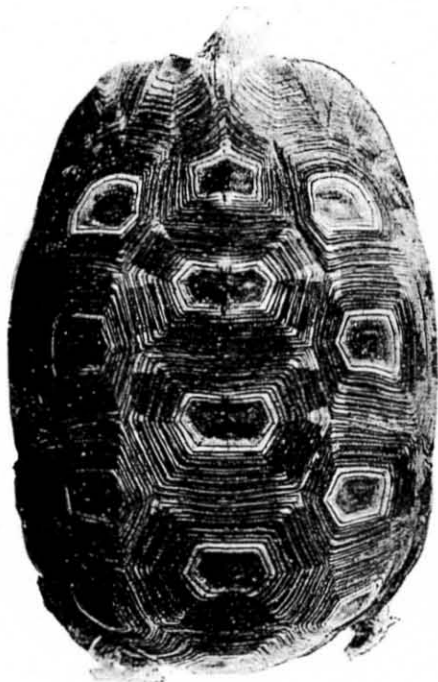
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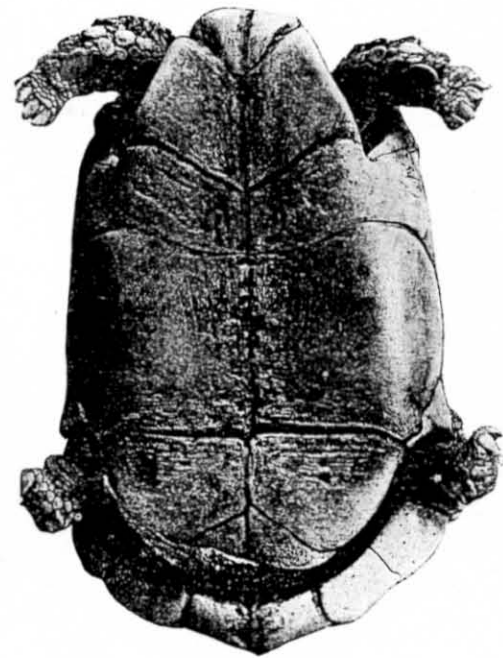
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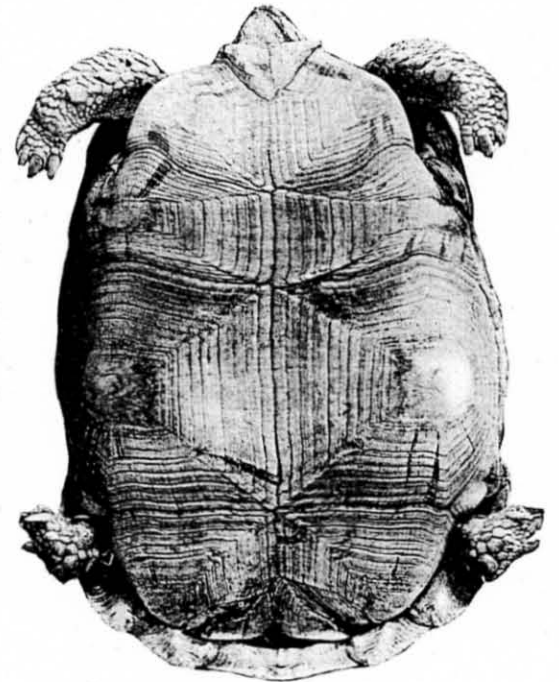
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Figs. 14-16, 18-23.—*KINIXYS BELLIANA ZULUENSIS* *subsp. n.*

FIG. 17.—*KINIXYS BELLIANA ZOMBENSIS* *subsp. n.*