

**ON THE CAPE SPECIES AND SUBSPECIES OF
THE GENUS *CHERSINELLA* Gray.**

By JOHN HEWITT.

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REPTILE
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On the Cape Species and Subspecies of the
Genus *Chersinella* Gray.

PART II.

By

John Hewitt.

With Plates XVI and XVII.

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I. SYSTEMATIC.

Chersinella schonlandi *sp. nov.* Pl. XVI, figs. 46-50.

THIS is based on three specimens, a sub-adult male from Namaqualand, C.P., presented to the Albany Museum by Mr. W. Magennis in 1906, a female from the same source, and a

second female from Namaqualand in the collection of the South African Museum (collected by Dr. L. Peringuey at Ookiep probably).

Type: the above-mentioned male (Pl. XVI, fig. 46).

This species is related to *fiski Blgr.* from De Aar. It is distinguishable therefrom on the general form and the colour pattern, on the character of the marginal shields, and probably also on the form of the supracaudal in the adult male, this shield being less strongly curved in our male of *schonlandi*. In the two first mentioned specimens there is a single large axillary shield, the second shield being very small; in the third example there are two distinct shields, the second being small, much smaller than the first, which is a large one.

Shell rather high and broad in relation to its length, well-rounded costal surfaces and marginals not laterally compressed. The individual carapace shields are not raised, except very slightly vertebral IV of the male. Lateral marginals flattish, not forming an angle with the costals, presenting in all three examples a sharp edge with upper and lower surfaces, which are at an angle to each other. Posterior marginals also very obliquely placed. Edge of carapace upturned very slightly in the posterior half of the body; in the second example upturned also in the "shoulder" region. Costal IV much smaller than I in the females, decidedly smaller also in the male.

In the female, the supracaudal projects posteriorly somewhat acutely and is not upturned; in the male it is large, well curved, the apex directed downwards, but not forwards. Lateral marginals not grooved except faintly in the male.

In the male, the scales on the fore limb are unusually few, arranged somewhat as in *trimeni*, two very stout ones larger than the rest, the most distal one largest; in the Ookiep female they are also rather few, but all stout, the largest not the most distal one, and the arrangement not as in *trimeni*. A single large tubercle on the femur posteriorly in both sexes. Pectoral suture short in all three specimens, and the humero-pectoral line, well angled in the middle. Humeral suture in all three specimens rather long, twice or more than twice as long as the

femoral, and 2-3 or more times as long as the pectoral. The colour pattern is fairly simple. Areolæ all large and yellow, without black spots. About 6 complete yellow rays on each shield, at times only 4 or 5. On each costal the four diagonal rays are well developed, but inferiorly the intermediate ray is absent or only partially developed. The middle longitudinal ray of the two middle costals in the male is much broader than the diagonals; these longitudinal rays of the four costals are interrupted at the junctions of the shields. Much the same condition is found in the Ookiep female, but in the other one the longitudinal rays of both costals and vertebrales are poorly developed.

The colour pattern of the marginals is also simple, black and yellow triangles alternating; each marginal has a thin black hind margin, and the remaining area is divided diagonally into yellow above and black below. The two females differ considerably from each other in details due to preponderance of either black or yellow.

Supracaudal with 3 yellow rays, and the lateral margins also yellow; the middle ray in the male is thinner than the other two. Plastron brownish in the middle, but with no conspicuous radii nor pattern in the male; with rather ill-defined pale-brown radial markings and stripes in the mesial area of the female. The brown pigmentation not forming a pattern on the humeral shields. No radial markings whatever towards the outer portion of the plastron.

Measurements of type male and of female from Ookiep: Length of carapace M. 85, F. 127 mm.; breadth of carapace, M. 72, F. 101.5 mm.; height of carapace, M. 45, F. 70.5 mm.

Prof. C. de Villiers has three shells of this species labelled "Steinkopf". The female (Pl. XVI, fig. 48) is very much like the mate of the type male in form and size; in colour it only differs in that the yellow rays and areolæ are rather stronger. It has a well-marked humero-pectoral angle, a short pectoral suture and a single large axillary shield, the second being very small. Laterally the costals and marginals are in the same plane.

Two males agree well therewith in the essential features of colour pattern. One much resembles the type male, but is a little bigger (carapace $91 \times 73 \times 48$ mm.), and the yellow areolæ somewhat more extensive. The other male is more elongate, and the yellow rays and areolæ still stronger; elongation affects especially the hinder half of the carapace, the supra-caudal projecting rather strongly backwards. This specimen (Pl. XVI, fig. 47) I take to be approaching senility. The carapace measurements are $99 \times 73.5 \times 51$ mm. The smaller male has a long pectoral suture and the humero-pectoral angle is not very pronounced (though much more so than in Smith's figure of *verroxii*). The larger male has a shorter pectoral suture, but humero-pectoral angle is similar. The gulars are much stronger in the smaller male. In both males there are 2 axillaries, but the first axillary is noticeably large, and the second small. In the larger male the lateral marginals are more or less broadly grooved, but the channel is not sharply defined; in the smaller one there is only incipient grooving.

In these three specimens the plastron coloration is very variable: in the female there is a light brown infuscation rather indefinitely disposed over the central area; in the small male a more concentrated dark brown infuscation over a narrower area along the middle, somewhat as in Smith's figure of *verroxii* but with margins undefined; in the larger male with remains only of brown infuscation, more or less in the form of rays mesially.

A very young specimen also from Steinkopf (C. de Villiers) has simple, thin, yellow diagonal rays on each vertebral and costal shield, and a single diagonal on each marginal; the lateral marginals are obliquely disposed, inclining more away from the vertical than in adults.

Dr. G. Theiler has specimens from the following localities: Mt. Liliefontein, Namaqualand; just before Gamoep (Concordia) (Pl. XVI, fig. 49) in Mesembryanthemum veld, sandy to pebbly; 16 miles out of Concordia on Good-house road, sandy grass veld; and between Gamoep and Alwijnfontein, 30 miles from Gamoep, in pebbly to sandy Mesem. veld. Vertebrales and costals not

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the margins ; a fairly simple pattern of yellow rays on a blackish background was evidently present. Plastron without infuscation. There are only 4 vertebrals ; costal IV is smaller than I. Measurements : $120 \times 89 \times 64.8$ mm. The globose form of this specimen brings it definitely under *schonlandi* rather than *fiski*.

In all specimens of *schonlandi* that I have examined the femoral suture is shorter than the anal, as in *verroxii*.

The carapace pattern may somewhat resemble that of *orangensis* from near Philipstown, but the latter has a complete middle ray on costals II and III inferiorly and the carapace is not so elevated as in *schonlandi* ; with *orangensis* or other form of *fiski* there is evidently close relationship.

The axillary character tends towards the condition of *geometrica* and *oculifera*, but no direct relationship is otherwise indicated ; the lateral marginals are not specially elevated as in those species, and the supracaudal of the female projects backwards, not more or less vertically downwards.

In general form of the shell, *schonlandi* has some resemblance to *smithi*, first recorded from "South Africa", and now identified as a Great Namaqualand species. From this species, *schonlandi* is distinguished on the simpler colour pattern, the more globose carapace with sharp lateral edge and plastron less flattened ; whilst there are usually two almost equal-sized axillaries in *smithi* (see 'Brit. Museum Cat. Chelonians,' 1889, pl. iv ; also Siebenrock in 'Südafrikanischen Testudo-Arten der Geometrica-Gruppe,' 1904, pl. iii). It may be a near ally of *verroxii* Sm., but the antibrachial scaling is different ; moreover, according to the original figure this has 2 axillaries, the first only moderately large, and the plastron coloration is not like that of *schonlandi*. Nevertheless, Siebenrock's fig. 5, pl. v, labelled "young of *verreauxii*", is based on something rather like a male of *schonlandi*, and he recorded *verreauxii* from both Little and Great Namaqualand ; on the other hand, his figure 4, pl. iv, labelled adult of "verreauxii", is certainly not an adult of *schonlandi*.

In the same region *trimeni* occurs, but apparently the two

species are separated topographically; *trimeni* belongs mainly to the sandveld, and may be confined to the Namib area of botanists; *schonlandi* occurs on Mesembryanthemum veld and belongs to the Namaqualand desert province of botanists. The limited number of yellow rays in *trimeni* is a character in common with *schonlandi*, but the continuous thin lateral stripe along the costals and the strikingly marked plastron of *trimeni* afford important distinguishing characters; the two species do not seem to be directly related.

Chersinella fiski Blgr. Pl. XVI, figs. 51-56.

Chersinella fiski Blgr., Proc. Zool. Soc. London, 1886, p. 542, pl. lviii.

Of this species a considerable number of specimens from the Hanover district was presented to the Albany Museum by Mr. S. C. Cronwright-Schreiner, about twenty-five years ago. Unfortunately there is no further locality data. These specimens exhibit extraordinary variation both in form and pattern. Characters expected to be tolerably stable, such as the form and shape of the supracaudal shield and the degree of elevation of the vertebrals, are subject to wild fluctuations.

All the specimens are thin-shelled; the supracaudal shield, for example, is much weaker than in specimens from the Albany district or from Somerset East. Moreover, a number of specimens have pathological or senile appearance in the roughness and exfoliation of all the carapace shields. It may be that some essential element was lacking in the food supply. A deficiency of lime was suspected, until Mr. Cronwright assured me that over thousands of square miles the vast flats of the Hanover district have abundant supplies of lime underlying the very thin layers of soil. The supposed deficiency may perhaps relate to quite minute quantities of such substances as manganese or even of iodine, a problem only to be solved experimentally.

On the colour pattern, the Hanover shells could be resolved into at least six groups. To what extent these are topographically or geographically separated is not known; the assumption is that some separation does actually occur. Structurally, also,

several groups are recognizable, but the structural and colour groups do not coincide at all well; for this reason, I refrain from attempting to define more than two or three forms, although I believe that intensive study in the field would reveal the existence of a number of natural units. In the meantime, it seems permissible to treat the material as composed of two or three contrasting types, together with various grades of intermediates which are possibly hybrids, or sometimes unstable insufficiency forms. At present, the adult male seems to afford the most satisfactory means of discrimination.

As to the names to be applied to these forms, fiski *Blgr.* was founded on a single young specimen, said to be male, from "De Aar, not far from Hopetown"; this locality data now seems a little ambiguous, but presumably the type locality was De Aar.

The total length is 75 mm., and, according to the illustration, the breadth is 60 and height 41.5 mm. The lateral marginals appear to have sharp lateral keels, considerable vertical depth, and no deep groove; the original description reads, "lateral marginals not forming an angle with the costals." The plastron apparently is not strongly flattened, and the supracaudal shield not strongly curved; yet without doubt in adult males the supracaudal must be more or less curved. Gulars short and broad, the suture shorter than the anal. Vertebral shields only slightly raised. Colour pattern very simple, the rays few and thick, well marked ocelli on the costals, on some of the marginals 2 black rays, on the fifth only 1.

In the Cronwright series there is no specimen agreeing both in general form and pattern with the type.

An adult female (Pl. XVI, fig. 54) from De Aar (Mrs. Cowling), in the Kimberley Museum, is presumably a typical fiski. The carapace is rather broad and depressed, plastron shallow and flattish, gulars more or less as in type figure, vertebral shields a little raised, but not conical, costals with well-rounded surfaces, but not raised or scarcely so, lateral marginals grooved but not deeply and with sharp lateral edge, hinder marginals somewhat upturned. The pattern is more complex than in the type;

on the costals a continuous but irregular lateral stripe, above which 3 yellow rays pass from the areola on each shield, and below it also 3 which may bifurcate distally; on the lower edge of the costal also two intermediate yellow rays not reaching the areola. Each vertebral with 6 or 7 complete yellow rays. Plastron with a few dark rays mesially.

Measurements: $117.5 \times 93 \times 62$ mm.; vertebral III is 24.5×38 mm., being thus rather broad.

A young specimen (Pl. XVI, fig. 55) from the same source, measuring $76.5 \times 66.5 \times 40.5$ mm., has also a more complex pattern than the type.

An adult female in the Cronwright series has conspicuous rays on the plastron shields (Pl. XVI, fig. 56). Another female from Richmond (Mr. Francis Graham) has only the vertebrae raised, though not strongly so. Lateral marginals well keeled, posterior ones upturned, but not the supracaudal. Costal ocelli present, but not closed, the middle rays more or less merged into the lateral band. Rays on carapace shields not very numerous; on lower half of costals II and III an inverted black ∇ . On the fore limb one scale is enlarged more than the others. Measurements: $108 \times 86.5 \times 58$ mm.

A small female from Victoria West (now in Cambridge Museum, Mass.), only 62.5 mm. long, has continuous mid-dorsal and mid-costal bands and rather few rays on each shield—6 on vertebrae III and IV; lateral marginals with sharp-keeled edge and not deeply grooved.

Adult males from the type locality are not available, but several in the Cronwright series most probably belong to true *fiski*. The characters of one measuring $89.5 \times 70 \times 46.5$ mm. are as follows: Dorsal shields all somewhat raised, the costals only slightly, and the vertebrae not pronouncedly conical, having fairly extensive flat tops. Growth lines are strongly pronounced throughout. Lateral marginals salient, not compressed laterally, with strong ridge and very weak groove; hinder marginals extending outwards laterally rather more than in *cronwrighti*, their margins a little upturned, which is also

the case with marginals III and IV. Supracaudal well arched, measuring 26.5 mm. in breadth, a trifle incurved at the apex, which is markedly truncate, a pair of low lateral keels along the line of the thin yellow lateral rays. Plastron rather flatter than in *cronwrighti*. Gulars short and broad, quite different from those figured in *seimundi* (Pl. XVI, fig. 53).

The colour pattern differs from that of the type *fiski* in that there are continuous and rather narrow mid-dorsal and lateral yellow stripes, so that ocelli as such are absent. The yellow rays generally are relatively narrow and not numerous. On the lower borders of costals II and III only 3 long rays occur, including the diagonals; on the front margin of costal IV there are 4 yellow rays including the diagonals. Plastron with incomplete blackish rays on most of the shields.

A smaller male measures only 82.5 × 64.5 × 39.5 mm. Vertebral shields only a little raised, flat-topped. Costals scarcely raised, except the fourth. Posterior marginals spreading out laterally. Lateral marginals with a groove not strongly marked, lateral keel distinct. Supracaudal broad (25 mm.), well curved, hind margin rounded a little and directed a trifle forwards; its surface with a pair of low lateral keels along the line of the yellow rays. Plastron flattish, gulars rather broad. Colour pattern of typical *fiski* type, more or less, but the yellow rays all narrow, including that which enters the costal ocellus; two of these ocelli are open or nearly so. Lower portions of costal shields without rays.

A third male measuring 90 × 74.5 × 48 mm. agrees in the main; posterior marginals are a little upturned; supracaudal measuring 27.5 mm., with keels almost obsolete, hind margin rounded, but not broadly so. The colour pattern is indistinct, apparently due to some abrasion or absorption of the black pigment; but there seem to be remains of costal ocelli with central dark streaks.

Another male that seems well placed here is old and a little worn. The supracaudal has the surfaces much rubbed, and the keels are almost vanished. The summits of the other carapace shields are also somewhat smoothed. Yet the lateral keel of

the marginals is quite strong, and these shields are not compressed. The measurements are $97 \times 74.5 \times 47$ mm.; supra-caudal breadth 27 mm.

The females of this series show pronounced growth-lines on carapace and plastron. The lateral keels on the supra-caudal are well distinct, and this shield does not present a well-rounded surface, nor is the hind margin rounded, the sides being more or less straight for a considerable distance. Lateral marginals with strong lateral keels and weak grooves. Posterior marginals oblique, not upturned in two examples, but well upturned in a third. Vertebrales and costals moderately raised, with flat tops, not very conical. The colour pattern differs from that of typical fiski in the absence of distinct ocelli, the dorsal and lateral stripes being more or less continuous. On the forelimb one of the distal enlarged scales is much larger than the others. Measurements: $106.5 \times 87 \times 60$ mm.

Still another female has the vertebrales well elevated, and the shell generally is high, so that it approaches tentoria in appearance. The shields are flat-topped; lateral marginals rather high, well ridged and weakly grooved. There are mid-dorsal and lateral yellow stripes, the ocelli as such being not differentiated. The yellow rays are rather numerous, costal II having 5 on the lower border. The measurements are: $104 \times 83.5 \times 61$ mm.

Lastly Mr. J. H. Power has taken an adult male, somewhat resembling the above, at Britstown. The colour pattern is more like that of the type, but not identical therewith; there are ocelli laterally and dorsally. Carapace shields mostly not raised; gulars rather long, not incised in front; supra-caudal well arched, but not incurved. Measurements: $97 \times 73 \times 46.3$ mm.; supra-caudal breadth 26.5 mm. In males from Richmond (Transvaal Museum) the supra-caudal is large (breadth 30 mm.), lateral marginals rather deeply grooved, and vertebral IV well raised, though with extensive flat top.

A series from Naauwpoort (Transvaal Museum) may represent a distinct local race. A frequent character is the much enlarged distal ante-brachial scale. A half-grown female has a strong

development of dark rays on the plastron, including several on the outer borders of both pectoral and abdominal shields; centrally, the plastron has an infuscated area such as occurs in the tentoria group, but not so well defined. An adult male and female have exceptionally well-rounded surfaces, the vertebrals being not all raised in the male, only feebly so in the female. Another female has vertebrals well raised, especially IV; plastron rather flattish, lateral marginals only slightly grooved and not particularly deep. The females have ocellate costals, and the yellow centres tend to have a dark line along the middle; on the vertebrals the mid-dorsal yellow ray broadens in front. Measurements: M. $95 \times 73 \times 48$ mm.; F. $114 \times 90.5 \times 64.5$ mm.; breadth of M. supracaudal 29 mm. In females of this race, the rays on the costals tend to be rather more numerous than usual, and the lateral marginals more deeply grooved.

Chersinella fiski seimundi (*Blgr.*). Pl. XVI, fig. 57.

Testudo seimundi *Blgr.*, Ann. Mag. Nat. Hist., 7, xii, p. 216, pl. xvii.

Another form described from the Hanover district is *Chersinella seimundi* (*Blgr.*). The type described as an adult male from a spot three miles east of Deelfontein was the only specimen of its species recorded; but Boulenger listed tentoria from Deelfontein at the same time. This tentoria record is presumably based on a more normal specimen of *seimundi*, or possibly on *fiski* or *cronwrighti*. The type of *seimundi* has dorsal shields somewhat swollen, separated from one another by deep furrows, lateral marginals divided by a very deep groove, supracaudal strongly incurved; the illustration shows the lateral marginals as strongly compressed. The shape of the gular extremity, emphasized by Boulenger, is probably not of systematic importance. I have seen something like it in the adult male identified with *cronwrighti*, but not in any specimen that could be referred to *seimundi* on the marginal character.

I have not exactly matched the type in colour pattern, for the rays thereon are more numerous than in any male specimen

in our collection; on the front border of costal IV, apparently 6 abbreviated black rays occur. Still, having regard to the great individual variation exhibited in tortoises, I apply the name *seimundi* to all specimens from the Hanover district characterized by very deep lateral grooves, rounded dorsal humps, and posterior marginals strongly upturned. The specimens in our collection which conform sufficiently well in structure have generally a *fiski* type of colour pattern, and even in structural characters there are certain more or less intermediate specimens; so that *seimundi* cannot possibly be regarded as more than a sub-species of *fiski*, and may be merely a nutrition form. The marginal groove, very pronounced in some examples, is by no means constantly so; and an ill-developed groove accompanies only feebly upturned posterior marginals.

Our largest male of this group, and one which perhaps conforms best with the type of *C. fiski seimundi*, measures $97 \times 79.5 \times 46.5$ mm. The rays on the carapace are, however, comparatively few. There are ocelli on the vertebral region and on the costals; below the ocelli, on costals I-IV are black markings of inverted V shape on each shield. The plastron is relatively flat. Rounded humps occur on the vertebral region, but only that of IV is well developed; costal region without humps and no depressions between the several shields. The supracaudal is broad, hind margin well rounded and directed downwards; surface well curved but not strongly bulging.

A smaller adult male, measuring 88 mm. in total length, is very similar, but most of the ocelli are open, both vertebral and costal. The dark pattern on the costals inferiorly takes the form of unbroken triangles.

These males with deep lateral grooves have polished and worn surfaces, but do not seem to be merely aged examples of *fiski*. At any rate, both small and large males are laterally grooved. Further, several quite unworn females have the same character.

The females are a somewhat mixed lot, and some, but not all, have a senile or diseased appearance. The lateral groove of the marginals is in most cases very well developed, occasionally

only weakly so in specimens otherwise similar. Lateral marginals never with strong keels, but weak keels may occur. Posterior marginals with upturned edges. Vertebral region with well-rounded humps, in one specimen (Pl. XVI, fig. 57) sub-conical with extensive flat tops. Costal region either not raised, or only slightly so, or in one example with costal IV well raised. Supracaudal with curved surface, not ridged, either upturned or not so. Plastron generally very flat, but sometimes not so. In one or two old specimens the plastron is depressed down the middle over almost the whole length. The pattern is fairly simple, of the fiski type, more or less; but the lateral ocelli may be open, and generally the ocellus includes a smaller yellow spot below the main centre. Measurements of an old female are: $116 \times 93 \times 62.5$ mm.

Another series (loc. ? : Naauwpoort district suspected) with females more numerously rayed than the above is as follows: Male much like those above described, but rather more strongly humped, and the costals are distinctly raised; vertebral IV is flat-topped and the sides are slightly fluted. Marginal groove well developed, supracaudal large, well curved and hind margin directed forwards. Rays of carapace few. Measurements: $93 \times 69 \times 49$ mm. The females are large; marginal groove weak, sometimes nearly absent, the lateral keel always present but variable, sometimes very weak, sometimes moderately strong; hinder marginals sometimes upturned, generally not so. Vertebral humps in one large specimen well developed and more or less fluted, especially IV; in two others large and well rounded, the apices being much rubbed. The costals are all more or less raised. The supracaudal in three large examples has a well-curved surface, somewhat like that of a male, but hind margin directed backwards; in another example, which seems to belong to this series but is less strongly humped, the supracaudal is quite different in form, being strongly upturned like the hinder marginals. The colour pattern is of fiski type but rather more complex. Each lateral ocellus generally has a more or less distinct central dark core, an elongate stripe. Plastron generally rather flat, but sometimes not so. Also, several

of the largest specimens are depressed mesially over the whole length of the plastron. Measurements of a large female are: $126 \times 96 \times 66$ mm. (Pl. XVI, fig. 51).

Another female which on the colour pattern might be included here is remarkable for the almost complete absence of humps; shell rounded, only very low flat-topped humps occur on the vertebrals and the costals are scarcely raised. Marginal groove present, though not very deep, plastron very flat. There are more dark rays than usual on the costal shields. On the lower border of costal II for example six thin dark rays enter. Apparently males with fluted humps and deep marginal grooves belong to the females with little marginal grooving and fluted humps. The status of *seimundi* must remain *sub judice* until a good series of specimens from the type locality becomes available; or, until through feeding and breeding experiments, some better knowledge as to the values of its characters is obtained.

It may be noted that although the shell is much lighter than that of other forms with weak femoral tubercles, such as *trimeni*, yet these tubercles are very large in *seimundi*; there are also much enlarged scales at the side of the tail, and the scales are supported on bony tubercles. Males have a single pair of such scales and females several.

Chersinella fiski cronwrighti subsp. nov. Pl. XVI, fig. 58.

Type: A single adult female (Pl. XVI, fig. 58) from Hanover, C.P., collected 1883 by Mr. T. C. Scanlan, and now in the South African Museum.

It has high lateral marginals, the surface not curved, quite ungrooved and sharp edged, nearly in the same plane with the costals; hinder marginals spreading somewhat, and supra-caudal large, acute behind; vertebrals conically raised with small flattened tops, and all the costals are raised; the plastron is deep, gulars fairly long and large, well incised mesially. On the carapace black predominates, the yellow rays being rather thin; there are costal ocelli, each with a yellow spot or short ray below the main central yellow ray, which is long and narrow.

Anterior mid-dorsal ray not entering the areola. Plastron with some brown rays centrally, but not very definite or intense. Lower portions of lateral marginals approaching the horizontal, being at an angle with the sloping sides of the plastron.

The measurements are : $122 \times 93 \times 65$ mm. ; vertebral III, 24.5×33.5 mm.—narrower than usually the case in fiski ; supracaudal breadth 35.5 mm.

An adult male example in the Cronwright collection agrees sufficiently well therewith in form. It has vertebral and costal shields all raised, the vertebrae fairly strongly so ; they are much higher than the typical fiski as figured or in those just described under fiski. The tops of the shields are flat and rather extensive. A large well-curved supracaudal, 24 mm. broad, the truncate hind margin projecting downwards. Lateral marginals slightly grooved, and not so steep as in the female. A more or less continuous yellow lateral stripe over the costal region, and a nearly continuous mid-dorsal stripe ; these stripes are a little wider than the rays in the female. Supracaudal with three yellow stripes. Plastron deep, gulars long and narrow. Measurements : $79 \times 65.5 \times 43$ mm.

Another specimen with well-raised vertebrae and deep plastron is a young female with ocelli in vertebral and costal regions ; it also has rather elongate gulars and marginals like those of the male just mentioned. Measurements : $82.5 \times 68.5 \times 46.5$ mm. It may be noted that on marginal VI both specimens have 3 black rays.

Another rather high female shell is remarkable in that the carapace shields are not only very slightly raised ; this applies even to vertebral IV. The lateral marginals are high and well keeled. Ocelli absent, the lateral rays meeting. The yellow rays are few and thin. Measurements : $97.5 \times 78 \times 55$ mm.

Two adult males and two immature females from Hanover (Transvaal Museum) have rather heavy shells and a somewhat tentoria-like form ; the plastron pattern is peculiar—a blackening along the sutural margins of all the shields over the middle half of the plastron ; adult male with rather deep plastron, deep lateral marginals which are grooved, hinder

marginals only upturned at the margins, supracaudal not very large, bluntly ridged mesially at the base, costals with narrow lateral stripe imperfectly connected up, measurements $89 \times 70 \times 46.5$ mm.; an old male measuring $91.5 \times 73 \times 45$ mm. has supracaudal of normal fiski type. An immature female has deep lateral marginals which are grooved and not sharp-edged, supracaudal with indications of a mesial ridge basally, hinder marginals not at all upturned, costals with ocelli but the yellow centres are narrow. An adult female has marginals neither grooved nor upturned, vertebrales more or less conically raised, costals ocellate.

It may be noted that other specimens labelled "Hanover" (Transvaal Museum) are referable to true fiski. They have flat shallow plastron, carapace shields raised but with rounded summits, posterior-marginals in both sexes upturned, lateral ones more or less grooved, but not very deeply, costals with large ocelli, or narrow ocelli, or ill-defined lateral stripe; in one adult male the vertebrales are not at all raised, another has well-defined rays on the plastron, especially over the central area of the abdominals and pectorals.

From Burghersdorp we have a large female shell which approaches the type of *cronwrighti*, although the supracaudal is narrower (31.5 mm.) and more pointed, and the lateral marginals are a little grooved; it is more elongate than the female of *colesbergensis* and the shields are more definitely raised. Measurements: $123 \times 94 \times 68$ mm. Lastly, a young female from Plaatjesfontein, near Dwaal (D. galpin), seems to be referable to *cronwrighti*.

Chersinella fiski orangensis *subsp. nov.* Pl. XVI,
figs. 59, 60.

Type: An adult male (Pl. XVI, figs. 59, 60) from a locality between Philipstown and Petrusville district, presented to the Albany Museum by Mr. Charles Hoole, September, 1918. From the same source also an older male and a young specimen.

There is some resemblance to *cronwrighti*, but the main

differences are: supracaudal in *orangensis* rather narrower, and more strongly globose in the middle, its hind margin more strongly incurved; hinder marginals of *orangensis* not upturned.

The carapace is depressed, not laterally compressed, vertebrals only feebly raised and with rounded summits, costals not raised; lateral marginals not inclined to the costals, with distinct keel and weak groove; the upper portion not flattened; posterior laterals somewhat inclined to the costals, but their plane very far from the horizontal. Plastron fairly flattish, without dark rays or pattern. Carapace shields with rather few rays, mid-dorsal and lateral rays continuous; lower half of costals II and III with 3 rather wide complete yellow rays; lateral ray of costals still wider. The pale areolæ of vertebrals and costals all relatively extensive, especially so the costals.

Measurements: $92 \times 74.5 \times 44$ mm.; greatest breadth of supracaudal, 23.5 mm.

An older male from the same source differs in that the shields of the carapace are more strongly raised; vertebral IV may be described as strongly raised with rounded summit; between all the costals more or less deep grooves occur. Laterally there is some compression, the marginals having ill-developed keels, but the groove is quite weak; posterior laterals not upturned, but spreading outwards. Supracaudal bulging in the centre. Coloration similar to the type, but pale areolæ rather larger. Measurements: $91 \times 70 \times 45$ mm.; breadth of supracaudal, 27 mm.

To this subspecies I refer also a male and several female specimens from Orange River Station (J. H. Power); they were found on the open veld of the plains. The male differs from the type in smaller size, in a more elongate vertebral V—it is longer than broad, instead of broader than long, as in the type—the costal region is not so well arched, and there are slight differences of colour pattern; for instance, on the supracaudal there is a wide blackish mesial stripe, instead of a narrow yellow one flanked on each side by a broader black one. The female is

large, carapace well rounded, shields not raised or scarcely so, although hindermost vertebrals and costals are distinctly so; no deep grooves between the shields; lateral marginals inconspicuous and in the same plane with costals, weakly grooved and weakly keeled; hinder marginals a little upturned or not at all, and not much outspreading; supracaudal projecting, the margin somewhat acute; vertebral V broader than long. A large femoral tubercle; two of the enlarged antibrachials much larger than the rest in one specimen, but numerous subequal scales in another. Plastron with weakly developed dark rays on the mesial area of abdominals, femorals, etc. Rays on carapace shields rather thick and not numerous; vertebral III with 5 complete yellow rays and 4 or 5 incomplete; mid-dorsal yellow stripe continuous or nearly so; costals with imperfect ocellar markings, II and III inferiorly with 2 inverted black ∇ marks. In several females from Orange River Station both mid-dorsal and lateral rays tend to run in continuous lines; a young male has ocelli dorsally, and ocelli or incomplete ones laterally. Measurements of M., $85 \times 66 \times 42$ mm.; of F., $119 \times 93 \times 63$ mm.

Chersinella fiski colesbergensis *subsp. nov.* Pl. XVI, figs. 61, 62.

The type is an adult male (Pl. XVI, fig. 61) from Colesberg, now in the collection of the South African Museum (coll. Mrs. H. H. Murray). It resembles *orangensis*, but has a different supracaudal, the borders of the hinder marginals are strongly upturned, and the lateral streak on the costals is narrower. The vertebrals are all elevated, but not strongly so, costals scarcely at all. Laterally the carapace is a little compressed, lateral marginals moderately grooved and well keeled, hinder marginals spreading out laterally, a noticeable salient in the region of marginals VIII and IX. Supracaudal large and bulging in the centre, hind margin directed downwards, but not at all forwards, the whole margin tending very slightly to be upturned. The yellow rays on the carapace are relatively few. Lateral ray

not quite continuous on either side. On vertebrals II and III there are 5 complete rays, on costals II and III are 7 complete rays, on the supracaudal 3 rays, not counting the broadly yellow margin. Marginal VII with a single oblique yellow ray. Plastron with some infuscation mesially and with some spots and traces of undeveloped rays, but without a defined dark area. Measurements: $94.5 \times 77 \times 49$ mm.; breadth of supracaudal, 26 mm.

There is an older male specimen in the Albany Museum, sent by Mr. G. H. B. Shaw. In this, the broad supracaudal is scarcely at all bent forwards. Lateral marginals considerably compressed, the keel being obsolete. A few additional but incomplete rays in the costal region; two such additional rays enter the lower margin of costal II. In this, as in the type, the pectoral suture is very short. Measurements: $103 \times 80 \times 52$ mm.

Another Colesberg male, in the Natal Museum, perhaps immature as the supracaudal is not so strongly arched as in the type, has the same characteristic broadening of the inguinal region. It resembles in pattern certain males from Hanover district, but has more rays; on the lower portions of the costals there are, besides the diagonals, one large yellow ray and two smaller ones, the latter being absent in Hanover specimens. Costals scarcely raised, IV less so than in Hanover specimens; hindermost marginals more upturned in the latter.

A female specimen (Pl. XVI, fig. 62) from Colesberg, sent by Mr. Kemper, is decidedly larger than the male, though not very different in total length. It agrees in the rather marked broadening of the carapace in the inguinal region, the marginal edge presenting an angular salient there. Costal region not well arched, and carapace as a whole not raised high. Vertebral shields more or less raised, IV fairly strongly; costals only slightly so. Lateral marginals grooved and rather weakly keeled, in the same plane with the costals, as also are the hinder marginals; hinder marginals and to a less extent the supracaudal with upturned edges. Vertebral V broader than long. Supracaudal projecting a little behind. The rayed pattern is more or less of same type as in the female, but the rays are rather

more numerous. Anterior median rays of vertebrae II and III broadening out considerably. The lateral ray in the costal region only imperfectly connected up. Supracaudal with 3 rays and margin also yellow. Marginal VII with a single oblique yellow ray, and hind margin may or may not be yellow; the keeled lower margin is yellow. Plastron without rays or infuscation, although central area is brownish; lower parts of marginals III-VI with dark rays. A long humeral suture, but pectoral and femoral both unusually short; the humero-pectoral sutures at pronounced angle with each other. A large femoral tubercle; antibrachials all rather large. Measurements: 99.5 × 87 × 57 mm. Breadth at region of fourth marginal, 74.5 mm.

In all four specimens the pectoral suture is noticeably short, and the humero-pectorals are well inclined to each other, characters well separating it from *verroxii* as represented by Smith.

Compared with males from Hanover district, the supracaudal in *colesbergensis* is relatively deep in proportion to the breadth, and is more strongly curved in the middle. The type supracaudal is 25 mm. broad and 21.3 mm. deep.

It may be noted that none of the specimens referred to this subspecies or *orangensis* has supernumerary shields on the carapace.

Chersinella fiski grica *subsp. nov.* Pl. XVI, figs. 63-66;
Pl. XVII, figs. 67-71.

A fine series of specimens from Niekerks Hope and Marydale, localities in Hay and Prieska districts, collected by Mr. J. H. Power, show a great range of variation in colour and form (see Power's paper (9), based on specimens collected within a radius of three or four miles around Niekerks Hope). They are, no doubt, all closely related and essentially the same species, but can be divided into two tolerably distinct groups, now described as subspecies, although there is only imperfect geographical separation apparently. One group is closely related to *orangensis* and to typical *fiski*; the other approaches *smithi*,

but is not so broad and depressed as that species and costal IV is larger. It is quite probable that the two groups are more or less connected up by intermediates.

Type : Male and female (Pl. XVI, fig. 63 ; Pl. XVII, fig. 67) from Marydale, situated about midway between Prieska and Kenhardt (coll. J. H. Power).

In both sexes the plastron is flattish and shallow, the lower portions of the lateral marginals in the same plane with its sides which merge very gradually into the plane of the ventral surface. Female carapace with well-rounded surfaces, no raised shields except very slightly vertebral IV ; lateral marginals compressed, passing insensibly into the costals, ridged and slightly grooved ; marginals IX–XII not very large, and IX and X not forming a salient ; gulars small, hind margins of anals very obtusely inclined to each other. On the vertebral and costal shields of the female, yellow rays are numerous and thin ; yellow areolæ rather small ; 4 diagonals the main rays of each shield, often the only complete rays. On the costals an obscurely ocellate pattern ; 4–6 minor yellow rays entering the lower margins of costals II and III. Supracaudal with 8 thin yellow rays, but only 3 or 4 complete ones.

Another female (Pl. XVII, fig. 68) has the hinder marginals rather strongly upturned.

What seems to be the adult male has vertebral and costal shields forming quite continuous surfaces, none being raised ; but the yellow rays are much fewer than in the female. No distinct ocelli. Vertebrales II and III have the diagonal rays complete, and in front a trident marking not entering the areolus ; the corresponding mark on the costals is double ; on the lower border of costal II a single ray with a trace of another on each side of it. Supracaudal broad, rather lightly curved and not curving forwards below, with 3 yellow rays and the margins also yellow ; intermediate rays lacking.

In another adult male, the individual vertebral and costal shields are a little elevated, the yellow rays are fewer and thicker than in the female, and costals have imperfect ocelli ; on the lower border of costal II there are 3 yellow rays apart from the

diagonals. Supracaudal well curved with 3 complete rays and 4 short ones, excluding the yellow margins. Marginals IX–XII not markedly enlarged, and no salient near IX. This specimen makes some approach to *gricoides* in the slightly raised costal and vertebral shields, and the pattern is not so very different, but the carapace is not so compressed at the middle and the hinder marginals do not project outwards so much.

Males have enlarged femoral tubercles, but no well enlarged ones on the tail; in the female the former are more enlarged and there are enlarged scales at the base of the tail.

Measurements: M. $94.5 \times 71 \times 44.8$ mm. (type), $93 \times 69.5 \times 46.5$ mm. (second specimen). F. $113.5 \times 84 \times 59.5$ mm.

A larger Marydale specimen (Pl. XVII, fig. 69), somewhat senile, has numerous pale rays about equal in width to the interspaces. A still larger female from Niekerks Hope (Pl. XVII, fig. 70) measures $125 \times 97.5 \times 65.5$ mm. This has fewer yellow rays than the Marydale specimens (2 females), but the rays are thin; in form of shell it agrees well with them. Three further specimens from Niekerks Hope (Pl. XVI, fig. 64, 65; Pl. XVII, fig. 71) agree in pattern fairly well with the type; one (fig. 71) has numerous thin dark rays on the plastron; all are elongate, the two former also flattened, and it should be added that some specimens from the same locality with typical *gricoides* pattern are also flattish.

Two adult males from Niekerks Hope that possibly belong to the above-mentioned series do not agree well with the Marydale males, nor indeed with each other. One resembles the type male in general form, has thin and numerous rays, but the carapace shields are somewhat raised and supracaudal strongly curved, projecting forwards below; measurements: $106 \times 76 \times 48.5$ mm. The other (Pl. XVI, fig. 66) is less depressed, measuring $97 \times 78.8 \times 51.5$ mm.; carapace shields scarcely raised, costals quite rounded; but yellow rays are all thick, and on vertebrae III and IV, 5 enter the areolus; supracaudal scarcely incurved. This specimen is peculiar in form and pattern, unlike any other from Niekerks Hope or Marydale.

In form, specimens of *grica* approach *smithi*, but the yellow rays are not black-edged as in that species; the gulars are more elongate and ante-brachials different.

Chersinella fiski gricoides *subsp. nov.* Pl. XVII,
figs. 72-75.

Type: Adult male and female specimens from Niekerks Hope, about midway between Griquatown and Prieska, C.P. (coll. J. H. Power).

The plastron is deeper and not so extensively flattened as in *grica*, and its sides curve more rapidly; the lower portions of the lateral marginals in the type female are not in the same plane with the sides of the plastron. Carapace with all the shields raised more or less, though not quite so much so as often in true *fiski*. Marginals IX-XII enlarged and with a noticeable salient in the region of X. Gulars moderately large; hind margins of anals at an angle of about 120°. On vertebral and costal shields of female, yellow rays are thick, but not numerous; yellow areolae rather large; on each shield 4 diagonals are the main rays, generally the only complete rays. Costals with ocellate markings; 2 or 3 rays, apart from the diagonals, on the lower border of costal II. Femoral and caudal tubercles very strong; antebrachials well developed, and no extensive area of quite small scales distally.

Male with supracaudal strongly curved and projecting forwards below; all the costals more or less swollen and well rounded; a salient in the region of marginals IX and X, the hinder marginals projecting outwards rather more transversely than in *grica*, and presenting a well-marked angle at the junction with costal IV; on the lower margin of costal II there is a single intermediate ray which may be bifurcated.

Measurements: M. 96.7 × 69 × 46.5 mm.; F. 127 × 90.5 × 66 mm.

In most female specimens the anterior mid-dorsal ray on each vertebral does not enter the areolus, and the lateral rays are not connected up; occasionally the mid-dorsal ray enters the areolus and the lateral rays on the costals may be more or less

connected, though never into a well-defined line. These latter specimens somewhat resemble females of *orangensis* from Orange River Station, but have thicker yellow rays and the lateral ray is not so definitely connected. There is also resemblance to *colesbergensis*, which, however, is shorter and the lateral marginals rather more compressed and grooved. In older specimens of both sexes the hinder marginals tend to spread out laterally and the supracaudal to extend backwards; an old male (Pl. XVII, fig. 73), length 117.5 mm., has the hinder marginals upturned almost as in *oculifera*, and marginals II and III are also well upturned; an old female with hypertrophied marginals is figured (Pl. XVII, fig. 75).

There are also two specimens from the neighbourhood of Springfield, near the Asbestos Mountains; one is labelled "5 miles beyond Springfield on the road to Griquatown", the other "4 miles south of Springfield on the road to Niekerks Hope".

To this form also I refer male and female specimens from Prieska; the female has a sharp lateral edge, hindermost marginals not upturned, measurements: 119 × 94 × 63 mm. The male somewhat resembles ocellated males from Hanover district, but the lateral marginals are not or scarcely grooved, and hinder ones not upturned, as is usually the case in Hanover males; the latter also tend to have an enlarged distal brachial scale not found in Prieska specimens.

Lastly, a large female from Marydale has much resemblance to *gricoides*; vertebrals somewhat raised, hinder marginals well upturned, anal angle only about 120°, plastron rather deep; the pattern is somewhat intermediate, rays thickish, but yellow areolæ all smaller than in Niekerk examples of *gricoides*; it also differs therefrom in that the carapace is not so much compressed laterally. The identification is uncertain.

The specimens from the Asbestos Mountains at Niekerks Hope were all found as succulent feeders on the kopjes; in the same neighbourhood *oculifera* occurs, but only on the flat sandy plains as a grass feeder (J. H. Power).

Chersinella verroxii (Smith). Pl. XVII, fig. 78.

Testudo verroxii Smith, Ill. Zool. S. Africa, pl. viii, 1839.

This species was founded on a male example said to have been taken near the sources of the Gariiep or Orange River. It is still ill-understood, for the type is non-existent, and there is no specimen on record that corresponds well with Smith's figure. Dr. Werner has given descriptions and figures in his report on the Schultze' collection ('Zool. u. Anthrop. Erg. Forsch. in West. U. Zentral Südafrika', Jena, 1910), but the identifications are not all convincing, and some of Siebenrock's records from Namaqualand, C.P., may also be viewed with suspicion, two different forms having been confused together.

However, if Boulenger's inference as to the absence of a femoral tubercle is correct—and it was adopted by Siebenrock—then there is most probably an error in the original locality data; for all specimens in our collection from the eastern parts of the Orange River region have well-developed thigh tubercles. Power's suggestion that the type was taken somewhere north of Aliwal North, between the Orange and Caledon rivers, is therefore not acceptable. Another character in which our Eastern province specimens seem to differ from Boulenger's account, and also from the original figure, is in the lateral marginals; of these, Boulenger says, "lateral marginals forming an angle with the costals". Nevertheless, Boulenger did not see an original specimen of *verroxii*, and the species has never been represented in the collection of the British Museum (*vide* H. W. Parker).

Relying on Smith's figure and description, one seeks to identify this species through the following characters: Coloration of carapace and plastron; slight gibbosity of carapace shields, pattern and perhaps direction of the marginals, and great size of hinder marginals; form of ante-brachial scales; axillaries apparently two, neither very large; short femoral suture; humero-pectoral line nearly straight mesially; perhaps also

the peculiar form of the nuchal, narrowing in front, but Smith's figure and description do not tally well. It may be noted that no complete rays, except diagonals, enter the lower borders of the costals. The antebrachials were referred to as large, flat, imbricate, pear-shaped scales, and the figure represents them well separated from the claws; he also remarked on the thinness of these scales.

We have a single female specimen labelled "Ukamas (J. Preston)" (Pl. XVII, fig. 78), which agrees fairly well with that figured by Siebenrock as adult of *verreauxii*. The only striking difference in pattern lies in the increased breadth of the anterior rays of vertebrae II-IV, and some of the lateral rays on the costals are thickened. Marginals mostly with thin rays. There are two axillary shields, the second of moderate size; plastron not so flat as in *smithi*; supracaudal convexly curved above and rather strongly projecting; costal IV almost as big as I, and vertebral V also of good size, but a little narrower than III; the vertebrae all slightly raised, the fourth most strongly; sides of carapace well rounded. Plastron well rayed over the central areas.

Measurements: $141 \times 102.5 \times 74$ mm.

This specimen is much larger than the type female of *amasensis* (see p. 334), the shields are less depressed and are well rayed; but, as in our other specimens from Ukamas, the inguinal is only in contact with marginal VIII. It differs from *smithi* chiefly in the narrowness of the carapace, in the greater depth of the plastron, and in the rather large size of costal IV; as in *smithi*, some of the costal and vertebral areolæ have blackish spots. Another large female from Klein Karas (N. J. G. Smith) is evidently closely related; but there are very broad yellow rays on all the carapace shields and extensive yellow areolæ; on each side a small costal V, costals II and III being well arched.

An adult male and female recently received from Klein Karas (A. Örtendahl) are as follows: Male ornamented much as in Smith's figure, except that the thin rays of the carapace are all reddish, the areolæ smaller and with black spots, the pale

rays of the marginals not so broad; moreover, the shell is less elongate, there is no costo-marginal angle laterally, the nuchal is quite short and doubled, the humero-pectoral line forms a more definite angle mesially. It has, in common with Smith's *verroxii*, two fair-sized axillaries, a large inguinal, a number of moderately large antibrachial scales separated from the bases of the claws by a zone of small scales; this zone is more extensive than in most species of *Chersinella*, at once distinguishing it from any form of *tentoria* or *trimeni*. Also, the femoral tubercle is rather small; vertebral V a trifle narrower than III. The female sent by Mr. Örtendahl much resembles that above mentioned from Ukamas, but the yellow rays are a little thinner, and 2 thin rays may enter the lower margin of costal II or III, in addition to the diagonals; vertebral IV with 8 complete rays; costal IV is much smaller than I, and vertebral V a little narrower than III; the plastron is conspicuously dark-rayed over the whole mesial area, and dark rays also occur on the outer borders of the pectorals and abdominals—in the male, a more general brown infuscation something like that figured for *verroxii*. Femoral tubercle of moderate size; the 6 or 7 enlarged antibrachial scales including a rather stout one distally, but one or two smaller ones separate it from the zone of small scales. Claws of both male and female rather short and weak. Measurements: Carapace of M. $86.2 \times 71 \times 45$ mm., of F. $125.5 \times 95 \times 66.5$ mm.; breadth of supracaudal of M. 26 mm.

Although the identification with *verroxii* in a restricted sense is still somewhat doubtful, I think the specific identity can be accepted. The *verroxii* group is characterized by a rather weak development of antibrachials, weak or moderate femoral tubercles, anterior margin of carapace rather shallowly incised mesially, male supracaudal not very strongly arched, anal suture generally longer than femoral, costals without distinct ocelli. Probably it will be found to merge with the *fiski* group.

Chersinella verroxii smithi (*Blgr.*). Pl. XVII,
figs. 76, 77.

Testudo smithii *Blgr.*, Proc. Zool. Soc. London, 1886, p. 542; and
Brit. Mus. Cat., 1889, p. 165, pl. iv.

We have a specimen from Great Namaqualand (Hans Schinz) referable to this species. It is the actual specimen figured by Siebenrock on pl. iii, fig. 3 of his paper. The plastron is flattish and well rayed; there are rays on the outer margin of the abdominal shield, more or less as figured in the type. The upper surface of the supracaudal is somewhat upcurved, and two hinder marginals are upcurved. Costal IV is decidedly smaller than I, and vertebral V is rather small. Gulars broad, as in the type. A peculiarity of this specimen is the presence of two inguinal shields, the outer one being in good contact with marginals VII and VIII, as in the type. The measurements are: $138 \times 106 \times 68$ mm.

A specimen from Abiam, Gordonia (Kimberley Museum), agrees sufficiently well in general proportions. It is very plain, pattern scarcely traceable, only very faint dark rays here and there at the outer parts of the shields and never reaching the areolæ. Costal IV much shorter than I; vertebral V small, but not so small as in Schinz's specimen. Supracaudal not upturned at all. Plastron flat, more so than in that referred to *verroxii*. Measurements: $124.5 \times 99.5 \times 64$ mm.; vertebral III very broad, 42×22 mm.

In the same collection are three specimens (Pl. XVII, figs. 76, 77) that seem to be males of *smithi*; localities are Lower Molopo and South Gordonia (M. Wilman). These are uniformly brown, two without a trace of rays, the third with dark spots and very short rays at the margins of some of the shields above and below. They have large inguinal and axillary shields; in one there are two subequal axillaries, in the others the second axillary is quite small. The humero-pectorals are inclined to each other at about 150° or 160° . Pectoral suture noticeably short in two of them; in all three the humeral suture is much

longer than the anal. Costal I bigger than IV. Vertebral V is of moderate size or even large, and costal IV is small to moderate. Posterior marginals upturned in two of them; only faintly so in the third, which is largest and probably somewhat senile. Supracaudal broad and arched, the apex directed downwards, but not curving forwards; in two of them the apical margin is rather acutely rounded. The largest specimen is distinctly sulcate laterally between costals and marginals; in all three the lateral marginals are more or less in the same plane as the costals. A fairly large femoral tubercle in all. Measurements of largest specimen: $100 \times 77 \times 50$ mm.; breadth of supracaudal, 31 mm.

These males seem to differ from the type of *verroxii* in the form of the supracaudal, which, according to Smith's figure, curves forwards a little at the apex inferiorly; they also have rather larger antibrachials.

Two immature females from Narudas Sud, S.W. Africa (P. A. Methuen), are doubtfully referred to *smithi*. They have flattish plastron, inguinal in contact with costals VII and VIII, carapace well rounded, supracaudal not upturned nor projecting strongly backwards, posterior marginals not wide-spreading, costal IV decidedly smaller than I, vertebral V small or moderate; gulars not so broad as in typical *smithi*. One of them is completely rayed, areolæ of vertebrae and costals large and yellow with small black spots; the yellow rays are not of equal thickness throughout, as is approximately the case in typical *smithi*, but they mostly taper, and thus resemble the rays on the large specimen of *verroxii* from Ukamas. Also, the black-edging is mostly limited to the lower half of the costals. The other specimen has costals and vertebrae unicoloured, except near the margins, where incipient black and yellow rays occur. Measurements: $97 \times 72.5 \times 53.2$ mm.; $95 \times 74 \times 49$ mm.; the former is higher and narrower than *smithi*, thus approaching *verroxii*; the latter resembles *amasensis* (p. 334) in ornamentation, but is not so elongate.

Chersinella verroxii boettgeri (Sieb.).

Testudo boettgeri Sieb., Anz. Akad. wiss. Wien, 1904, no. 16; and

S.B. Akad. wiss. Wien, vol. 113, 1904, p. 310, tab. 1, 2.

T. oscarboettgeri Lindh., Zool. Anz. Leipzig, 1929, p. 295.

This species is based on a shell from Great Namaqualand. It is related to *smithi* Blgr., but has the first costal not larger than the fourth; also, there are simple yellow rays on the carapace shields, a continuous lateral extending between the areolæ of costals I-IV, and a more or less continuous mid-dorsal along the vertebrales; vertebrales II and III have 6 and 7 rays respectively. There are 2 axillaries; carapace shields not raised or only slightly. Some of the areolæ of costals and vertebrales have black spots.

The Transvaal Museum has a female specimen from Aus (V. Fitzsimons) measuring $124.5 \times 94.5 \times 71$ mm. It is nearly typical, but some of the yellow rays are thickened; areolæ without black spots. Vertebrales I-IV all raised a little. Antebrachials few, and not greatly enlarged, two—the distal and the proximal—bigger than the rest; an extensive area free of enlarged scales distally. A moderately large femoral tubercle. Central area of plastron brownish, but no pronounced rays. Pectoral suture short, femoral shorter than anal. The great basal width of the first marginal and the narrowness of the suture between marginal II and costal I (20.7, 4.2) is a feature of the Aus specimen. It differs from females of *verroxi* in being more laterally compressed, vertebral V smaller, but costal IV bigger. In pattern and colour of carapace there is considerable resemblance to *trimeni*, as mentioned by Siebenrock; but there is no obvious resemblance in structure, and without doubt *boettgeri* is nearer to *verroxii* and *smithi* than to *trimeni*.

Chersinella verroxii amasensis *subsp. nov.*

We have 2 shells from Ukamas district (types), and the South African Museum a pickled specimen from Keimoes, which seem

distinct from the type of *smithi*. The two males are noticeably narrow, and the female shell is relatively well developed in its hinder half and the plastron rather deep. The Keimoes male measures $92.5 \times 68 \times 47$ mm.; supracaudal breadth 30.5 mm.; vertebral V widest, then III only very slightly less, then I and II, then IV slightly less; costal IV moderate sized, but decidedly smaller than I; vertebral IV longest. Axillaries 2, but second small. A rather small femoral tubercle. At the margins of the shields on carapace and plastron there are incipient dark rays and spots.

The Ukamas male is similar, but has no trace of dark pigmentation. Vertebral V decidedly the widest, then III, then II and IV, and lastly I; IV very long. Costal IV moderate sized. Measurements: $100.5 \times 73 \times 49$ mm.; supracaudal breadth 33.5 mm., well arched, but not directed forwards inferiorly. Two axillaries of nearly equal size. Plastron not strongly flattened. Between costals and marginals slightly sulcate, as also in the Keimoes male. The Ukamas female measures $108 \times 83 \times 55.5$ mm.; supracaudal width 32 mm. Vertebral III is broadest, then II, then IV very slightly less, then I and V about the same. On the left side 5 costals, on the right 4, the last being of moderate size, not much smaller than I. Plastron not well flattened, much deeper than in the type of *smithi*, axillaries 2. Supracaudal not strongly projecting. The carapace shields have incipient yellow dark-margined rays at the sutures; on the plastron there are dark rays at the lateral margins of the abdominals, also pectorals, and several on the humerals mesially; otherwise no dark rays, but the central areas of the plastron shields are lightly infuscate.

In all three specimens the carapace shields are not raised, or only slightly; the hinder marginals are lightly upturned; supracaudal broader than vertebral V; inguinal either in contact with marginal VIII only, as in Ukamas specimens, or in Keimoes male just touching VII also.

Two males have also been received recently from Klein Karas (A. Örtendahl). These considerably resemble the types in form and general characters, but the carapace has a pronounced

colour pattern, somewhat like that of *smithi*. The mid-dorsal and mid-costal rays are all thick, but never well defined, owing to bleaching; the diagonals are sharply defined, also an intermediate ray on vertebral IV and in the upper part of costal III; the yellow diagonals are black-margined, the black and the yellow increasing distally. The marginals and supracaudal show a good deal of bleaching, and likewise also considerable portions of the costals. Plastron with only small or faint infuscation. Vertebral IV is slightly raised in the larger specimen; femoral tubercle small; antebraçhials of small or moderate size, one rather larger than the rest, separated in the larger specimen from the distal small-scaled zone by a slightly enlarged scale. The last vertebral widest in both specimens; there are 6, and one has a supernumerary costal. Measurements: $98.5 \times 70.5 \times 49.5$ mm.; $88.5 \times 68 \times 44.5$ mm.

Chersinella verroxii bergeri (*Lindholm*).

Homopus bergeri *Lind.*, Jahrb. Nassau ver., Bd. lix, 1906, p. 348; see also Zool. Anzeiger, xxxiv, August, 1909.

This form, first described as a *Homopus*, and referred by Siebenrock in his Synopsis (1909) to the synonymy of *boulengeri*, is apparently a *Chersinella*. Dr. F. Werner gave some notes and illustrations in his account of the Schultze collections, based on a specimen from Hereroland; from which, apparently, the species approaches that called *verreauxi* by Siebenrock, but has no markings. The supracaudal is large, broader than vertebral V, and costal IV is much smaller than I. Original locality Gibeon, Great Namaqualand. From the type male measurements, $91 \times 63-69 \times 43.5$ mm., it would appear to be near to *amasensis*, but I hesitate to unite therewith, as *bergeri* is said to have a very large femoral tubercle and vertebral III broader than V. The carapace shields are scarcely raised, "but the top is not flattened as in *Homopus*" (author *in lit.*), and the shell is uniformly light brown.

II. SUPPLEMENT.

See p. 262 : *Geometrica*, like *oculifera*, is chiefly a grassveld species, unlike the various forms of *tentoria* and *fiski* which inhabit dry karroid veld.

A subadult female from Darling, sent to me by Mr. B. Peers, is remarkable in the general flatness of the shields; the costals are not at all raised, and vertebrales III and IV only slightly so. The nuchal is of unusual shape, broad at the base and narrowing considerably in front, though not pointed. Vertebral III is just a trifle broader than costal III. The hind claws are rather long and slender; this is a character of the species, the claws III and IV considerably longer than II, and this much longer than I; in adult specimens of most species the differences are much less pronounced, II, III and IV being subequal, and I not much less. Vertebrales II and III have each 8 yellow rays, but in III the two mesial ones bifurcate almost from the base, and in II the hinder mesial one bifurcates at the middle of its length. Plastron with dark brown rays, but mesially with extensive areas uniformly dark, this being the case over the front half of the anterior lobe. The several antibrachial scales are well separated and small; a distinct elbow scale on the inner side, as large as the biggest antibrachial. Mr. B. Peers believes that the species is not uncommon in parts of the Porterville, Mooresburg, Eendekind districts, the common name being "Seerpootjies".

See p. 278 : An old female *karuica* from Calitzdorp (H. Maughan Brown) is abnormally broad ($134 \times 106.5 \times 70$ mm.), rays numerous, plastron flat.

See p. 272 : An adult male of *subsulcata* (S. A. Museum, loc. unknown), agrees generally well with the type; has much thickened supracaudal and posterior marginals, the former well projecting and strongly curved, well sulcate between marginals and costals posteriorly, though not so much as in the type; shields not raised so much as in type, vertebrales moderately raised, but costals scarcely so, the first 2 being

rather flattish. Plastron with a dark pattern much broken up into rays.

An adult female of *subsulcata*, recently sent from Steytlerville by Mr. D. A. Schoonees, differs considerably in general appearance from that described on p. 272; the latter is probably senile. There are more rays on the carapace and they are thinner; vertebrals II and III have 12 or 13 rays instead of 6. Supracaudal with 5 yellow rays, the middle one a little thicker than the rest. Plastron pattern black. Vertebrals 5, costals 4; they are all raised high, including vertebral I, and the areolæ are flattened at the tops. Marginals with pronounced lateral groove, all except I and II with edges upturned, strongly so except III. There is general resemblance to *albanicus*, and but for the rather deep lateral groove it might have been referred thereto. It is rather larger than *albanicus*, and there are large and conspicuous black rays on the outer borders of the pectorals and abdominals—a character not often found in *albanicus*. Measurements: 116.5 × 90.5 × 66 mm. The females from Klipplaats, mentioned on p. 271, may represent a distinct local race.

See p. 264: *Oculifera* was taken at the following localities in the Kalahari by the Vernay Lang expedition: Gemsbok, Gomodino, Kaotwe and Makarikari. The S. African Museum has it from Sandup and Onodongo in Ovamboland. In this species a mid-dorsal yellow stripe and mid-costal lateral stripe occur even in very young specimens. The Hereros state that these tortoises are eaten by the Bateleur eagle; jackals, ratels and brown hyæna all break open the plastron to feed thereon (R. D. Bradfield). The egg of a specimen from Kimberley measures 39.5 × 31 mm.

See p. 291: *trimeni* occurs near Van Rhyns Pass, between Van Rhynsdorp and Nieuwhoudtville (V. Fitzsimons). Senility in females from Bitterfontein seems to cause a flattening of the plastron, a lowering of the elevated carapace shields, and thickening of the yellow rays on carapace and plastron.

III. KEY TO SPECIES AND SUBSPECIES OF *CHERSINELLA*.

- a. Carapace with lateral marginals in same plane as the costals, neither grooved nor arched; marginal VI not so broad as high (measured from the keel); supracaudal of female more or less vertical; nuchal long and generally pointed in front; a single axillary shield; anals short.
1. All lateral marginals much higher than broad; nuchal usually narrow; enlarged femoral tubercle lacking; the several antibrachial scales, elongate, small or moderately enlarged and separated from each other. Cape Peninsula, Paarl, and Malmesbury distr. *geometrica*.
 - 1^l. No nuchal; vertebral III broader than the costal. Loc. ? *subsp. strauchi*.
 2. Some of lateral marginals as broad as high; nuchal triangular more or less; vertebral III generally broader than costal III; one very large antibrachial scale; a large conical femoral tubercle; hinder margins of carapace strongly serrate and upturned. Northern parts of S.W. Africa, Bechuanaland Protectorate to Free State. *oculifera*.
- b. Carapace broadly rounded, the shields not raised or not strongly so; lateral marginals not so high as in a, but generally more or less in the same plane with the costals; female supracaudal oblique; nuchal not long; antibrachials leaving a considerable area free of large scales distally (except in *schönlandi*); anal suture a little longer than femoral, or subequal thereto.
3. Carapace broad and low, plastron flat and shallow; costal IV smaller than I; femoral tubercle weak or moderate. Gt. Namaqualand. *smithi*.
 - 3^l. Similar, but carapace narrower and plastron not so flat. Gt. Namaqualand, Ukamas. *amasensis*.
(Near this comes *bergeri*, a plain coloured form from Gibeon: femoral tubercle very large.)
 - 3^{ll}. Similar to 3, but carapace a little narrower and plastron deeper; vertebral IV well raised in female; carapace shields generally rayed, but costals without definite ocellar markings or continuous lateral ray. Gt. Namaqualand. *verroxi*.

- 3^{II}. Carapace higher and narrower, costal IV as big as I; a narrow continuous yellow ray along the costals, and another mid-dorsally; axillaries 2. Gt. Namaqualand.
böttgeri.
4. Carapace more or less globose; costal IV smaller than I; femoral tubercle large; axillary single or with a second small one. Namaqualand, C.P. schönlandi.
- c. Carapace generally with some of shields well raised, often conically so. Lateral marginals and nuchal not as in A. Antebrachials well developed, large scales reaching almost to the base of the claws.
5. Antebrachial shields tending to run in a single row; vertebrals more or less conically raised, but with flat tops; pectoral and femoral sutures relatively long, and the two humero-pectoral sutures nearly in the same straight line; supracaudal well arched in both sexes. Carapace rays thick and few, costal II having 7 or 8. Orange River mouth to Lamberts Bay. trimeni.
6. Antebrachials not arranged in a single row; carapace shields rather more conical than in 8; femoral tubercle generally moderate, and females with only 1 or 2 enlarged scales at the base of the tail laterally, or none at all; lateral rays on costals not forming ocellate markings; plastron with extensive well-defined infuscated area centrally (except when senile), which may be broken by yellow rays and patches. Lower Karroid parts of Cape Province from Hex River eastwards to Gt. Fish River.
tentoria and subspecies.
- a. Areolæ of vertebrals and costals in both sexes all much flattened, but vertebrals all well raised and costals somewhat so. Female supracaudal not arched. Hex River. hexensis.
- b. Vertebrals of female more conical, but a little flattened at the tops; costals also flattened laterally, and posterior marginals wide-spreading. Adult male elongate, shields raised, but areolæ all flattened; supracaudal projecting rather strongly backwards. Plastron dark pattern somewhat broken up. Uniondale. karuella.
- c. Similar to *b*, but female with marginals more deeply grooved, and above the grooves well folded, producing in places a narrow sulcus between marginals and

- costals. A sulcus between costals and marginals in the adult male; supracaudal strongly projecting and curving forwards below. Plastron infuscation uniform. Steytlerville and Klipplaats. subsulcata.
- d.* Resembling *c*, but shell depressed, plastron flattened; yellow rays thick. No marked sulcus between costals and marginals; male supracaudal moderately projecting, not curving forwards below. Willowmore. lativittata.
- e.* All vertebrae of female conical, even I well raised and all costals more or less strongly conical, and marginals outspreading; central area of plastron uniformly infuscated. Loc. ? probably not far from Grahamstown. tentoria.
- f.* Vertebrae of female conical, except I, and costals raised in the areolar region; marginals not so widespreading as *e*. Adult male not so elongate as *b*, *c* and *d*; supracaudal well curved, but not projecting backwards; shields raised as in female, but not so pointed. Central area of plastron deeply and nearly uniformly infuscate. Albany district. albanica.
- g.* Resembling *f*, vertebrae and hinder costals strongly conical, but lateral marginals deeply grooved and much compressed inferiorly; hinder marginals with edges upturned a little; all yellow rays thicker, but plastron not so deeply infuscate in adult female. Little Fish River. piscatella.
- h.* Female shell with well-rounded sides; costals only slightly raised or even not at all; vertebrae raised, but not acutely conical, the tops flattish, though not extensively so; supracaudal large in both sexes, that of male broad and well arched, of female rather steep and not strongly projecting behind. Gulars of female rather short, the base of the triangle always much longer than the side. Prince Albert and Beaufort West districts. karuica.
- i.* Resembling *h*, but costals rather more elevated; a tendency to formation of numerous rays, of deep lateral grooves, and upturning of the hinder marginals; supracaudal smaller, in adult male very strongly arched and curving forwards below. Graaf Reinet. duerdeni.

j. Female resembling *albatica*, but vertebrals and costals less elevated, hinder marginals more wide spreading. Middelburg district. tentorioides.

7. Resembling 7, but carapace shields not so conical as most forms, except *h* and *j*; femoral tubercle large or very large, and females (but not males) with several enlarged tubercular scales on each side of the base of the tail; anal suture generally longer than femoral, or subequal; lateral rays of costals either forming more or less definite ocellate markings, or tending to form a continuous stripe; plastron without extensive sharply defined infuscated area, though brownish rays may occur or ill-defined infuscation. Upper Karroo. fiski and subspecies.

k. Carapace shields a little elevated; lateral marginals with keeled edge and only slightly grooved, vertebrals rather broad and carapace generally a little depressed and wide. Supracaudal of adult male somewhat incurved, 25–27·5 mm. broad, sometimes with lateral keels; vertebral and costal areolæ flat and extensive. De Aar, Britstown, Richmond and Victoria West. fiski.

l. Similar to *k*, but lateral marginals more or less deeply grooved and compressed, without sharp lateral edge; carapace shields with more rounded tops; male supracaudal strongly incurved. Deelfontein. seimundi.

m. Carapace shields subconically elevated; lateral marginals high and without groove; vertebrals rather narrow; plastron deep. Adult male short; the supracaudal curved and directed downwards, width about 24 mm. Hanover. cronwrighti.

n. Resembling *k*, but raised vertebrals tending to have rounded summits, or shields scarcely raised; supracaudal of male rather narrow (23·5 mm.) and strongly globose in the middle, the margin becoming much incurved. Females tend to have more or less continuous mid-dorsal and lateral rays. Philipstown neighbourhood. orangensis.

o. Like *n*, but male supracaudal scarcely bent forwards, though deep and strongly curved in the middle. Carapace markedly broad in the inguinal region. Male with a more or less continuous lateral stripe. Colesberg. colesbergensis.

- p.* Like *n*, but on the costals there are ocellate markings, never a continuous well-defined lateral stripe nor a continuous mid-dorsal; yellow rays thick; carapace compressed about the middle of its length, plastron usually rather deep; posterior marginals widespreading and tending to upturn in the male. Carapace of *F.* longer and narrower than in *k* or *l*; anterior median ray of vertebrals widening distally and sometimes trifurcating, not entering the areola, or if so, narrowing at the point of entrance. Niekerks Hope, Asbestos Mountains. gricoides.
- q.* Like *p*, but plastron flatter, carapace almost entirely without raised shields, posterior marginals less spreading and male supracaudal less strongly curved. Yellow rays thin and numerous, more divided than in *p*. Marydale, between Prieska and Kenhardt. grica.

IV. GENERAL REVIEW: DISTRIBUTION AND CHARACTERS.

Land-tortoises from South Africa have been known from the times of Kolbe (1727), and various species were named and described by Linnæus and his followers in Europe, but until recent decades it seemed to be sufficient to locate one and all "Cape of Good Hope" or "Cape Colony". Even Andrew Smith (1849), usually very accurate in matters of herpetology, could only say of the south-western species *geometrica*, "found in different districts of Southern Africa"; and of the purely western species, *Pseudomopus signatus*, he wrote, evidently in error, "common throughout the whole of southern Africa". The first attempt to deal with our geometric tortoises as a distinct group, the various species and their distribution, was contained in a brief paper by G. A. Boulenger (2) published in 1886; after which came his important 'Catalogue of Chelonians' in 1889. Then followed the several papers by F. Siebenrock, of which those of 1904 (5) and of 1907 (7) add much to our knowledge of the South West African species. All these papers, based on rather scanty material, contain misleading distributional data which seriously limit their usefulness;

Siebenrock's errata include *geometrica* from Great Namaqualand, *fiski* from Kapstadt, and *trimeni* from Stellenbosch; and whereas in Boulenger's first paper he quoted the correct information of Andrew Smith that the Kalahari species, *oculifera* (*semiserrata*) is common in the districts between Latakoo and the Tropic of Capricorn, his later list of 16 specimens in the British Museum Catalogue has only one with precise locality data—between Richmond and Victoria West—which, however, I venture to assert is erroneous.

In 1907 there appeared an important paper by J. E. Duerden on the *Geometrica* group (6), based on far more material than was available to any previous author. As a study of variation and distribution it provides a good body of data for valuating characters according to their taxonomic importance. This and other papers by the same author should be consulted by all workers on South African tortoises; but it may be remarked that the author was not interested in the problem of local units, and he either failed to recognize their existence or thought them unworthy of notice. A short paper on somewhat similar lines by J. H. Power (9) is concerned with the "enormous amount of variation shown by a single species in a specific locality"; there is also the interesting statement that in the same locality, just north of the Orange River, two species of *Chersinella* live side by side, yet preserving their specific entities.

All systematists are agreed that certain specific groups such as *geometrica*, *oculifera* and *tentoria* must be recognized. These particular groups, conventionally called species, do not now overlap in distribution, being, in fact, well separated or even widely so, and their characters do not intergrade appreciably, although within each group there is much variation. As to the nature of that variation, opinions differ, the possible modifying effects of food and environment being quite unknown. Some writers apparently regard the variation as wholly erratic; others believe in the existence of rather ill-defined natural units lower in grade than species. Thus, there are various published records of *tentoria* from Beaufort West and from the Albany district, 250 miles apart; but individuals from those

localities are always distinguishable, in spite of a wide range of variation in each area ; they may fairly be placed in distinct subspecies. I suspect that with more intensive study in the field many local units will be found to exist, each in its own area, which, geographically, may be small or large. Such intensive studies, however, have not been made.

The genus *Chersinella* is confined to the western, southern and central districts of Southern Africa. The eastern limits are the Great Fish River valley in the south, the neighbourhood of Colesberg and perhaps even Burghersdorp in the Orange River basin, the neighbourhood of Bloemfontein, in the Free State ; there are no records from the Transvaal nor from Rhodesia, but one species occurs throughout the Kalahari region. The broad facts of distribution can be correlated, but only roughly so, with that of the flora (*see* ' Main Botanical Regions of S. Africa ', by I. B. Pole Evans, in ' Botanical Survey Memoir ', no. 4, 1922) ; a small part of the Cape region is the home of the peculiar species *geometrica* ; the Karroo Province contains the two closely related species, *tentoria* and *fiski*, with their varieties ; the Kalahari province is the home of *oculifera* ; the Namaqualand province has *verroxii* with its several varieties ; the southern Namib has its peculiar species *trimeni*.

In respect to the Namaqualand province, available material is particularly scanty ; it is impossible to say to what extent the lower part of the Orange River may serve as a natural boundary ; floristically it appears to have no such significance, and if we can rely on Siebenrock and Boettger's records of *trimeni* and *verroxii*, the *Chersinella* fauna is the same north and south of that river ; these records, however, should await confirmation, for our material (*schonlandi*) from Namaqualand, C.P., does not show very close relationship to that (*verroxii*) from Namaqualand, S.W.A.

Within the extensive region occupied by *Chersinella*, its species and subspecies are generally distributed each in its own area, and any one locality harbouring but one form as a rule ; exceptions occur in the case of *oculifera* and *gricoides*, and

of *trimeni* and *schonlandi*, these being pairs of forms not so very closely related and differing in food requirements. In general, connecting links between the forms of *Chersinella* are fairly common; whether this should be interpreted as belonging to the original diversity or as due to secondary hybridism we do not know. The possibility of occasional interbreeding may explain the great and confusing variation that is apt to occur where two specific areas overlap or adjoin, although a good range of intermediates may be lacking. Such facts as the following are frequent: the Hex River subspecies *hexensis*, being the most western member of *tentoria*, is distinctly nearer in structure and pattern to its geographical neighbour, the most southern form of *trimeni*, than are typical *tentoria* and *trimeni* to each other. However, considering the distribution of *Chersinella* as a whole, we do not see a picture of original simplicity; it is not merely a blend of forms all in continuous series and interspersed with vacant spaces once occupied by intermediates.

Geographically the variation within this genus is in some respects discontinuous. It seems clear that the Kalahari form, *oculifera*, and the Cape form, *geometrica*, though quite distinct species, are yet more closely related to each other than to the intervening forms; apparently no intermediates exist anywhere; the directly intervening areas are, nevertheless, inhabited by other forms of *Chersinella* which are linked together in continuous fashion, and, indeed, it seems likely that the forms found in Namaqualand, S.W.A., are connected up by all grades of intermediates with those of the Eastern Cape Province. The occurrence of closely related forms on the high veld and in the south-west corner of the Cape Province is known in other groups of animals (*cf.* *Agama hispida* and *Agama distanti*; also the snake *Amplorhinus multi-maculatus*); but the correspondence with the case under consideration is not exact, inasmuch as *oculifera* apparently does not extend to the high veld of the Transvaal.

It cannot be claimed that efforts to grade the various characters in the order of their taxonomic importance have produced

quite satisfactory results. As a rule, the antibrachial character and the length of the anal in comparison with the femoral are characters of major importance. But in certain localities the scaling of the forearm may vary very greatly; this has been noticed especially in *fiski*, both at Niekerks Hope (Power) and in the Hanover district. The length of the anal suture is a character on which the genus gravitates into two apparently natural groups, including on the one hand *geometrica*, *oculifera*, *trimeni* and *tentoria*, and on the other, *fiski* and *verroxii*; but intermediates and anomalies occur, especially in Karroo areas.

An important character in certain species lies in the form of the nuchal; in *oculifera* it is large and considerably triangular, sometimes narrow, sometimes broad or even very broad, but always more or less pointed in front; in *geometrica* it is long and generally tapering in front; in *fiski* there is much variation, the shield being occasionally lacking, generally short, sometimes rather long, but apparently always quite blunt in front; in *tentoria* and *trimeni* it is generally small, sometimes of moderate size, but only very rarely tapering in front.

In distinguishing the various subspecies, a promising character not hitherto noticed lies in the form of the supracaudal of the adult male, which differs greatly from that of females and young; actually there is no mention of sexual dimorphism in the literature, nor of the fact that adult males are generally much smaller than females; the size difference is least pronounced in *oculifera* and *geometrica*.

There are certain resemblances in detail between the *geometrica-oculifera* section of *Chersinella* and related genera of Testudines, viz. *Megachersine pardalis* of South Africa, *M. elegans* of India and Ceylon, and "*Testudo*" *radiata* of Madagascar; all these have vertically elongate lateral marginals, short anals, and radial pattern on carapace. The significance of this resemblance is uncertain; but in view of the genetic affinity, it would seem very probable that the *geometrica-oculifera* section represents the least modified

original stock of *Chersinella*. It is of interest that another African genus, *Kinixys*, presents similar wide variations in the marginals and anals.

A character peculiar to *Chersinella* amongst the Testudine genera of Africa is the prevalence of conical shields on the carapace; this character is most pronounced in *tentoria* and *trimeni*, which occupy the lower Karroo and sub-coastal regions of the Cape, and is least so in *oculifera*, the Kalahari species. A somewhat similar condition occurs amongst the water-tortoises of the genus *Pelusios*, and is more pronounced in the Zululand form *zuluensis* than in those occupying the head waters of the Limpopo and Zambesi. This may be a secondary hypertrophy, in some way connected with peculiar environmental conditions; yet other tortoises (*Chersine angulata*) in the same region as *tentoria* have no such tendency.

It is regretted that some of the subspecies described in this paper are based on very few specimens; I have had to use the material available in our museums, mostly collected in somewhat haphazard fashion. Consequently, the range of variation has not been accurately defined, and some of my key characters will probably not withstand the strain of future critical work. Moreover, in this group of reptiles especially, our present system can only represent the facts of nature very imperfectly, for there are no sharply defined units.

V. LITERATURE.

1. GRAY, JOHN EDWARD.—'Supplement to the Catalogue of Shield Reptiles in the Collection of the British Museum,' Pt. I, Testudinata, 1870.
2. BOULENGER, G. A.—"On the South African Tortoises allied to *Testudo geometrica*," 'Proc. Zool. Soc. London', 1886, pp. 540-542.
3. ——— 'Catalogue of the Chelonians, Rhynchocephalians and Crocodiles in the British Museum,' 1889.
4. ——— "On Batrachians and Reptiles from the Interior of Cape Colony," 'Ann. Mag. Nat. Hist.', 7, vol. xii, p. 216, 1903.

5. SIEBENROCK, FRIEDRICH.—“Die südafrikanischen Testudo-Arten der Geometrica-Gruppe s.l.,” ‘Sitzungsberichten der kaiserl. Akademie der Wissenschaften in Wien’, Bd. cxiii, Abt. I, May, 1904.
6. DUERDEN, J. E.—“Variations in the Geometrica Group of South African Turtles,” ‘Report South African Assoc. Advancement of Science’, 1906, pp. 178–208.
7. SIEBENROCK, FRIEDRICH.—“Synopsis der rezenten Schildkröten mit Berücksichtigung der in historischer Zeit ausgestorbenen Arten,” ‘Zoologischen Jahrbüchern’, suppl. 10, heft 3, 1909.
8. WERNER, F.—“Reptilia et Amphibia, Schultze, Zool. und anthrop. Ergebnisse e. Forsch. im west. und zent. Südafrika,” ‘Jenaische Denkschriften’, xvi, 1910.
9. POWER, J. H.—“*Testudo verreauxii* Smith: A Study in Variation,” ‘South African Journ. Sci.’, 1932, vol. xxix, pp. 466–472.

EXPLANATION OF PLATES XVI AND XVII,

Illustrating Mr. John Hewitt's paper, “On the Cape Species and Subspecies of the Genus *Chersinella* Gray: Part II”.

PLATE XVI.

Chersinella schonlandi sp. n.

- FIG. 46.— $\times \frac{2}{3}$. Male, type, Namaqualand.
 FIG. 47.— $\times \frac{2}{3}$. Female, old, Steinkopf.
 FIG. 48.— $\times \frac{2}{3}$. Female, Steinkopf.
 FIG. 49.— $\times \frac{1}{2}$. Female, young, Gamoep.
 FIG. 50.— $\times \frac{2}{3}$. Female, young, Liliefontein.

Chersinella fiski (Blgr.) subsp. ?.

- FIGS. 51, 52.— $\times \frac{1}{2}$. Females, Hanover district. See p. 317.

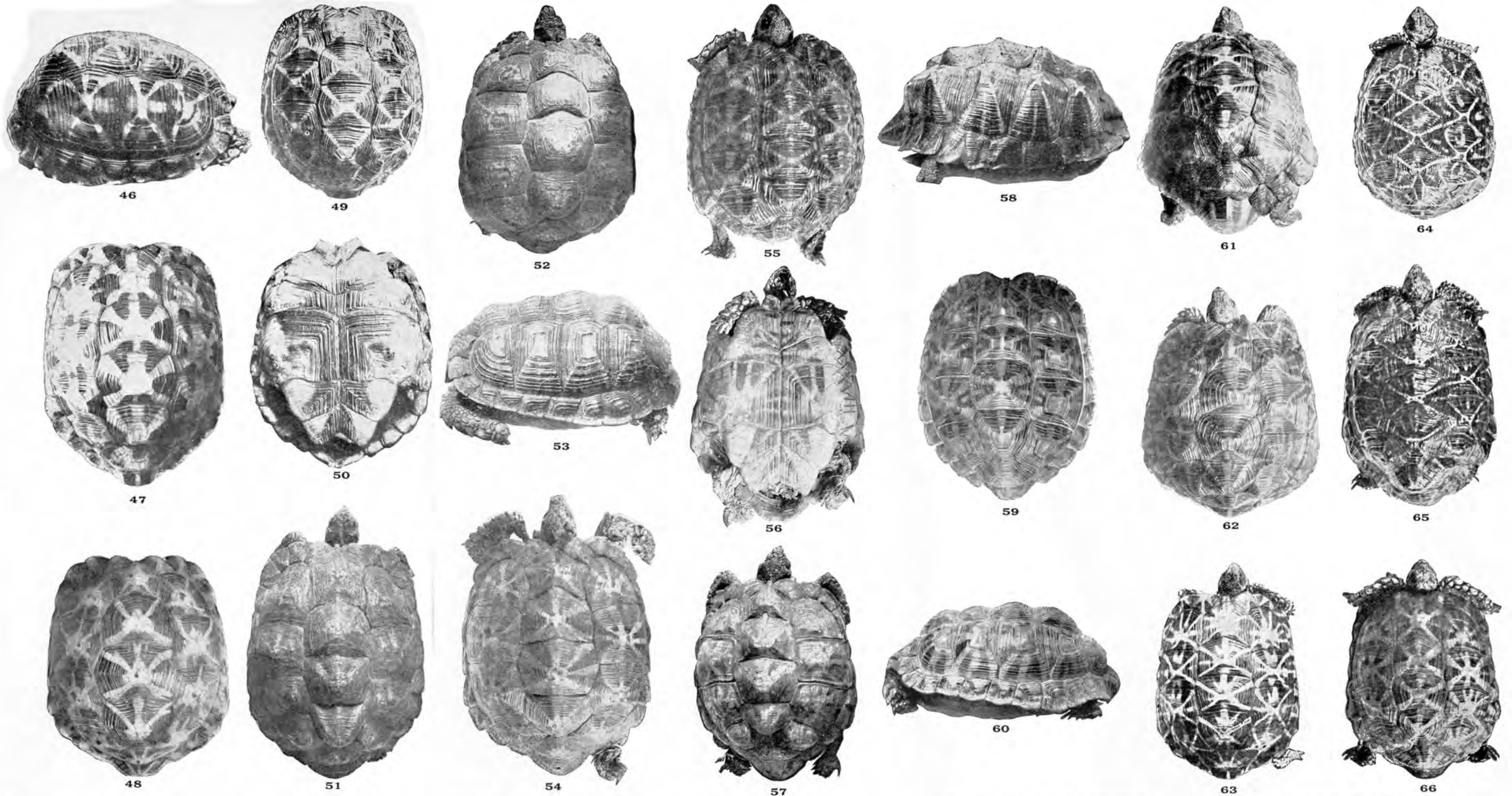
Chersinella fiski fiski (Blgr.).

- FIG. 53.— $\times \frac{2}{3}$. Male, Hanover district.
 FIG. 54.— $\times \frac{1}{2}$. Female, De Aar.
 FIG. 55.— $\times \frac{2}{3}$. Female, young, De Aar.
 FIG. 56.— $\times \frac{1}{2}$. Female, Hanover district.

Chersinella fiski seimundi (Blgr.).FIG. 57.— $\times \frac{3}{4}$. Female, Hanover district.*Chersinella fiski cronwrighti* subsp. n.FIG. 58.— $\times \frac{1}{2}$. Female, type, Hanover.*Chersinella fiski orangensis* subsp. n.FIGS. 59, 60.— $\times \frac{3}{8}$. Male, type, Philipstown-Petrusville.*Chersinella fiski colesbergensis* subsp. n.FIG. 61.— $\times \frac{4}{5}$. Male, type, Colesberg; this specimen has the pattern broken through abrasion.FIG. 62.— $\times \frac{1}{2}$. Female, Colesberg.*Chersinella fiski grica* subsp. n.FIG. 63.— $\times \frac{1}{2}$. Male, type, Marydale, between Prieska and Kenhardt.FIGS. 64, 65.— $\times \frac{1}{2}$. Males, young, Niekerk's Hope. ? Subsp.FIG. 66.— $\times \frac{1}{2}$. Male, Niekerk's Hope. ? Subsp.

PLATE XVII.

Chersinella fiski grica subsp. n.FIG. 67.— $\times \frac{1}{2}$. Female, type, Marydale.FIG. 68.— $\times \frac{1}{2}$. Female, Marydale.FIG. 69.— $\times \frac{1}{2}$. Female, old, Marydale.FIGS. 70, 71.— $\times \frac{3}{4}$. Females, Niekerk's Hope. ? Subsp.*Chersinella fiski gricoides* subsp. n.FIG. 72.— $\times \frac{3}{4}$. Male, type, Niekerk's Hope.FIG. 73.— $\times \frac{1}{2}$. Male, old, Niekerk's Hope.FIG. 74.— $\times \frac{3}{4}$. Female, type, Niekerk's Hope.FIG. 75.— $\times \frac{1}{2}$. Female, old, Niekerk's Hope.*Chersinella verroxii smithi* (Blgr.).FIGS. 76, 77.— $\times \frac{3}{4}$. Males, Lower Molopo.*Chersinella verroxii* (Smith).FIG. 78.— $\times \frac{3}{4}$. Female, Ukamas, S.W.A.



Figs. 46-50.—*CHERSINELLA SCHONLANDI* sp. n. Figs. 51, 52.—*CHERSINELLA FISKI* (Blgr.) subsp. ? Figs. 53-56.—*CH. FISKI FISKI* (typical). Fig. 57.—*CH. FISKI SEIMUNDI* (Blgr.). Fig. 58.—*CH. FISKI CRONWRIGHTI* subsp. n.
 Figs. 59, 60.—*CH. FISKI ORANGENSIS* subsp. n. Figs. 61, 62.—*CH. FISKI COLESBERGENSIS* subsp. n. Figs. 63-66.—*CH. FISKI GRICA* subsp. n.