ADDITIONS TO THE FAUNA OF SOUTH WEST AFRICA: SOLIFUGES, SCORPIONS AND PEDIPALPI

by

R. F. LAWRENCE
Albany Museum, Grahamstown

(With 8 figures)

Published with the aid of a Grant awarded to the Namib Desert Research Station by the South African Council for Scientific and Industrial Research

SCIENTIFIC PAPERS OF THE NAMIB DESERT RESEARCH STATION,
ORIGINAL PRINT, NO. 34, AUGUST 1967

Contents

Introduction

Since the appearance of my list of S.W. African solifuges in 1963 a number of further additions have been made (1966, 1967) in papers which also include descriptions of typical desert Arachnida such as the dune spiders (Sparassidae) and scorpions. The current paper presents descriptions of still further discoveries, chiefly from little explored regions of South West Africa, the Namib litoral and the north western Kaokoveld. Among these two species of large Amblypyge whip-scorpions are recorded from the territory for the first time with notes and comments on the systematics and distribution of the African fauna.

I am under a great obligation to the following collectors for their enthusiasm and co-operative support: Dr. C. Koch of the Desert Research Station, Gobabeb, S.W. Africa; Mr. C. G. Coetzee of the State Museum, Windhoek; Dr. W. Steyn, Dr. L. Schulze and Mr. W. D. Haacke of the Transvaal Museum, Pretoria; Dr. W. G. H. Coaton, Chief of the Termite Survey, Plant Protection Research Institute, Pretoria; Mr. F. Gaerdes of Okahandja, and Mr. H. Maedler, Walvis Bay.

The types are deposited in the State Museum, Windhoek, and the Transvaal Museum, Pretoria.

Order *Solifugae*

Family SOLPUGIDAE

NOTE ON A PECULIAR FORM OF SOLPUGID FROM SOUTH WEST AFRICA.

Figs. 1 and 2

A male specimen of Solpugid from Spitzkoppe, Erongo Mts., sent to me by Dr. C. Koch, Director of the Desert Research Station, Gobabeb, differs completely from any known species of the order from Southern Africa in its colouring, and from all other genera of the family Solpugidae, except *Zeriassa,* in the setation of the coxae of the legs. The following is a brief description based on a dried and disarticulated specimen:

Colour. — The entire animal deep black with the exception of the tergites of the abdomen (though not the two anterior ones) which are snowy white contrasting strongly with the general colouring. The first two tergites of abdomen a light golden or tawny colour, the scopula of pedipalp-metatarsus also a dull terra-cotta contrasting with the general dark colour of the appendage; the long slender setae of the palpi and legs of a similar colour along their entire length or with the basal halves blackish; spines of the tarsi reddish brown.

Setation. — Chelicerae with long, stout curved setae dorsally and in anterior half of lateral surface, thick at their bases but finely tapering, an under coat of quite short slender setae; headplate with strong black setae along its anterior margin, more numerous around the ocular tubercle, these much shorter though comparatively thicker than the long setae of the chelicera; general surface of headplate with an under coat of very short, fine setae of uniform length, shorter and much denser than those of the chelicerae.

Coxae of legs I—IV with a number of short, bluntly pointed rod-like setae (the *bacillae* of Roewer), differing in thickness and general appearance from the neighbouring setae and resembling those figured for *Namibesia* (Lawrence 1962, *Ann. Transv. Mus.* 24 (2, 3), p. 217, figs. 2a, b); they are arranged as follows: I with about 8 along its anterior margin, II with about 10 along the anterior and lateral margins, III with 12—14 on the anterior half of the segment, IV with 20—22 covering most of the surface of the segment. The pedipalp coxae without bacillae.

The white appearance of the dorsum of abdomen created by a thick coating of comparatively short and fairly thick hairs, not pointed apically but sometimes weakly cleft; furthermore on each tergite a small number of much longer, slender, finely pointed setae directed backwards. Sternites with fairly sparse, moderately long black setae of approximately consistent length throughout. Legs with scattered long setae as previously described and an under coat of short hairs similar to those on the chelicerae. Pedipalp metatarsus with a scopula extending its entire length, almost to its distal end, its ventral surface with scattered cylinder bristles, these more numerous distally and on the tarsus, tibia without. Tarsi of legs II—IV with the spine formula typical of the genus *Solpuga,* the spines very strong; claws normal.

Structures of the chelicerae:

Flagellum as in fig. 2a seen from the outer side, fig. 2b seen from above, smooth except for a few accessory spicules. Dentition normal but the teeth much worn down, fig. 2a. Stridulatory area unusually large, slightly raised above the general surface and defined by a distinct narrow rim; with 8 strong keels and between them on the anterior margin about 6 much shorter keels, fig. 2c.

Total length approximately 38 mm.

A colour photo of another specimen from the same locality taken by Mr. H. Maedler *in situ* is undoubtedly a female specimen and gives a clear idea of the general colouring which is essentially similar to that of the male, Fig. 1.

Fig. 1. A female specimen of the peculiar Solpugid from Spitzkoppe, photographed on the spot by Mr. H. Maedler (*).

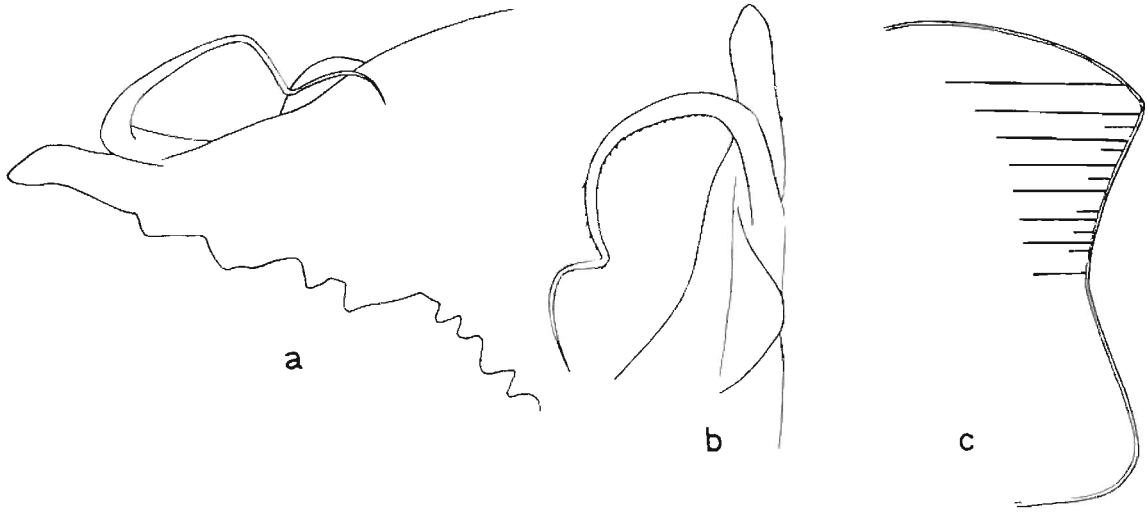

Fig. 2. A melanic male Solpugid from Spitzkoppe, Erongo Mts.: *a*, chelicera from outer side; *b*, apical half of the same from above; *c*, stridulatory area.

(*) Special thanks are due to the photographer who placed one of his original colour slides at the disposal of the Namib Desert Research Station.

Remarks. — This melanic form is peculiar in its distinctive colouring and also in having stout rod-like setae on the ventral surfaces of the coxae of the legs (bacillae). Although it must undoubtedly be placed in the Solpugidae, none of the genera of this family except *Zeriassa,* which has been considered by some authors to represent a distinct subfamily, possess these organs. In Southern Africa besides *Zeriassa* only *Namibesia* of the family Daesiidae has such structures, which are more characteristic of the Rhagodidae, a family of north African and predominantly deserticolous Solifuges; they are also found in the North American family Eremobatidae. The stridulatory mechanism is unusually well developed.

Only among the Rhagodidae (of north African and tropical east African distribution), are totally black or dark coloured species found; even in this family many, if not most, of the members are parti-coloured, black alternating with yellow or reddish brown.

SOLPUGEMA AETHIOPS sp.n.

Fig. 3 *(a, b)*

Type 1 ♀, Numas Valley, Brandberg, South West Africa, collected by W. Steyn, April, 1963.

Colour. — Whole dorsal surface blackish brown, contrasting sharply with the sides and ventral surface which are dirty white to pale yellow; pleurites, except for a small blue-black portion adjoining the tergites on each side, white; sternites pale yellow, each bordered at the side by a blackish marking, giving the impression of a dark lateral stripe down each side; last two or three sternites almost entirely dark, anal segment blackish; ventral surface of prosoma (coxae and one or two segments distal to them) cream to light yellow, malleoli uniformly pale yellow; appendages uniformly blackish brown above and below (except only the basal segments mentioned above) even the claws, except at extreme apices, blackish, femur-tarsus of legs II and III also a little lighter ventrally.

Setation. — Chelicerae dorsally with scattered long reddish brown spinose setae and more numerous fine dirty yellow setae; headplate with numerous short yellow brown setae, some long brown spinose setae; tergites with yellow to russet coloured setae, pleurites almost naked, sternites of abdomen fairly thickly covered with yellow setae, coxae similar but the setae much more dense; stridulatory organ with 10-11 strong distinct lamellae.

Dentition. — First intermediate tooth very large, not very much smaller than the first main tooth, two subgeminate intermediate teeth between second and third main teeth, Fig. 1*a*; outer cheek series with 4 moderate sized teeth, the last a little smaller than the others; inner cheek series with 4 teeth, the second and fourth minute, subequal, the first very large, almost twice as high as the third, the second a little nearer the first than the third.

Pedipalps. — Metatarsus with numerous cylinder bristles ventrally, a few at the base of tarsus but more on tibia; metatarsus dorsally with a regular, fairly thick brush-like row of short setae, these less dense on tarsus and tibia.

Legs with the generic formula of spination, no mane on leg IV, the hairs and setae of all legs rather sparse, either quite short or in a few cases very long, the tarsal segments ventrally with much denser brush-like covering of short setae with a russet tinge.

The genital sternites drawn out posteriorly into the strongly projecting rounded lobes characteristic of the genus, these shiny and appearing to be more strongly chitinised than the rest of the segment, Fig. 1*b*.

Dimensions: Chelicera *(in situ)* 10.5, width of headplate 9, pedipalp 28.5, total length 39 mm.

Although in general females of this family cannot be satisfactorily identified, this species of *Solpugema* with its characteristic blackish coloration should be easy to recognise; in this respect it appears to be quite different from any other South West African Solpugid.

The species is peculiar in having a large first intermediate tooth between the two anterior main teeth and subequal to the first main tooth, Fig. 1*a*; in this it resembles *Solpugelis* and *Solpugiba* but the tooth is much larger than in these genera, the jaws themselves far more robust; it further differs completely from these forms in its colouring.

PROSOLPUGA SCHULTZEI (Kraepelin)

Solpuga schultzei Kraep., 1908, *Denkschr. med. nat. Jena,* 13, p. 270, figs. 2, 3.

Figs. 4 *(a, b, c, d)* and 5

Kraepelin's type was based on a single immature female, 10.5 mm. in length, from Rooibank, Walvis Bay, South West Africa.

The following description is based on 1 ♂, 1 ♀, 3 immature specimens, Swartbank near Gobabeb, C. Koch leg., Dec. 1966.

Male:

Colour yellow with blackish markings as follows: chelicerae with a narrow lateral stripe, the inner

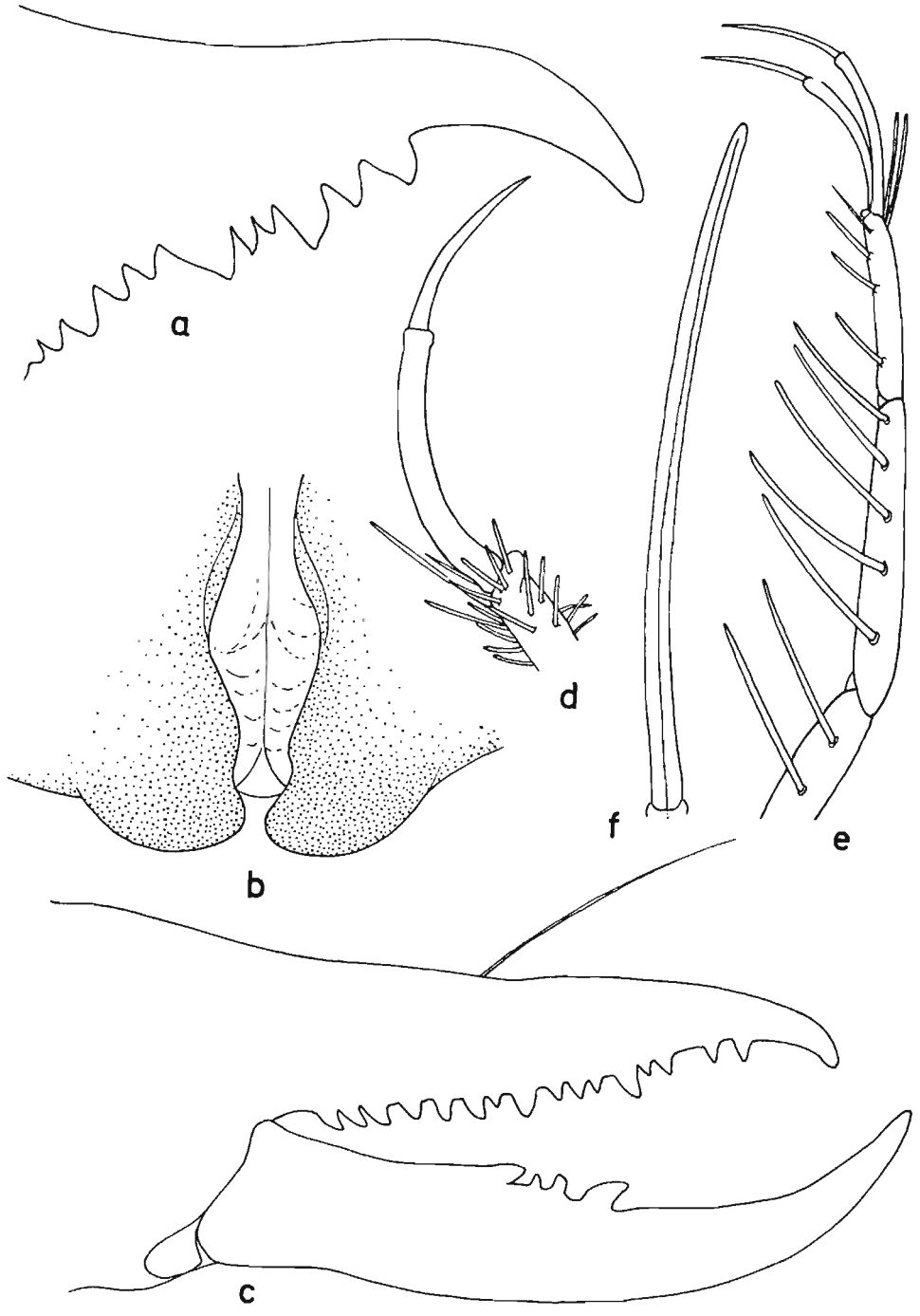

Fig. 3. *Solpugema aethiops* sp.n. ♀. *a*, dentition of dorsal jaw; *b*, genital opening, sternite I.*Unguiblossia cauduliger* sp.n. ♀ *c*, chelicera from outer side; *d*, claw of leg II enlarged; *e*, apex of tibia, metatarsus and tarsus of leg II; *f*, one of the modified spines of metatarsus II enlarged.

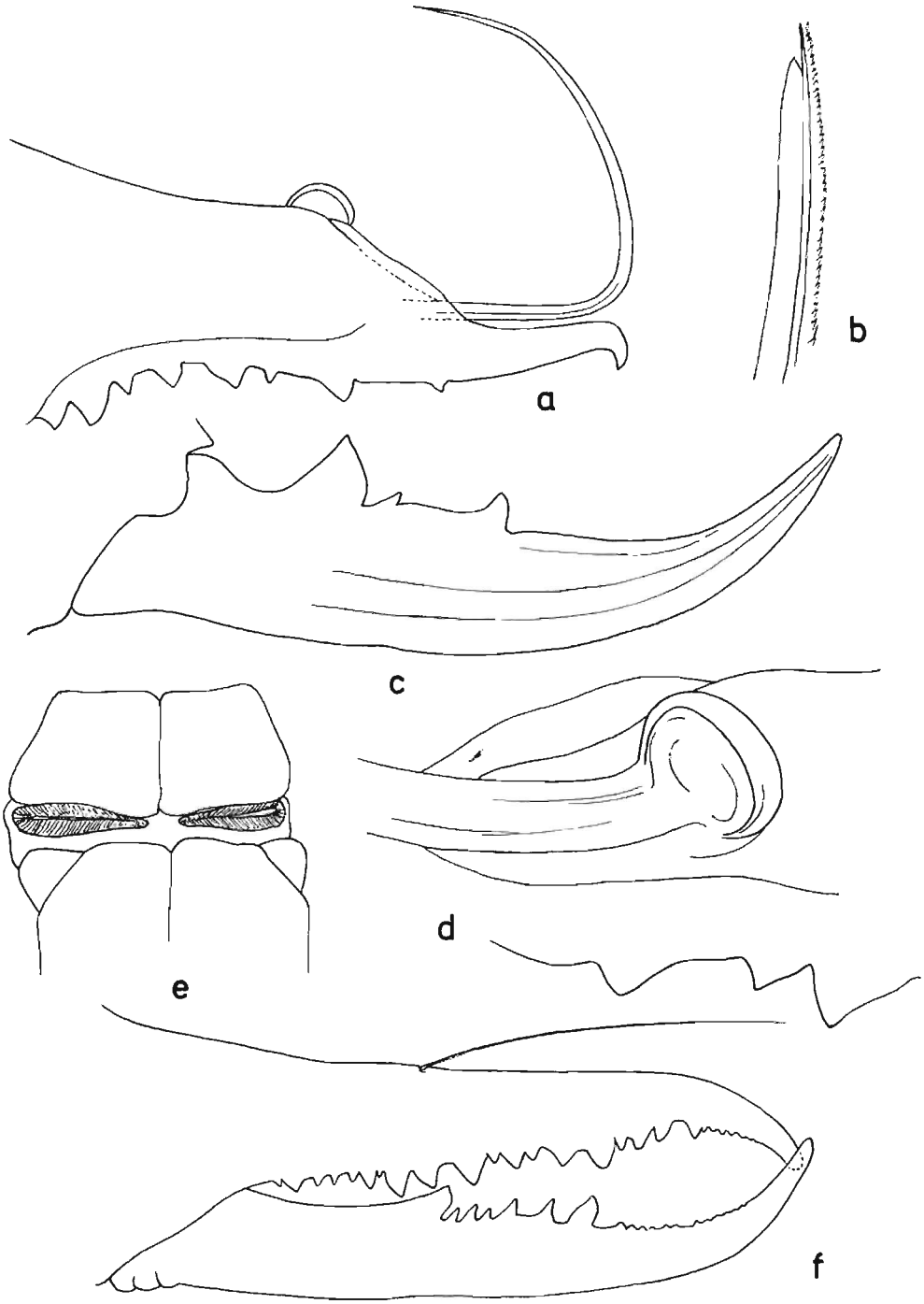

Fig. 4. *Prosolpuga schultzei* (Kraepelin). ♂. *a*, dorsal jaw of chelicera, outer view; *b*, apex of flagellum from outer side, enlarged; *c*, ventral jaw, outer view; *d*, basal enlargement of flagellum from inner side, enlarged. *Lawrencega longitarsis* sp.n. *e*, openings of prosomal stigmata between coxae II and III; *f*, chelicera from outer side.

(dorsal) stripe represented only by a large spot mesially to and a little in advance of the lateral one; headplate with a lateral stripe somewhat interrupted in places, continuous with a similar stripe at the sides of thoracic and abdominal tergites; eyes yellow to amber, not black; the lateral stripes of dorsum of abdomen crenulated, in addition a much less distinct reddish brown median stripe; ventral surface dark fuscous or reddish brown without black stripes, the greater part of the two preanal sternites however, blackish. Some of the small immature specimens differ in having the dorsal surface of abdomen reddish brown, the first five anterior and the two preanal sternites dark reddish brown, one or two sternites between these yellow.

Pedipalp-tibia with an indistinct stripe on posterior surface, tarsus amber (also tarsus of leg I); legs with indistinct longitudinal stripes at apex of femur and tibia I, II with a black spot at posterior apex of second trochanter, a pair of black spots at dorsal apex of femur, tibia darkened on each side at apex; tibia and metatarsus III darkened at apex, IV without any markings.

Chelicera and headplate dorsally with a few long scattered setae and a dense undercoat of minute but rather thick fleshy blunt-tipped hairs. Behind the dental row of dorsal jaw 8 rather short curved blunt-tipped setae; inner surface of ventral jaw with a distal group of three smooth, somewhat incrassate but pointed setae and 1 very long slender seta. Stridulatory area with 8 strong complete lamellae.

Abdomen. — Tergites and sternites with a dense coating (almost resembling granulation) of minute, very short spiniform setae of uniform density, contrasting strongly with the fewer large and long coarse setae of the pleurites.

Flagellum as in Fig. 4*a* from outer side, with two almost rectangular bends; seen enlarged, Fig. 4*b*, the flagellum is fringed from the first backward bend to just before the apex with close set small serrations along its outer edge while the opposite edge is bordered by a narrow transparent lamina. Seen from above the shaft describes a graceful curve towards the outer side as it becomes progressively more slender but parallel to the long axis of the jaw in its basal two-thirds; basal enlargement, Fig. 4*d* very small, round, situated very far back from the anterior bend, as in *Solpugelis, Solpugiba* and especially *Solpugista hastata* Hewitt.

Dentition reduced, only 8 weak and widely separated teeth in the continuous main row of dorsal jaw, Fig. 4*a*; 3 inner cheek teeth, the two anterior ones large, triangular, very widely separated, a minute third tooth near to the second; ventral jaw as in Fig. 4*c* from outer side, the dental arrangement as in *Solpugiba.*

Appendages. — Pedipalp slender, very long, exceeding total length of animal, femur with 6-8 long incrassate setiform spines on inner surface of distal half; tibia without enlarged setae but laterally with rows of extremely long bristles; metatarsus ventrally with a brush of long cleft forwardly sloping setae, more numerous short cylinder bristles than tibia, the long latero-dorsal setae similar to those of the tibia; metatarsus very long and slender, tarsus thicker and club-shaped.

Tarsus of leg IV as in Fig. 5, entirely unspined, the articulations of the segments indistinct and resembling sutures rather than joints; tarsi II and III without true spines ventrally as in other Solpugidae, metatarsus and tarsus of leg II with modified spines as in Roewer's Fig. 309 (1934, *loc. cit.*); the unguiculus of the claws about equal to the pedunculus.

Dimensions: Length of chelicera 6, width of headplate 4, femur and tibia and metatarsus-tarsus of pedipalp, 9.5 + 9.6 + 7.4; total length 22.7 mm.

Female:

Colour as in ♂, the eyes amber, the lateral stripes on tergites of abdomen very sharp, black, the median one ill-defined, much lighter, amber, the general colour of both tergites and sternites not darker than the pleurites. The colour pattern of the immature specimens much the same as the adults with the exceptions mentioned above.

Dentition. — As in Roewer's figure of the ♀ chelicera (*loc. cit.* Abb. 309*d*), the intermediate tooth between second and third main tooth of dorsal jaw may however be either absent or quite large. Thus 7 or 8 teeth in the main row as in the ♂, the 4 anterior main teeth subequal; 3 inner cheek teeth, the first distinctly larger than second, the third minute, contiguous with second.

Appendages. — Pedipalp as in ♂ but much shorter than total length of body; spination of legs I—IV as in ♂, claws of tarsus IV very long and slender, if straightened equal to length of tarsus.

Dimensions: Length of chelicera 5, width of headplate 3, pedipalp about 11.8, total length 16.2 mm.

Further material: In December, 1964, Dr. L. Schulze collected 3 specimens on the sandy dunes of Gobabeb, one very young (No. 123, 126x, 132x).

Remarks on the genus. — *Metasolpuga* and *Prosolpuga* are highly peculiar members of the family *Solpugidae,* differing in the modified setae of the second leg (Keulenborsten) from all others while also differing markedly from each other. *Metasolpuga* is easily distinguished in the first place

by its peculiar colour pattern while *Prosolpuga* is set apart from other Solpugid genera in at least three important characters, 1. the modified spines of the second leg, 2. the elongate unguiculus of the claws, a characteristic of very young stages of Solifugae, and 3. the total absence of spines on all segments of leg IV; the number and size of teeth in the dorsal jaw are also much reduced but this is a condition found in varying degree in a number of other genera and families. Some desert inhabiting genera display either or both of the first two characters but not the third; most Hexisopidae and *Unguiblossia* among the Daesiidae for instance possess the first and second characters but *Prosolpuga* is the only genus of Solifuges to have all three and the only member of the family Solpugidae to have modified elongate claws in the adult stage.

METASOLPUGA PICTA (Kraepelin)

Two full-grown females, Gobabeb, Namib desert, South West Africa, C. Koch leg., Nov. 1966. Total length of larger specimen, 32 mm.

The colouring of the two females differs from previous descriptions (Purcell 1899, p. 432; Lawrence 1963, fig. 12; 1965, p. 4, fig. 2) only in the abdominal tergites having a narrow black border on their posterior margins, disappearing when passing over to the pleurites; the characteristic bright reddish colour of the head and chelicerae has faded to yellow in the preservative.

Family MELANOBLOSSIIDAE
UNGUIBLOSSIA CAUDULIGER sp.n.

Figs. 3 *(c, d, e, f)* and 6 *(a)*

Type, 1 ♀, cotypes 4 ♀♀, on sandy dunes, Namib Desert Station at Gobabeb, South West Africa, collected by L. Schulze, Nov.—Dec., 1964.

Colour uniform pale yellow without a pattern of darker markings, prosoma and appendages a little deeper yellow than the trunk, tergites a little darker and just distinguishable from the pleurites but not as dark as appendages; borders of malleoli with indistinct brownish margination, a little darker than the base of the appendages.

Setation. — Headplate and chelicerae with fine, fairly dense short hairs and a few long slender setae dorsally, tergites of abdomen with much shorter, finer and more numerous hairs than the rest of dorsal surface, these however becoming longer on the posterior segments; last 3 or 4 segments with conspicuous lateral tufts of stiff setae, Fig. 6*a*, which being much longer, contrast with those of the more anterior abdominal segments; ventral surface with sparse setae, those of the posterior segments much longer; the two segments distal to the coxa ventrally with a stiff brush-like covering of strong erect setae, these darkened a little in some specimens; second stigma-bearing sternite with an oblique row of 4 long flesh coloured ctenidia on each side, distinctly thicker than any of the neighbouring setae, swollen at their bases where they are twice as wide as at the apices which, though strongly narrowed, are not tapering. Pedipalps with numerous short cylinder bristles (slightly cleft at apex) dorsally and ventrally, the other segments with rather sparse setae, a few very long fine ones; apex of tarsus of leg I with a dense brush-like tuft of short bristle-like setae distinctly cleft at their apices, a few long spatulate setae scattered among them.

Chelicerae shaped as in Roewer's fig. 23 (1941) seen from above, the distal half of the jaw very strongly and suddenly narrowed, the fang portion very long and slender, Fig. 3*c*, as in *Unguiblossia* and *Daesiella;* dorsal jaw with a single regular row of 16 small teeth of fairly uniform size, inner cheek teeth not visible, apparently absent; ventral jaw as in Fig. 3*c*, usually with 4 teeth but occasionally only 3; above the dental row on the inner surface of dorsal jaw 2 or 3 irregular rows of rather short feather-bristles, none of them much longer than the others as are the 2 or 3 distal ones shown in Roewer's Fig. 24 for *U. eberlanzi;* at the base of dorsal jaw an oblique row of 6 enlarged smooth spines (not feather bristles as shown in Roewer's Fig. 24 *loc. cit.,* a rather unusual condition); inner surface of ventral jaw with very long smooth setae distally, some shorter feather bristles proximally but not the single row of smooth spiniform setae shown by Roewer; stridulating organ consisting of 5 short distinct lamellae with indications of a sixth.

Abdomen with last three segments strongly narrowed in comparison with the anterior ones, resembling a short tail, Fig. 6*a*; or in some individuals the posterior apex triangular, coming to a regular point, these "tail" segments with conspicuous tufts of setae laterally.

Spination of legs. — Leg II on the ventro-posterior surface of metatarsus with a row of 5 (6) very long conspicuous spines, tibia with 4 similar but weaker spines, the 2 proximal ones distinctly shorter than the others, Fig. 3*e*; these spines long, strong, parallel-sided and with rounded or bluntly pointed apices, Fig. 3e, f, of the same nature as Roewer's "stumpfe Keulenborsten" which are however dorsal in position and with the apices distinctly widened or spatulate while in the present species they are of uniform thickness throughout; tibia to tarsus on the opposite side of the row of spines

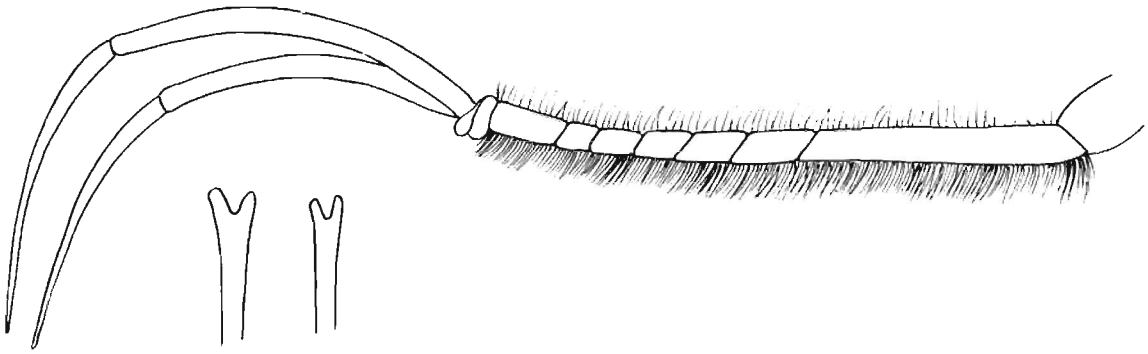

Fig. 5. *Prosolpuga schultzei* (Kraepelin). ♂. tarsus of leg IV with two of the cleft ventral setae enlarged.

with a short regular brush of small setae. Claws of legs II—IV as in *Unguiblossia,* the distal unguiculus about half or even more the length of the basal pedunculate portion, Fig. 3*d*.

Tarsus IV very long and slender, 8—10 times as long as deep, consisting like II and III of a single segment, no indication of a suture or false articulation; the ventral spination of the tarsi difficult to determine as this is rather irregular with the spines of different lengths and thickness; at the apex of each tarsus a cluster of several spines both dorsally and ventrally. Tarsal spination of IV apparently 2.2.2.2. or 1.2.2.2.2. of II and III, 1.1.2.

Dimensions: Total length 16; chelicerae 3.4; width of headplate 3.2; pedipalp 7.8 mm. Total length of smallest of the cotypes 11.4 mm.

Further material. — 4 mature ♀♀, 2 subadult ♀♀, 7 immature specimens, Gobabeb Desert Station, collected by C. Koch, Nov. 1966.

Remarks. — All the five specimens of *cauduliger* appear to be of the same sex; the species, though differing in a number of respects from the genotype, *U. eberlanzi,* undoubtedly belongs to *Unguiblossia* Roewer (1941, *Veröff. Deutsch. Kolon. Übersee Mus.* 3: 127). Neither of Roewer's two type specimens (a ♂ and ♀) were provided with ctenidia but unfortunately he does not mention any differences in the two sexes of dentition or size, the female being only described as lacking the modified spatulate setae on the tibia and metatarsus of the second leg. All the specimens of *cauduliger* have abdominal ctenidia and a row of long erect spines on the metatarsus-tibia of leg II (Fig. 3*e*), which though somewhat different in shape are of the same nature as the "Keulenborsten" of *eberlanzi;* in this respect alone they might be regarded as males.

Among the material collected by Dr. Schulze is a small immature specimen (total length about 9 mm.) which agrees well in colouring and dentition with *Prosolpuga schultzei,* the modified spatulate setae (Keulenborsten) of the second leg closely resembling those figured by Roewer for *U. eberlanzi* (1941, pl. 8, Fig. 27) as well as for *Prosolpuga schultzei* (1934, Fig. 309*b*).

The species now described differs from *eberlanzi* in having a single jointed tarsus IV, abdominal ctenidia, a larger number of teeth in the single row of the dorsal jaw and in the different shape of the modified spines of tibia — metatarsus II (which are also implanted laterally rather than dorsally). The length of the trunk in *eberlanzi* is only 7 mm. which seems rather small so that both the type of this genus and that of *Daesiella* (total length 9 mm.) may not be adult while the species described above seems to be definitely so; in that case the presence of ctenidia and the long bacillar type of spine on tibia-metatarsus II are indicative of the adult condition, the spines being spatulate and the ctenidia being absent in the immature stages, as in the small specimen of *Prosolpuga schultzei* mentioned above.

Placing *Lawrencega* in a different subfamily on the basis of an undivided tarsus in leg IV is unacceptable as in a number of cases *(Daesiella pluridens, Lawrencega hewitti)* it is difficult to say whether there are 1 or 2 segments, the tarsus being broken up by indistinct sutures or pseudoarticulations; nor can I agree that the number of segments or spines is of fundamental importance. The structure of the claws seems to be of far greater weight and this character would place *cauduliger* with *Unguiblossia* rather than with any other genus.

The following table records the main characters for the three related genera of Melanoblossiidae. *Unguiblossia, Lawrencega* and *Daesiella,* all the five South African genera now being regarded as belonging to a single subfamily, the *Melanoblossiinae.*

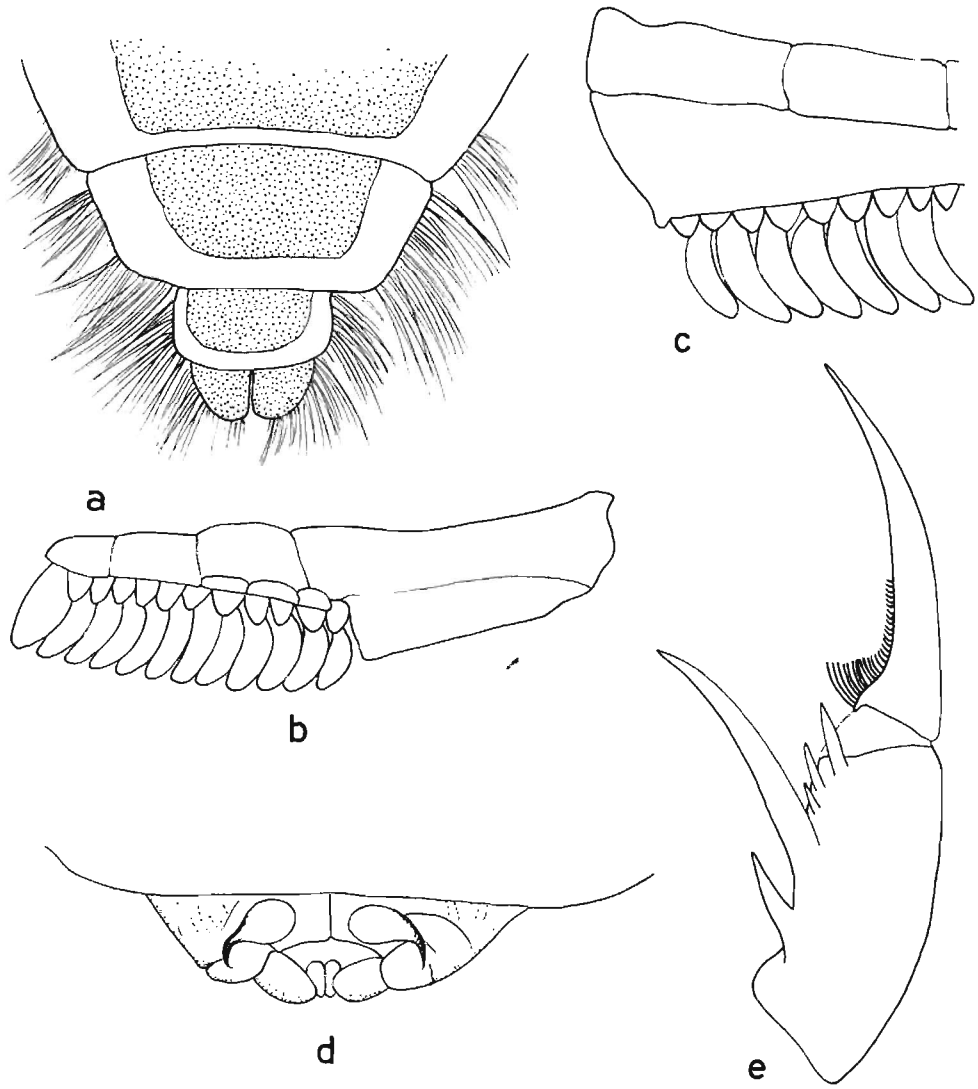

Fig. 6. *Unguiblossia cauduliger* sp.n. ♀. *a*, apex of abdomen, dorsal view. *Opisthophthalmus chrysites* sp. n. *b*, pectinal comb of ♀; *c*, base of pectinal comb of ♂. *Hemiphrynus machadoi* Fage. ♂. *d*, genitalia; *e*, tarsus of pedipalp from above.

Genus	Tibia-metatarsus of leg II	Number of segments leg IV.	Claws	Ctenidia	No. of teeth in dorsal jaw. / No. of teeth in ventral jaw.
Lawrencega	Without a row of spatulate setae (Keulenborsten).	1 *(tripilosa)*	normal	5 present	4—7 / 6 (discontinuous).
		1 or 2 *(hewitti)*	„	none	
		1 *(longitarsis)*.	normal	5 present	17 / 7
Daesiella *	Legs lost in type except IV. Probably not modified.	1 or more.	normal	absent	18 / 3
Unguiblossia	With spatulate setae only in *eberlanzi*.	2 *(eberlanzi)*	modified	absent	13 / 3
		1 *(cauduliger)*	modified	4 present	16 / 4

* The type of *Daesiella pluridens* Hewitt in the Albany Museum is so much damaged that only the chelicerae and one of the fourth pair of legs is in a condition to be compared with Hewitt's description.

LAWRENCEGA LONGITARSIS sp.n.

Fig. 4 *(e, f)*

Type. — One specimen, Swartbank near Gobabeb, Namib Desert, South West Africa; C. Koch leg., Dec. 1966.

Colour in general yellow without darker markings, opisthosoma darker than the rest, with a dull yellow tinge.

Chelicera and headplate dorsally with long, slender setae, chelicerae posteriorly with a few thicker and shorter blunt-tipped ones, an especially long seta, thicker than the others, rising from the middle of upper edge of dorsal jaw, Fig. 4*f*; whole of inner surface of dorsal jaw except distal fourth with a triplicated irregular row of feather bristles, above these near the proximal end of the jaw an oblique row of 6 long and incrassate blunt-tipped spiniform setae; distal 3—4 setae of inner surface of ventral jaw somewhat thickened, smooth; 7 well formed stridulatory lamellae. Openings of the anterior pair of stigmata between coxae II and III, very large, Fig. 4*e*.

Abdomen. — Tergites and sternites with sparse setae, the posterior segments however with progressively more numerous and longer setae; pleurites with far more numerous, evenly distributed setae than the tergites and sternites; first stigma-bearing sternite with a transverse row of 4 enlarged, thickened, setiform ctenidia near the posterior margin, becoming longer laterally, a fifth nearer the median division of each half segment, a little more anteriorly situated.

Dentition. — Dorsal jaw as in Fig. 4*f* from outer side, a long continuous row of about 17 small teeth, the last 4 or 5 (cheek teeth) minute; inner cheek teeth parallel to the main row at posterior end of jaw, much larger than the outer cheek teeth, 3 in number, the posterior smaller than the other two which are subequal; ventral jaw with 7 teeth.

Appendages. — Pedipalp femur on inner surface of its distal half with 3 long pointed spiniform setae, tibia with 3 similar but shorter setae on infero-median margin, metatarsus with 1 similar seta near its base.

Tarsus of leg IV very long and slender, 20—24 times as long as wide, consisting of a single undivided segment with 2, 2, 2, 2, 2, strong inferior spines, if the extreme apical pair is included, tarsi II and III with 1, 2, 2, 2, shorter spines. All the claws normal with short unguiculus as in most solifugae and unlike *Unguiblossia*.

Dimensions: Width of headplate 2.6; length of chelicera 4; pedipalp 11.5; leg IV, 17 (femur 6 and tibia-tarsus 11); total length 16.4 mm.

The species resembles *Unguiblossia cauduliger* in the ctenidia, undivided fourth tarsus and the spination of metatarsus and tibia II but differs completely in having normal claws without an elongate unguiculus; in the dentition and lengthening of the jaws it resembles *Unguiblossia* and *Daesiella* but in view of the claw character there seems to be no alternative to placing it in the genus *Lawrencega;* a distinctive feature of the species is the length and slenderness of the legs, especially the fourth pair.

Family DAESIIDAE
EBERLANZIA FLAVA Roewer

1 ♀, Desert Research Station, Gobabeb, South West Africa; collected by C. Koch, Nov. 1966.

The colouring of this female differs from my description (1962, p. 215) only in having the tergites of the dorsal surface of abdomen bisected by a fine purple longitudinal stripe composed of a narrow bar on each tergite; the last 2 or 3 tergites with a small blackish quadrilateral marking in the middle.

Family HEXISOPIDAE
HEXISOPUS FUMOSUS sp.n.

Fig. 7

Type, 1 ♂, in the Marienfluss between Otjinungua-Orupembe, N.W. Kaokoveld, South West Africa, collected by W. G. H. Coaton (T. 467), 24th April, 1966. Found running over coarse sand of dry stream bed at 6 p.m.

Colour. — Chelicerae and headplate dull reddish brown with an indistinct pattern of darker markings, e.g. headplate with a blackish anterior margin, behind this fine reticulation, a pair of narrow darker stripes diverging widely behind the ocular tubercle, headplate bisected by a narrow light stripe.

Three anterior tergites of abdomen darker than the others, smoky slate grey covered with blackish hairs, posterior segments light grey, all with a narrow posterior blackish margination, in the last seven segments these with a single regular row of brown setae, the remainder of the segment covered with long, fine, silky white hairs; ventral surface in general brown, lighter than dorsal surface, 3—4 basal segments of leg IV quite light, malleoli white.

Pedipalps dark brown, the tarsi much lighter, orange, but more or less infuscated at the base above; all legs brown, tarsi a little lighter, I and IV especially so, with an orange tinge; all spines reddish brown.

Dentition. — Dorsal jaw with 3 well formed teeth, the second longest, the basal rather low and subtuberculiform, Fig. 7*a*. Ventral jaw without teeth, more or less as in *nigrolunatus* Kraepelin, one angular prominence anteriorly, the cutting edge fairly straight posterior to this and near the base a pointed tubercle which is not however distinctly dentiform, Fig. 7*d*. Outer surface of ventral jaw with fairly small close granules as in Roewers' fig. 241*a* of *nigrolunatus* except that his figure shows the *inner* surface. Seen from above, Fig. 7*c*, dorsal jaw at its apex as in *nigrolunatus* (fig. 241 *a*2, *loc. cit.)* and *swarti,* the inner process however not so large.

Flagellum as in Figs. 7*a*, 7*e* seen from inner and outer sides, in general resembling *lanatus* C. L. Koch and *swarti* Lawrence in having the basal half expanded and lamelliform but much more strongly so than in either of these species.

Setation resembling that of *swarti* in general; stridulatory organ with about 15 short weak lamelliform ridges, 3 or 4 more incomplete ones between them, the whole organ much longer (vertically) than wide horizontally. Both surfaces of dorsal jaw and inner surface of ventral jaw in basal half, thickly covered with long fine silky setae, obscuring the dentition.

Dimensions: Length of chelicerae (non in situ) 8; greatest width of headplate 8; length of abdomen 11.5; pedipalp 11.5; total length 21.3 mm.

The species agrees with *swarti* in the colouring of the trunk (but not of the appendages); in shape of ventral jaw it resembles *nigrolunatus* rather than the other species; the flagellum is like that of *swarti* and *lanatus* differing in detail from both of them. In the dentition of the dorsal jaw it resembles the females of *lanatus* Koch and *fodiens* Simon, with more strongly developed teeth than the males of most of the other species.

Order *Scorpiones*

OPISTHOPHTHALMUS CHRYSITES sp.n.

Fig. 6 *(b, c)*

Types, 1 ♂, 1 ♀, 30 miles N.W. of Ouhandjo, Kaokoveld, South West Africa, collected by W. D. Haacke, May, 1966.

A species of *Opisthophthalmus* C. L. Koch, belonging to the *wahlbergi* group in Hewitt's section (2), and probably most nearly related to *wahlbergi* Thorell.

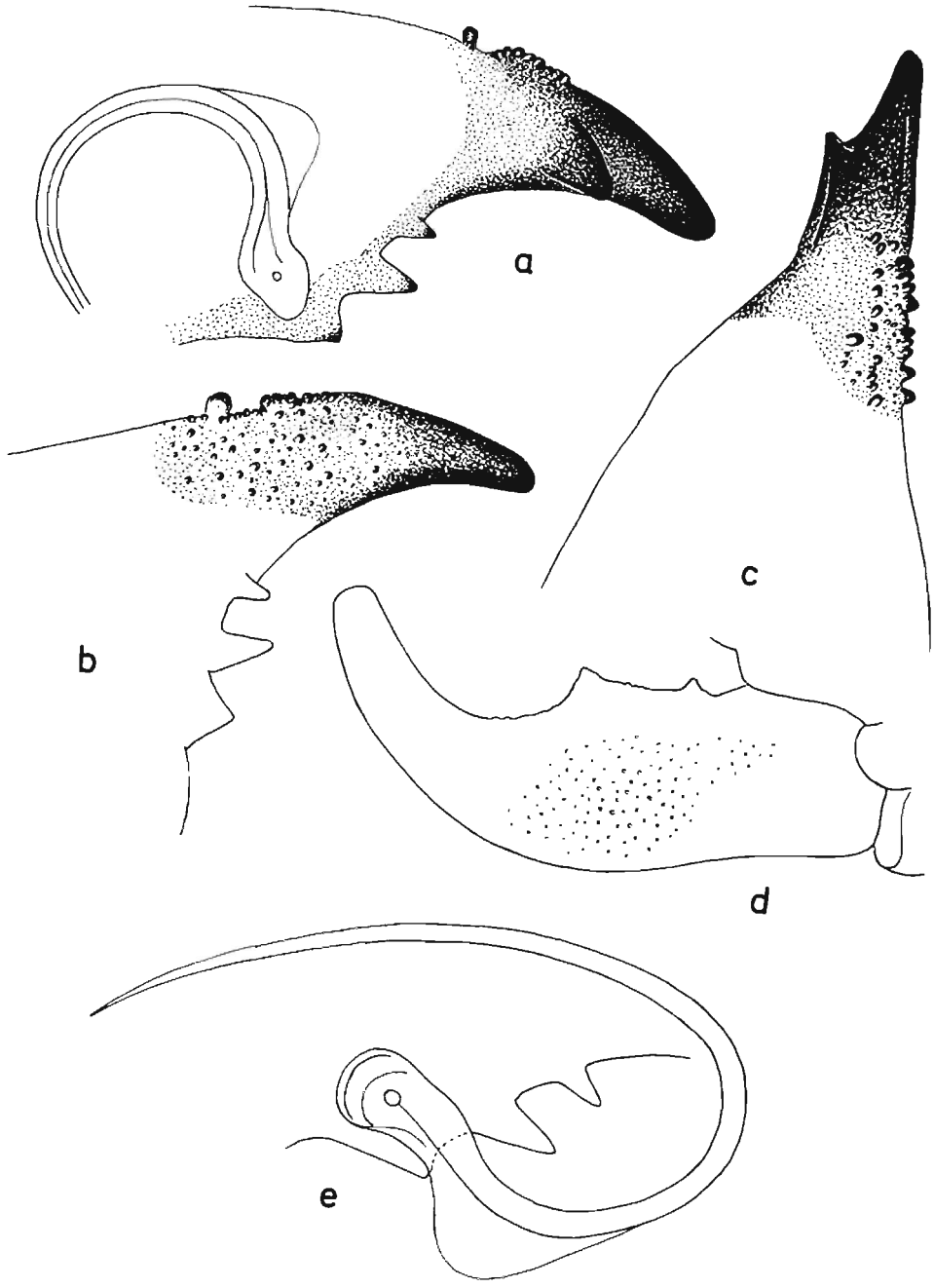

Fig. 7. *Hexisopus fumosus* sp.n. ♂. *a*, dorsal jaw and flagellum, inner view; *b*, apex of dorsal jaw, outer view; *c*, the same from above; *d*, ventral jaw, outer view; *e*, flagellum enlarged, inner view.

Male:

Colour. — Appendages and tail golden yellow, carapace similar but with a faint greenish tinge, tergites light olive green, sternites a little lighter.

Carapace. — Median eyes almost in the middle, a little nearer to posterior than to anterior margin; carapace a little longer than wide, the granules at sides and posterior to ocular tubercle moderately large, round, evenly distributed; interocular area shiny, almost entirely smooth, with a few minute scattered granules but more numerous just in front of ocular tubercle; anteriorly the median groove very weak, with no trace of a fork.

Abdomen. — Tergites shagreened, with fine regular dust-like granulation, V with enlarged granules laterally and posteriorly, an indistinct keel on each side composed of 5—6 granules; sternites smooth except for fine granules along their lateral margins, IV and V with some fairly distinct transverse, shallow, wavy grooves, the anterior sternites with only faint indications of these.

Cauda long and slender, especially segment V seen from the side; inferior surface of I and II smooth, III with faint indications of inferior keels which are distinct and granular in IV; I inferiorly with transverse grooves similar to those of sternite V; superior keels distinct but not strong, no enlarged posterior tooth, V with distinct superior and inferior keels, the superior much weaker in distal than in proximal half, the surfaces between them smooth (superior), almost smooth (lateral) or with irregular, fairly coarse scattered granules (inferior surface); infero-posterior edge with a collar-like transverse row of 11 small blunt equal sized granules; vesicle long, the bulb wider than segment V, with rather numerous long setae and a few weak low granules; aculeus long and slender.

Legs. — Neither tarsus III or IV with outer spines, inner surface with 4, lobes with 3 outer, 5 inner spines.

Pectines with the scape sharply angular at the base, a little more than 90°, toothed along its whole length, Fig. 6*c*; 21—23 teeth.

Pedipalp upper surface of humerus with a cluster of about 30 round granules in the middle, smooth at both ends; upper surface of hand almost flat forming a little more than a right angle with the outer surface, both surfaces thickly and uniformly covered with rather small sharp granules, not tubercles, some minute scattered ones amongst them; inner edge with a serrate row of larger projecting granules, finger keel well defined and strongly raised, with smooth granules in basal half; hand parallel sided, distinctly longer than wide, handback about 1⅓ as long as width of hand, movable finger 1⅓—1½ as long as handback.

Dimensions: Length of carapace 11.2, greatest width 10; handback 7.8, width of hand 5.8; tail 46, total length 78 mm.

Female:

Colour as in ♂, granulation of carapace at back and sides irregular, much weaker than that of ♂, composed of small granules intermingled with dust like granulation, interocular area completely smooth and shiny; tergites quite smooth, shiny, not shagreened except V which has minute dust-like lateral granulation; all sternites quite smooth, shiny; inferior surface of caudal segments I—III quite smooth and shiny, IV with indications of weak inferior keels; superior keels very weak, represented by rows of minute weak granules, those of V obsolete, consisting of an indistinct row of minute granules but inferior surface with 3 distinct granular keels, some dust-like granulation between them; granulation of inferior surface of vesicle, though stronger than in the ♂, still weak, with long scattered setae much sparser than in the ♂.

Legs. — Lobes of tarsus IV with 3 spines on each side, inner surface with 4 spines, outer with 0.

Pectines. — Almost half of the scape (basal portion) toothless, Fig. 6*b*; pectinal teeth 12—12.

Pedipalps. — Upper surface of hand weakly but distinctly rounded, not flat, the granules weaker than in the ♂, less regular, not so sharp, tending to be more tuberculiform and confluent, the whole surface nevertheless distinctly and completely covered with granules; upper and outer surfaces forming a more obtuse angle than in the ♂, finger keel strong but less raised; length of handback distinctly greater than its width, but only a little less than the movable finger.

Dimensions: Length of carapace 10.6, width 9.5; handback 7.5, width of hand 6; tail 37, total length 67 mm.

Additional material. — 1 ♀, Okotusu area, N.W. dunefield, South West Africa, with 10—11 pectinal teeth, the upper surface of hand a little less strongly granular but in all other respects identical with the type; total length 65 mm. 1 subadult individual from the same locality as the type, with 11 pectinal teeth; all collected by W. D. Haacke, May, 1966.

The species differs from typical *wahlbergi,* in its smaller size, smaller number of pectinal teeth,

grooved sternites of the ♂, granular upper surface of the hand in both sexes and a number of other details. It is probably nearest to Monard's *O. lundensis* (1937) as it differs from *wahlbergi* in the same characters, e.g. the number of pectinal teeth, as does this species. It can be distinguished from *lundensis* especially in the structure of the male, which is however not fully described. Monard however states that the sternites in both sexes are quite smooth which is not the case in *O. chrysites*, while the granules of the upper surface of the hand are arranged in "lignes reticulées". The colouring also appears to be somewhat different.

OPISTHOPHTHALMUS WAHLBERGI Thorell.

A single full grown male (total length 105 mm.) from Twee Rivieren, Kalahari (National Gemsbok Park), collected by C. Coetzee, Jan., 1966.

The specimen agrees fairly well with the description of typical *wahlbergi* except that the last sternite, though otherwise quite smooth and shiny, has a few indistinct transverse ripple-like wrinkles, especially in the posterior half; pectinal teeth 28—28.

It does not seem to be excessively hairy as claimed for this species by Hewitt (1935, p. 471). The specimen does not agree well with Penther's description of *O. betschuanicus* (1900, p. 160) which seems to have been based on an immature ♀. Hewitt's surmise that *betschuanicus* is a subspecies of *glabrifrons* is I think mistaken; it is much more closely related to *wahlbergi* as stated by the author and may be a subspecies of this form which seems to have produced quite a number of subspecific variations.

OPISTHOPHTHALMUS FLAVESCENS Purcell.

One adult ♀ collected by Dr. C. Koch on the sand dunes at Gobabeb.

This little known and peculiar species was first described by Purcell in 1898 from Walvis Bay. The eyes are unusually far back on the carapace, twice as far from its anterior as from its posterior margin. The superior terminal process on the posterior tarsi of legs is very thick and the claws are peculiar in being of different lengths and, unlike those of most species, long and almost straight, resembling in this respect *O. adustus longiceps* Lawrence from Orangemund. The peculiar claw character at least must I think be attributed to an existence on sand.

Other recently recorded localities for the species are: Rooibank on the Kuiseb river; 9 miles N. of the Ugab river; an undefined locality E. of Luderitz.

Order *Amblypygi*

Subfamily PHRYNINAE

Genus HEMIPHRYNUS Pocock

Hemiphrynus Pocock, 1902, *Ann. Mag. Nat. Hist.* (7) LX, p. 161.

HEMIPHRYNUS MACHADOI Fage

H. machadoi Fage, 1951, *Publ. Cult. Compan. Diam. Angola*, Sep. N. 13, p. 13, fig. 5.

Figs. 6 *(d, e)* and 8 *(b)*

One almost mature ♂, Otjinunga, N.W. Kaokoveld, South West Africa, collected by W. D. Haacke, 9-V-1966. Specimen in the collection of the Transvaal Museum.

This species is recorded for the first time from Southern Africa.

Colour. — Carapace dark brown, pedipalps except tarsus blackish brown, pedipalp tarsus and chelicerae reddish, abdomen above brown with olive green tinge, legs similar, I with reddish tinge.

Carapace with small granules evenly distributed over whole surface except interocular areas, much fewer, smaller and more widely separated than those of pedipalp; anterior margin quite smooth, granules only present at antero-lateral angles and in a row along the lateral margins, disappearing behind the level of the lateral eye tubercles, these granules distinct and pointed. Median tubercle separated by less than $\frac{1}{3}$ its diameter, lateral ones by distinctly more than their diameter, from edge of the carapace.

Pedipalps covered by small round granules, not dense but very regularly spaced, similar to but larger than those of the carapace. Tibia distinctly exceeding length of carapace, a little shorter than width of carapace which is equal to tibia and $^1/_7$ tarsus, its antero-superior edge with 9 spines, the fourth from proximal and fourth from distal ends longest, about equal to height of segment, the spine between them next longest, on each side of it a small spine; at distal apex 3 short spines, the middle largest. Inferior edge with 5 spines, the third from base longest, between the main spines a comb-like row of short pointed spines.

Femur with six small to moderate spines on its dorsal edge, the second and fourth moderately long but shorter than those of ventral row; ventral edge with 4 or 5 spines, only the first and third long, a little less than height of segment, the first longer than third, between these 13—15 much shorter triangular pointed spines.

Tarsus (basitarsus) above with a row of 5 spines almost exactly as in Pocock's figure 1*a* of *Tarantula laevifrons* (1894, pl. VII), the second from the base much the longest, Fig. 6*e*; ventral edge with 1 long basal spine, followed by 3 much shorter ones, the distal more than twice as long as the two proximal ones. Trochanter with 5 spines ventrally, 4 very small, 1 moderate and much shorter than height of segment.

Chelicera smooth, shiny, with 5—6 long black setae above.

Legs. — Femora with similar granules to those of the pedipalp, very regular and of equal density; otherwise as in Fage's description of *H. machadoi* but tibia IV with the middle section only two-thirds the length of the distal one.

Abdomen dorsally with a very few widely spaced granules of the same size as those of the legs; between them a shagreen of very fine microscopic granules. Genital segment and genitalia as in Fig. 6*d*.

Dimensions: Total length 21.2; length of carapace 7.5, width 9.3; length of abdomen 12.3, width 7.5; femur, tibia and tarsus (including claw) of pedipalp 8, 8.4 and 6.7 mm. respectively; leg I 112 mm.

This form differs from Fage's description of *H. machadoi* in the following particulars:

(a) Tibia distinctly longer than carapace; width of carapace only slightly exceeding length of tibia.

(b) Lateral eyes further from edge of carapace.

(c) Spines of pedipalp in general more numerous and relatively shorter.

(d) Middle section of tibia two-thirds length of the distal one.

Nevertheless I think that all these differences, as well as some other minor details, may well be the result of the different stages of maturity of the two specimens, the South West African being more than twice the size of the obviously immature Angolan form; geographically the two individuals are not widely separated and appear to have a very similar ecological background.

The granulation of *H. machadoi* is much weaker and the abdomen relatively longer than in any other Southern African Amblypyge; modified leaf-like setae are absent from the tarsal segments of the first leg.

The species agrees fairly well with Pocock's description of the genotype, *Tarantula laevifrons* (1894, p. 279) from Central America but there are, as enumerated by Fage (1951, p. 16), some decided differences. It is difficult however to assess the importance of these characters without studying the various New World species. If it should be necessary to erect a new genus for the African forms, as Fage seemed to believe, I propose the name *Afrophrynus* for the species *H. machadoi* Fage.

Subfamily PHRYNICHINAE

PHRYNICHUS SCULLYI Purcell

P. scullyi Purcell, 1901, *Ann. S. Afr. Mus.* 2, p. 206

Fig. 8 *(c)*

1 ♀?, 60 miles W. of Aus, South West Africa, collected by F. Gaerdes, May, 1964.

Dimensions: Total length 18.5; length of carapace 8, width 10.7; length of pedipalp femur 12.4; of pedipalp tibia 13; leg I 108 mm.

Fage (1951, 1954) accommodates the African members of this subfamily in two genera, *Myodalis* Simon and *Phrynichus* Karsch, using the latter name instead of *Tarantula* as employed by Simon (1936). *Phrynichus scullyi* seems to be generically distinct from both *Phrynichus* and *Myodalis* in the 3 large subequal spines directed forwards and inwards at the superior apex of pedipalp-tibia. Although it also differs from *Phrynichus* in lacking the row of modified stridulating bristles on the inner surface of chelicera, as illustrated by Whittick (1940, pp. 267, 370, figs 1—3), it seems best to leave it for the present in this genus.

In his paper of 1951 Fage suggests that *P. scullyi* may be synonymous with *Myodalis scabra* (Gervais) but this seems to be contradicted by his figures 2 and 3 on opposite pages (12 and 13) of the tibia-tarsus of the two species, where the differences are greater than the resemblances. Most unfortunately Purcell's types are lost so that Fage was unable to compare them with his Angolan material of *M. scabra* but the specimen from Aus agrees very well in the spination of the pedipalp-tibia as shown in my drawing of Purcell's type (Lawrence 1949, Fig. 2*b*) and reproduced by Fage (1951, p. 13, fig 3). I am of the opinion that *scullyi* is quite distinct from *scabra* which, according to Fage (1961, p. 11), is synonymous with *deflersi* (Simon); it is not in the least like *M. jayakari* (Pocock) according to the author's figures of the pedipalps (1894, pl. VIII, fig. 3); this is also in accord with the geographical distribution of these species. Fage in a later paper (1954, p. 180) regards *jayakari* and *scabra* as

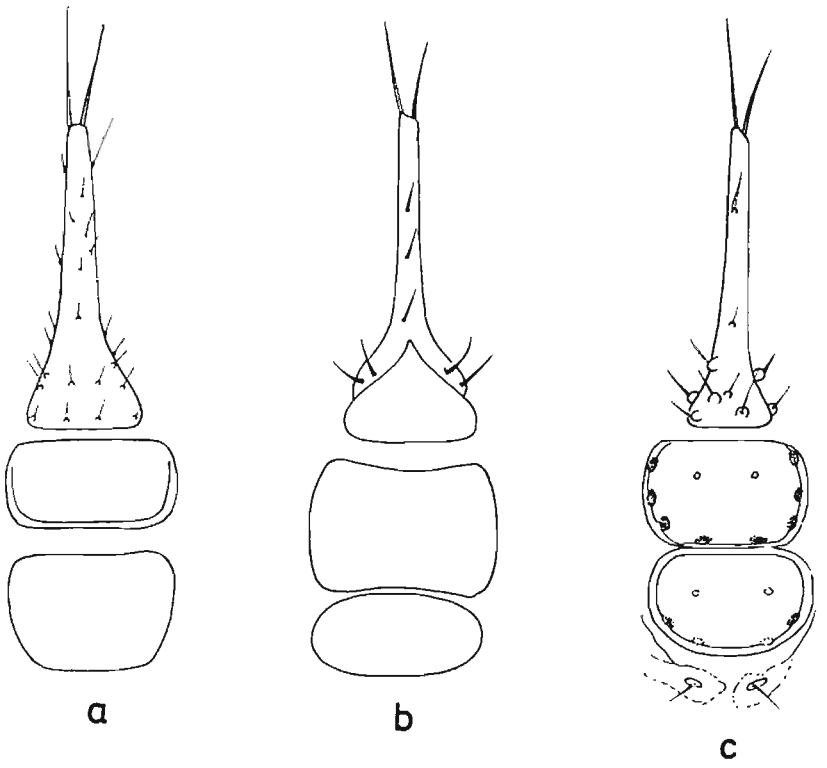

Fig. 8. The sternum of the three Amblypyge genera of Southern Africa; *a*, *Damon variegatus; b, Hemiphrynus machadoi; c, Phrynichus scullyi.*

distinct species while *scullyi* is also treated as a species of *Myodalis,* "perhaps the same as *scabra*", *M. deflersi* being taken to be merely a form of *scabra* and little different from it.

It appears to the writer that the distribution of a number of African Phrynichinae have still to be precisely defined. Unless they can be accounted for by artificial introductions the appearance of *Phrynichus bacillifer* in both Angola and Madagascar, *Myodalis scabra* in the Seychelles and Angola, seems dubious and unlike the distribution of other Arachnid orders, such as for instance the scorpions.

STERNAL DIFFERENCES IN THE THREE SPECIES OF AMBLYPYGI KNOWN FROM SOUTHERN AFRICA

As can be readily seen from figure 8, the structure of the sternum differs perceptibly in the three genera and species of South African Amblypygi; the tritosternum of *Damon* and *Phrynicus* is provided with setae springing from round tubercles which are very large and conspicuous in *Phrynichus scullyi* Purcell, resembling in this respect Millot's fig. 319A of *Charinus milloti* (1949, p. 564); the structure in *Hemiphrynus machadoi* Fage differs from the other two in consisting of two sections, a short triangular basal one and an elongate distal one which is as usual subparellel, Fig. 8*b*; it is quite free of round tubercles but near the base of the distal portion there are 4 very distinct, symmetrically arranged setae. The tetrasternum and pentasternum, middle sclerites of the sternal complex, are in all three genera wider than long, the pentasternum being more strongly so in *Hemiphrynus* and *Phrynichus* than in *Damon* and transversely oval in shape while that of *Damon* is obtusely quadratiform. The sternum of *Hemiphrynus machadoi* thus differs completely from that of *H. atzecas (sic. = H. aztecus* (Pocock)) as depicted in Millot's fig. 319 *B* (*loc. cit.* p. 564) where the two scerites behind the tritosternum are greatly reduced in size and a little longer than wide instead of transversely oval. The sternum of *Phrynichus scullyi* is peculiar and differs from the other two species not only in the numerous coarse tubercules at the base of the tritosternum but in having the

other two plates with conspicuous sockets of setae which show up as symmetrically arranged darker oval spots, Fig. 8*c*; posterior to the pentasternum there are two more setae each situated in the middle of a very weakly chitinised, more or less oval scute (the rudiments of the metasternum?).

The tetrasternal and pentasternal sclerites are very weakly chitinised in *H. machadoi*, perhaps indicative of immaturity, while these structures are clearly defined and well chitinised in the other two species; the surface of the tetrasternum of *Damon variegatus* is slightly but quite perceptibly concave, with a raised and thickened marginal rim posteriorly, Fig. 8*a*.

References

Fage, L. 1951. Pedipalpes (Amblypyges) récoltés en Angola par M. A. de Barros Machado. Separ. N. 13, *Publ. Cult. Compan. Diam. Angola.*

— 1954. Remarques sur la distribution géographique des Pedipalpes Amblypyges Africains, accompagnées de la description d'une espèce nouvelle de Madagascar: *Charinus madagascariensis* nov. sp. *Ann. Mus. Congo Tervuren, Zool.* **I**, 180—184.

Hewitt, J. 1934. On several Solifuges, Scorpions and a trap-door spider from South West Africa. *Ann. Transv. Mus.* **15**, 401—402.

— 1935. The trap-door spiders, Scorpions and Solifuges. Sci. Res. Vernay-Lang Kalahari Exped. March—September 1930. *Ann. Transv. Mus.* **16**, 459—479.

Lawrence, R. F. 1929. New South African Solifugae. *Ann. S. Afr. Mus.* **29**, 153—179.

— 1949. Notes on the whip-scorpions (Pedipalpi) of South Africa. *Trans. R. Soc. S. Afr.* **32**, 1—11.

— 1962. Solifuges, Scorpions and Chilopoda of the Namib desert. *Ann. Transv. Mus.* **24** (2, 3), 213—222.

— 1963. The Solifugae of South West Africa. *Cimbebasia*. N. 8. Dec. 1963.

— 1966. New and little known Scorpions and Solifuges from the Namib desert and South West *Africa. Sci. Pap. Namib Desert Res. St*, N. **29**, 1—11.

— 1968. A contribution to the Solifugid fauna of Southern Africa. *Ann. Transv. Mus.* (in press).

Millot, J. 1949. Amblypygi, in P-P. Grasset, *Traité de Zoologie*, **VI**, 563—588.

Monard, A. 1937. Scorpions, Solifuges et Opiliones d'Angola. *Rev. Suisse Zool.* **44**, 251—270.

Penther, A. 1900. Zur Kenntnis der Arachniden Fauna Südafrikas *(Scorpions). Ann. K.K. Naturhist. Hofmus. Wien*, **15**, 153—162.

Pocock, R. I. 1894. Notes on the Pedipalpi of the family Tarantulidae contained in the collection of the British Museum. *Ann. Mag. Nat. Hist.* (6), **14**, 273—298.

— 1902. A contribution to the systematics of the Pedipalpi. *Ann. Mag. Nat. Hist.* (7), **9**, 157—185.

Purcell, W. F. 1899. New or little known Solifugae in the collection of the South African Museum. *Ann. S. Afr. Mus.* **1**, 381—432.

— 1901. On some South African Arachnids belonging to the orders Scorpions, Pedipalpi and Solifugae. *Ann. S. Afr. Mus.* **2**, 206.

Roewer, C. F. 1934. Solifugae, Palpigradi. in *Bronn's Klass. u. Ordn. d. Tierreichs*. Bd. 5, Abt. IV, Buch 4.

— 1941. Solifugen 1934—1940, in *Veröff. Deutsch. Kolon. Übersee Mus.* **3**, 97—192.

Simon, E. 1936. Fage, L. and Simon, E. Pedipalpi, Scorpiones Solifugae et Araneae de la Mission Scientifique de l'Omo. *Mem. Mus. Nat. Hist. Nat.* **IV**, 239—340.

Whittick, R. J. 1940. On some African specimens of *Phrynichus* Karsch. *Ann. Mag. Nat. Hist. (11)* **6**, 366—377.