Hemispermatophore: As in Fig. 340. Differing diagnostically from its sister species *L. elegans* in the shape and size of distal lamina, hook notch and distal crest of distal lamina. In addition the following percentages are diagnostic for this new species:

1. ha → w distance × 100/dcr → w distance = 41,1%
2. ha → bsh distance × 100/ha → w distance = 50,0%
3. ha → bsh distance × 100/dcr → bsh distance = 28,0%

Variation: Sexual dimorphism: The only adult male differs from the only adult female in the following characters: ♂ proportionally smaller with carapace length 1,7 mm in ♂ and 1,9 mm in ♀; Pedipalp handback more globose, subcircular in cross-section in ♂, suboval in ♀; ♂ pedipalp handback shorter with length movable finger/handback length ratio 0,96 in ♂, 0,81 in ♀; ♂ carapace and tergites finely shagreened and matt, in ♀ these smooth and shiny; ♂ with 19–20 and ♀ 21 teeth per pecten.
Intraspecific variation: No distinctive variation in the type series.

Measurements: Measurements not otherwise obtainable from figures of holotype, as following in mm: maximum heights cauda I 1,7, cauda II–V 1,6. Total body length of holotype ♂ 2,7 cm, of adult paratype ♀ 3,2 cm.

Type material: Holotype and paratypes in Natal Museum. One paratype ♂ in State Museum, Windhoek.

Material examined: Holotype ♂ (NM 10697), 1 subad ♂ and 2 juv ♂ paratypes (NM 11110) all from Elandshoek farm 771, Otavi Highlands, 8 Mar 1969, B. Lamoral. The following paratypes: 1 subad ♂, Kempten (Höhle) ges. im Lehm Canon, 6 Aug 1977, P. von Wrede (NM 11390); 1 subad ♀, Märchenhöhle, farm Uisib 427, 13 Feb 1977, P. von Wrede (NM 11388); 1 ♀, Märchenhöhle, farm Uisib 427, 7 Aug 1977, P. von Wrede (NM 11389).

Distribution: Otavi Highlands in Tsumeb and Grootfontein Districts.

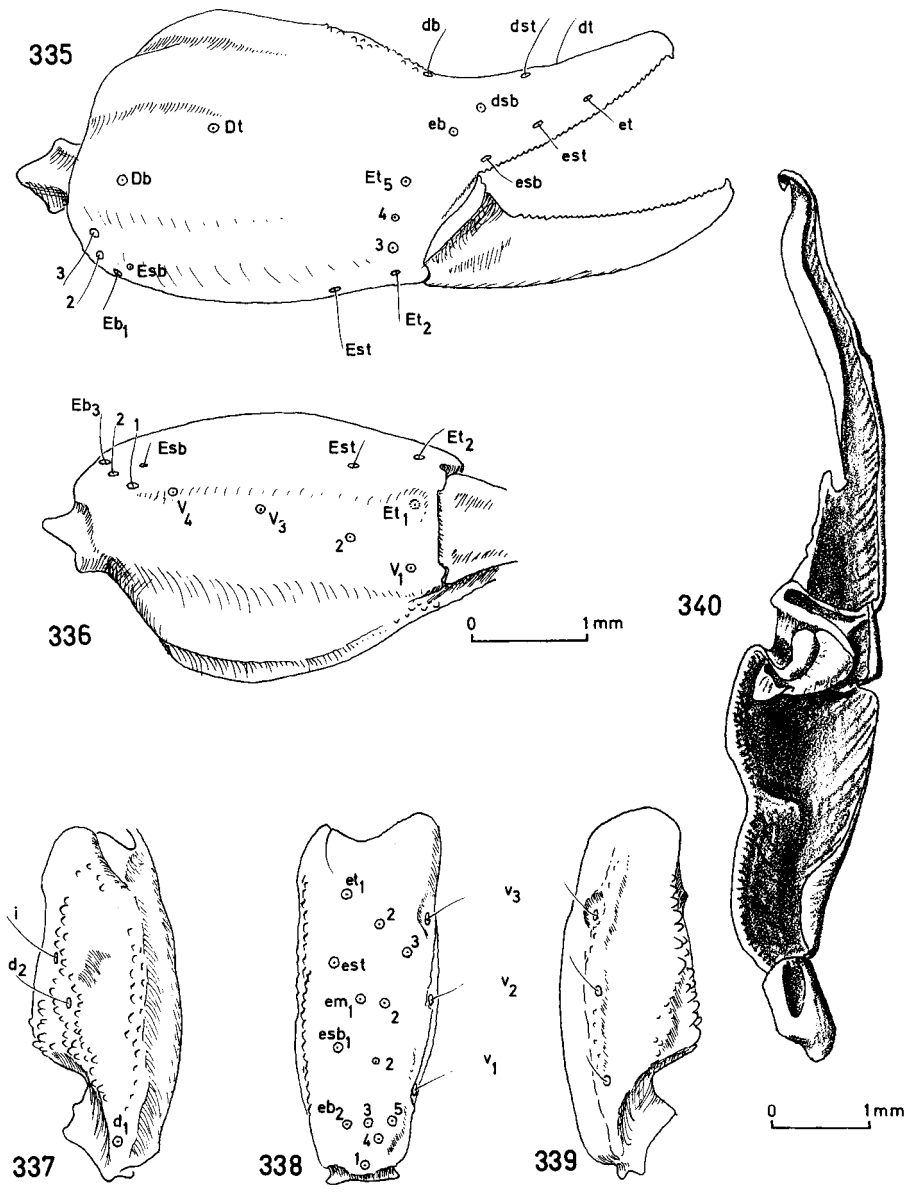
Bionomics: The types from Elandshoek farm were all found in burrows deep under the under surface of large boulders half imbedded in hard, slightly damp soil on south-facing hills supporting a fairly dense mixed Mopane/Acacia forest in an area of vegetation type 6 (Fig. 4). No specimens could be found from the south-facing hills supporting a less dense vegetation. All the other types were found in caves and *L. josehermana* is thus undoubtedly an endogean species occupying a euedaphic habitat.

Subfamily Scorpioninae Pocock, 1893

Genus *Opisthophthalmus* C. L. Koch, 1837

Opisthophthalmus C. L. Koch, 1837: 89.
Protophthalmus Lawrence, 1969: 105–106; see Newlands, 1972*b*: 241
Type species: *Scorpio capensis* Herbst, 1800, by original designation.

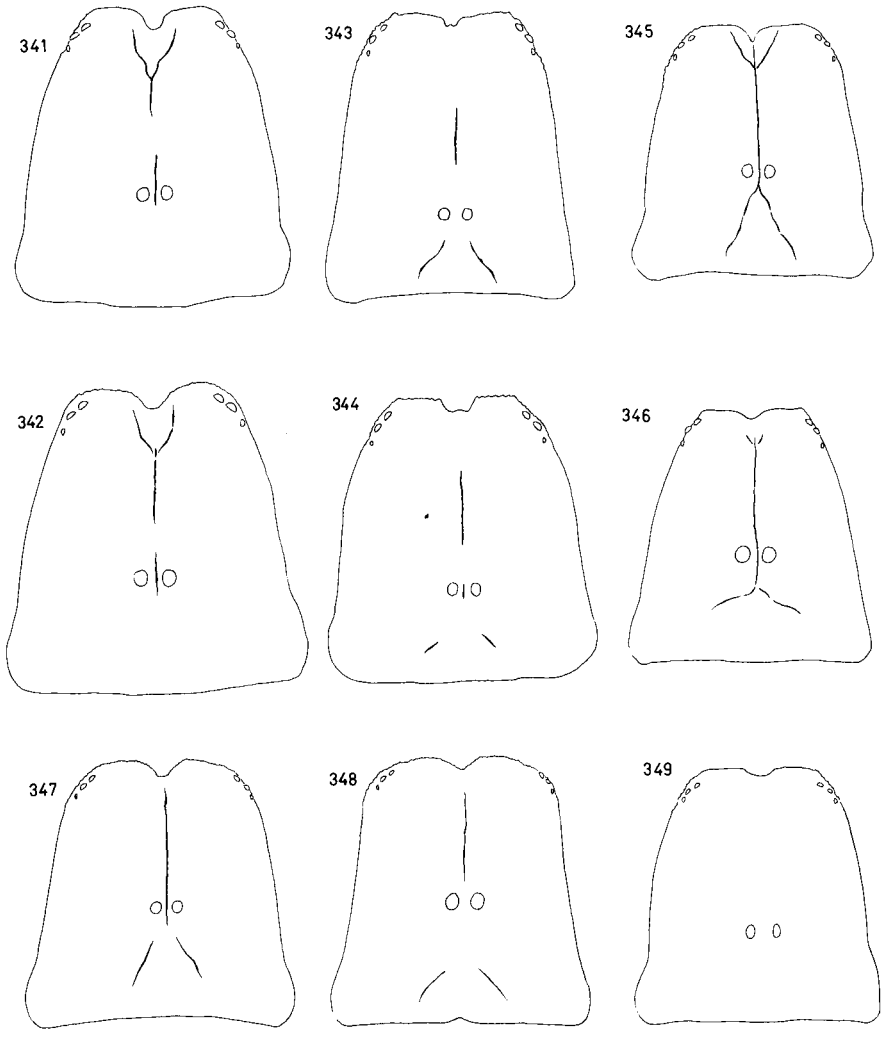
Diagnosis: Opisthophthalmus is most closely related to the genus *Scorpio* Linnaeus, 1758 but can be separated from it and other genera of the subfamily by the following combination of characters: chelicerae handback with stridulatory setae on inner surface; sternite VII without distinct and well-developed longi-



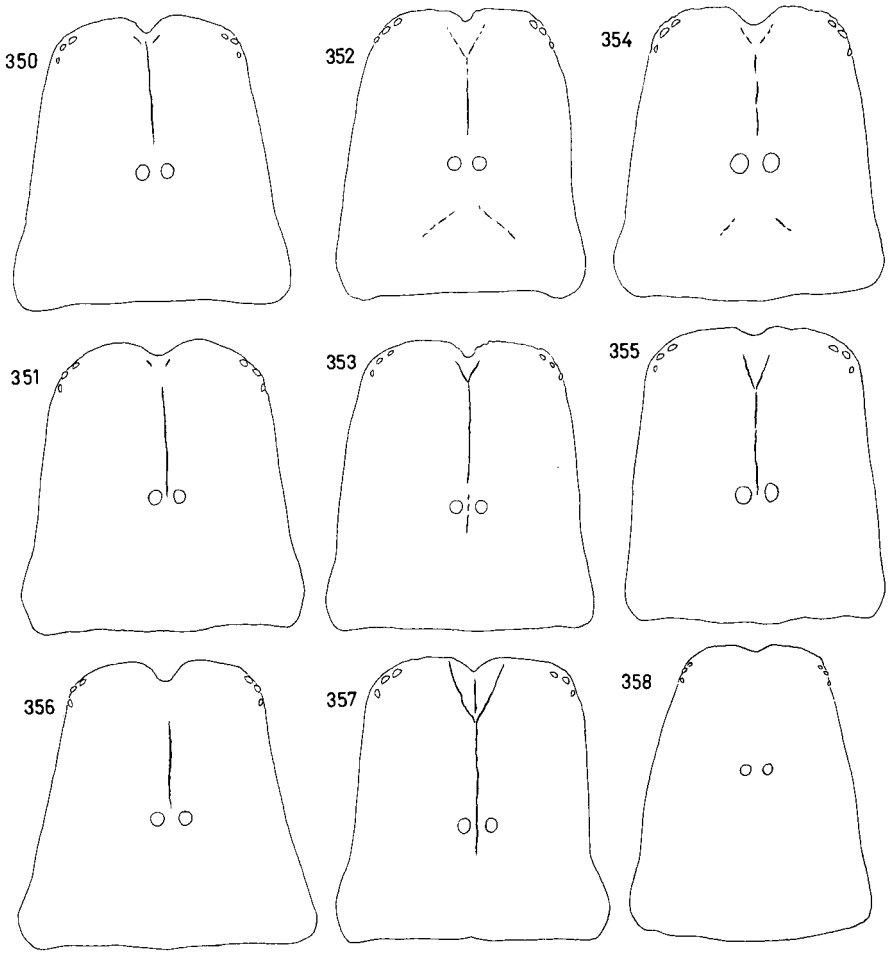
Figs 335–340. *Lisposoma josehermana* sp. n., ♂ holotype (NM 10697). 335–336, right hand; 335, outer aspect; 336, ventral aspect; 337–339, right pedipalp tibia; 337, dorsal aspect; 338, outer aspect; 339, ventral aspect; 340, right hemispermatophore, ventral aspect. *Scales*: 335–339, middle; 340, lower right.

tudinal keels; pedipalp tibia with 2 dorsal, 1 internal, at least 14 external and at least 3 ventral τ; in the majority of species males have a greater number of pectinal teeth than females.

Distribution: Southern Africa and southern East Africa.



Figs 341–349. *Opisthophthalmus* species, outlines of carapaces showing positions of median and lateral eyes and sutures in ♀. 341, *O. brevicauda*; 342, *O. ugabensis*; 343, *O. gigas*; 344, *O. haackei*; 345, *O. carinatus*; 346, *O. litoralis*; 347, *O. opinatus*; 348, *O. coetzeei* sp. n.; 349, *O. flavescens*. All drawn to approximately the same size to facilitate comparison.

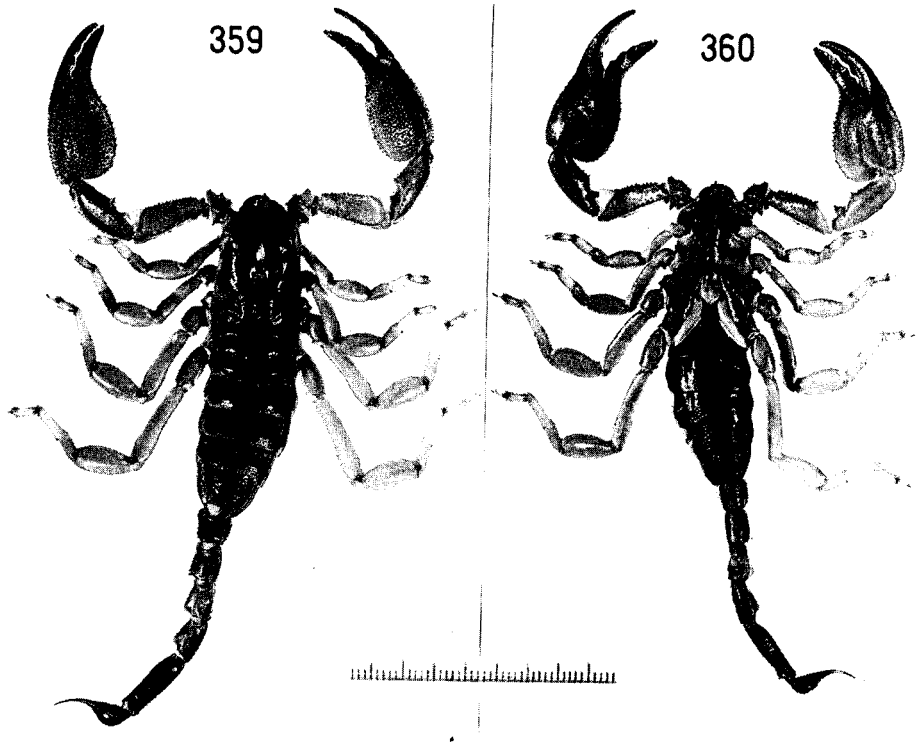


Figs 350–358. *Opisthophthalmus* species, outlines of carapaces showing positions of median and lateral eyes and sutures (when present) in ♀. 350, *O. intercedens*; 351, *O. fitzsimonsi*; 352, *O. adustus*; 353, *O. schultzei*; 354, *O. cavimanus*; 355, *O. lornae* sp. n. (♂); 356, *O. gibbericauda* sp. n.; 357, *O. setifrons*; 358, *O. holmi*. All drawn to approximately the same size to facilitate comparison.

Opisthophthalmus adustus Kraepelin, 1908. Figs 352, 359–368, 388

Opisthophthalmus adustus Kraepelin, 1908: 260–261.
Opisthophthalmus longiceps Lawrence, 1946: 401–403. **Syn. n.**

Diagnosis: O. adustus is most closely related to *O. schultzei* but can be separated from it and other species of the genus on the following combination of characters: Carapace, Fig. 352: anterior median furrow with a poorly developed bifurcating longitudinal suture; median ocular furrow with an obsolete longitudinal suture. Colour: coxal endites I and II melanous; telson vesicle, cauda IV & V and occasionally parts of III melanous to infuscated. Pedipalp chela: upper and



Figs 359–360. *Opisthophthalmus adustus*, ♀ (NM 10654). Scale in mm.

outer surfaces in ♂ and ♀ with flattened to coarse tubercules which occasionally anastomose. Ventral surface of telson vesicle smooth. Greatest body length of adult ♂ 11 cm of adult ♀ 10 cm.

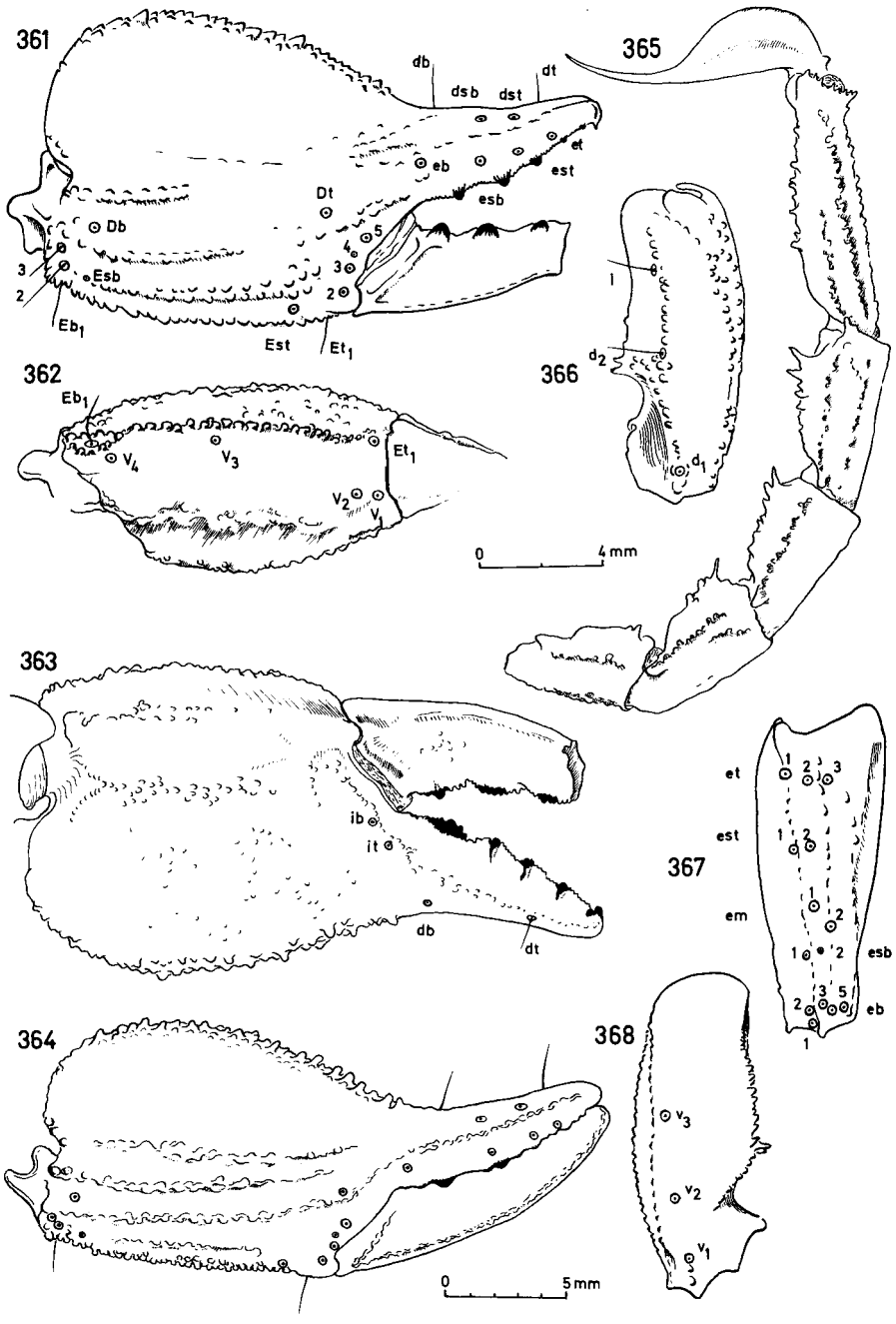
Description: The following account supplements Kraepelin's original description, Lawrence's (1946: 401–403) description of *O. longiceps* and Table 6.

Granulation: General granulation of body and appendages coarser and more pronounced in ♂ than ♀, particularly on tergites, inner surfaces of pedipalp hand and tibia, dorsal and ventral surfaces of leg patella, sternites and ventral surface of cauda I.

Colour: See diagnosis. In addition, with following patterns (Fig. 359): carapace with a subtriangular blackish marking extending from anterior margin and tapering posteriorly to a little beyond the median eyes, this marking occasionally but rarely missing or faint as in Kraepelin's types; anterior two-thirds of tergites I–VII melanous; cauda III occasionally partly infuscated to melanous.

Pedipalps: Chela, Figs 361–364: finger keel moderately developed in ♂ and ♀; secondary and accessory keels of upper and outer surfaces as in Figs 361 & 364, subject to individual variation; movable finger length/handback length ratio 1,10 (1,05–1,16) in adult ♂ and ♀. Tibia and femur as in Figs 366–368.

Carapace: Median eyes almost halfway between anterior and posterior margins,



Figs 361–368. *Opisthophthalmus adustus*. 361–363, ♀ lectotype, right hand; 361, outer aspect; 362, ventral aspect; 363, inner aspect; 364–365, ♂ paralectotype; 364, right hand, outer aspect; 365, cauda, left lateral aspect; 366–368, ♀ lectotype, right pedipalp tibia; 366, dorsal aspect; 367, outer aspect; 368, ventral aspect. *Scales:* 361, 366–368, top; 362–365, lower.

with lc/x ratio 1,80 (1,75–1,95) for ♂ and ♀. Interocular area smooth except anterior third with a few (20–30) widely separated granules.

Cauda: See Fig. 365. In adult ♂ and ♀: cauda I, ventral surface weakly tubercular, ventral and ventro-lateral keels absent; cauda II–III smooth and shiny, ventral and ventro-lateral keels absent; cauda IV smooth and shiny, ventral and ventro-lateral keels absent in ♀, obsolete to weak in ♂; cauda II–IV, dorsal keels well-developed, posteriorly with 1–2 distinct, elongated and pointed spines; telson aculeus nearly straight, vesicle agranular, smooth and shiny.

Sternites: See Fig. 360. Sternites IV–VII in ♂ and VI–VII in ♀ with flattened, broad tubercules occasionally forming interrupted transverse ridges.

Legs: Leg I–IV: lateral claws distinctly elongated, equal or almost equal to telotarsus length, and almost straight.

Pectines: ♂ with 21–24 and ♀ 13–19 teeth per pecten.

Sternum: Subpentagonal in shape, with a deep, laterally compressed median furrow; length/width ratio 1,50 (1,47–1,54).

Trichobothria: As in Figs 361–364, 366–368. (+1) neobothriotaxic for Group C with 14 external τ on tibia. Chela: τ *dst* level with or more proximal than *est*; τEt_4 small and in line with *Et* series; distance $V_4 \rightarrow Et_1/V_3 \rightarrow Et_1$ ratio 1,65 (1,60–1,70) in ♀ and ♂. Tibia: τd_2 closer to *i* than d_1; τet_1, est_1 and esb_1 axis in line with eb_2.

Setation: Pedipalps, chelicerae, legs, cauda and telson with numerous long setae; lateral margins of all sternites with a row of setae; patella, tibia, basitarsus and telotarsus of legs I–II with a single longitudinal row of long stiff setae on anterior and posterior surfaces forming a regular brush-like structure undoubtedly associated with a psammophile habitat.

Hemispermatophore: As in Fig. 388, sub-apical, ventro-lateral margin of hook (salmh) shallowly concave, undulating and long, percentage ha → bsh distance of ha → w distance 53% (52–54%); hook apex situated almost halfway of total distal lamina (DL) length, percentage ha → w distance of dcr → w distance 41,5% (41,0–42,0%); hook notch V-shaped; distal crest (dcrml) of median lobe narrow (one-fifth of width of distal lamina at this level), not reaching the distal lamina (DL) lateral crest (lcr) ectally, but bending sharply medially to form the ectal crest (eccr) which is subparallel to the sagittal axis of the hemispermatophore.

Variation: Sexual dimorphism: In adults, males differ from females in the following characters: ♂ proportionately more slender with width sternite V/carapace length ratios 0,75 (0,70–0,80) in ♂ and 0,94 (0,90–1,00) in ♀; ♂ carapace 10% longer, cauda and telson 15% longer, pedipalp chela 13% longer; ♂ handback narrower with handback width/carapace length ratios 0,60(0,56–0,63) in ♂ and 0,75 (0,71–0,80) in ♀; genital operculum suboval, wider than long in ♂, subtriangular in ♀ with width equal to length; ♂ pectinal teeth twice as long as female; first proximal middle lamella of each pecten mesially angular in ♂, shallowly curved and devoid of teeth along proximal one-quarter of total pecten length in ♀; ♂ with 21–24 and ♀ 13–19 teeth per pecten.

Intraspecific variation: Shape, size and intensity of blackish marking on prosoma variable, markings occasionally, but rarely, missing or faint; size and density of

granules on outer and upper surfaces of pedipalp hand and prosoma are subject to variation within single populations. Males have 21–24 and females 13–19 teeth per pecten.

Measurements (in mm): For measurements of types, see Kraepelin 1908: 261; also see Lawrence 1946: 403. The following are measurements from the female and male homotypes (NM 10713). Male measurements in brackets after female's. Prosoma length 15,0 (16,8), posterior width 13,5 (14,3); length of handback 12,5 (13,6), of movable finger 14,4 (17,3), of hand 23,5 (27,5); handback width 11,1 (9,9); lengths of caudal segments I 5,5 (6,5), II 5,5 (6,5), III 5,8 (7,5), IV 6,6 (7,9), V 11,4 (12,9); widths of these segments 4,9 (5,8), 4,5 (5,5), 4,2 (5,2), 3,6 (4,6), 3,4 (3,6). Maximum recorded body length of adult ♂ 11 cm (carapace 1,8 cm), of adult ♀ 10 cm (carapace 1,6 cm).

Type material: Kraepelin's original description was based on 1 ♂ 1 ♀ syntypes. The ♀ is hereby selected as lectotype of *O. adustus* Kraepelin, 1908 and the ♂ as paralectotype. These types are deposited in the collection of the 'Zoologisches Institut und Zoologisches Museum Universität Hamburg', in Hamburg, Germany.

Homotypes: A ♂ and ♀ have been selected as homotypes and they are deposited in the Natal Museum collection (NM 10713).

Material examined: ♀ lectotype, ♂ paralectotype, Deutsch-Südwestafrika, Prof. Fulleborn (ZMH); *Opisthophthalmus longiceps* ♀ holotype, Oranjemund (TM 8628); 1 ♂ 1 ♀ (Homotypes), 28 km E of Rosh Pinah, 18 Feb 1973, B. Lamoral (NM 10713). 1 ♂ 1 ♀ 2 juv ♂, Namuskluft 88, East of Rosh Pinah, 13 Oct 1970, F. Burger (SMN 191); 3 ♂, Namuskluft 88, 10 km E of Rosh Pinah, 12 Oct 1970, P. Olivier (NM 10712); 1 ♂, Rosh Pinah Mine, Dec 1971, A. Maritz (TM 10536); 1 ♀, Rosh Pinah Mine, Jan 1972, A. Maritz (TM 10537); 1 ♀ Chamais Gate, June 1973, C. J. Coetzee (NM 10625); 1 ♂ 1 ♀, Namuskluft 88, 10 km S of Rosh Pinah, 11 Nov 1970, P. Buys (SMN 188); 2 ♂ 1 ♀ 2 ♂ 2 ♀ juv, Rosh Pinah near golf course, 16–19 Feb 1973, B. Lamoral (NM 10654); 3 ♂ 3 ♀ 1 ♂ 1 ♀ subad, Obib dunes, ± 16 miles W of Rosh Pinah, 17–19 Feb 1973, B. Lamoral (NM 10636); 1 ♀, Namuskluft 88, 11–13 Oct 1970 (SMN 200); 2 ♂ juv, Namuskluft, 10 km N Rosh Pinah, 10 Oct 1970, I. Mokgoabone (SMN 189); 1 ♂ juv, Obib dunes ± 12 miles W of Rosh Pinah, 18 Feb 1973, B. Lamoral (NM 10592); 1 ♀ juv, 15 km E Rosh Pinah 7 Oct 1970. P. J. Buys (SMN 195); 1 ♀ subad, Namuskluft 88, 10 km E Rosh Pinah, 9 Oct 1970, P. Buys (SMN 184); 1 ♂, Tsirub 13, 3 Mar 1976, B. Lamoral (NM 10721); 1 ♀, Gorrasis 99, 25 Jan 1974, State Museum staff (SMN 508); 1 ♂ & 1 ♀ subad, Tsirub 13, 3 Mar 1976, B. Lamoral (NM 10791); 1 subad ♂, Neuland 98, 4 Mar 1976, B. Lamoral (NM 10792); 1 ♀, Obib dunes, 18 Feb 1973, B. Lamoral (NM 11091); 1 ♂ 2 ♀ 11 ♂ & 2 ♀ juv, Kubub 15, 2 Mar 1976, B. Lamoral (NM 10725).

Distribution: O. adustus has so far been recorded only within the confines of vegetation area of type 3A (Fig. 4) and it has not been recorded at all south of the Orange River.

Bionomics: A psammophilous species which digs a deep (maximum depth recorded, 75 cm below ground surface) multi-directional burrow in sandy soils of

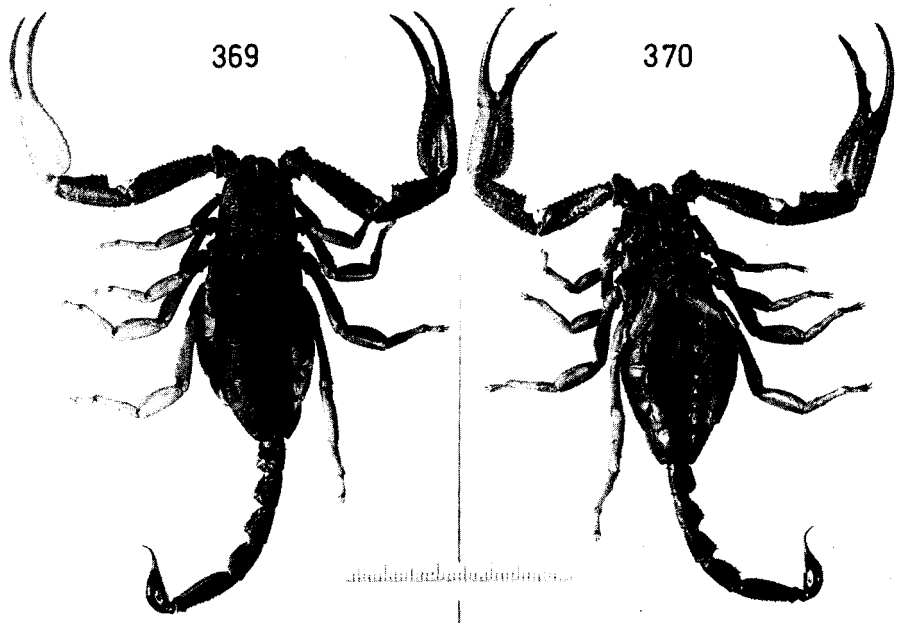
categories V and VI (see Table 2) in vegetation area of type 3A (desert and succulent steppe) (Fig. 4). No specimens have been found under rocks on sandy surfaces. This species is nocturnal. Females are sedentary and seldom move far from their burrows, which they enlarge as they increase in size. Due to this, 95% of the females collected had to be dug out of their burrows. Males move about considerably at night, and most of them were captured while wandering away from their burrows. It is not known whether adult males return to their burrows or dig a new one each night.

Opisthophthalmus brevicauda Lawrence, 1928. Figs 341, 369–374

Opisthophthalmus brevicauda Lawrence, 1928: 275–277.
Opisthophthalmus carinatus scabriceps Lawrence, 1966: 5. **Syn. n.**
Opisthophthalmus gaerdesi Lawrence, 1961: 149–151. **Syn. n.**

Diagnosis: O. brevicauda is most closely related to *O. ugabensis* but can be separated from it and other species of the genus on the following combination of characters. Carapace Fig. 341: anterior median furrow with a poorly developed bifurcating longitudinal suture; median ocular furrow with an obsolete longitudinal suture. Colour: caudal segments and telson, tergites I–VII, sternite VII, dorsal and lateral surfaces of pedipalp trochanter, femur and tibia, melanous to occasionally infuscated. Pedipalp tibia: 8–13 v τ, τ v_1 with an outer accessory τ forming a basal pair; τ esb_2 with an accessory τ (Fig. 372). Greatest body length of adult ♂ and ♀ 10 cm.

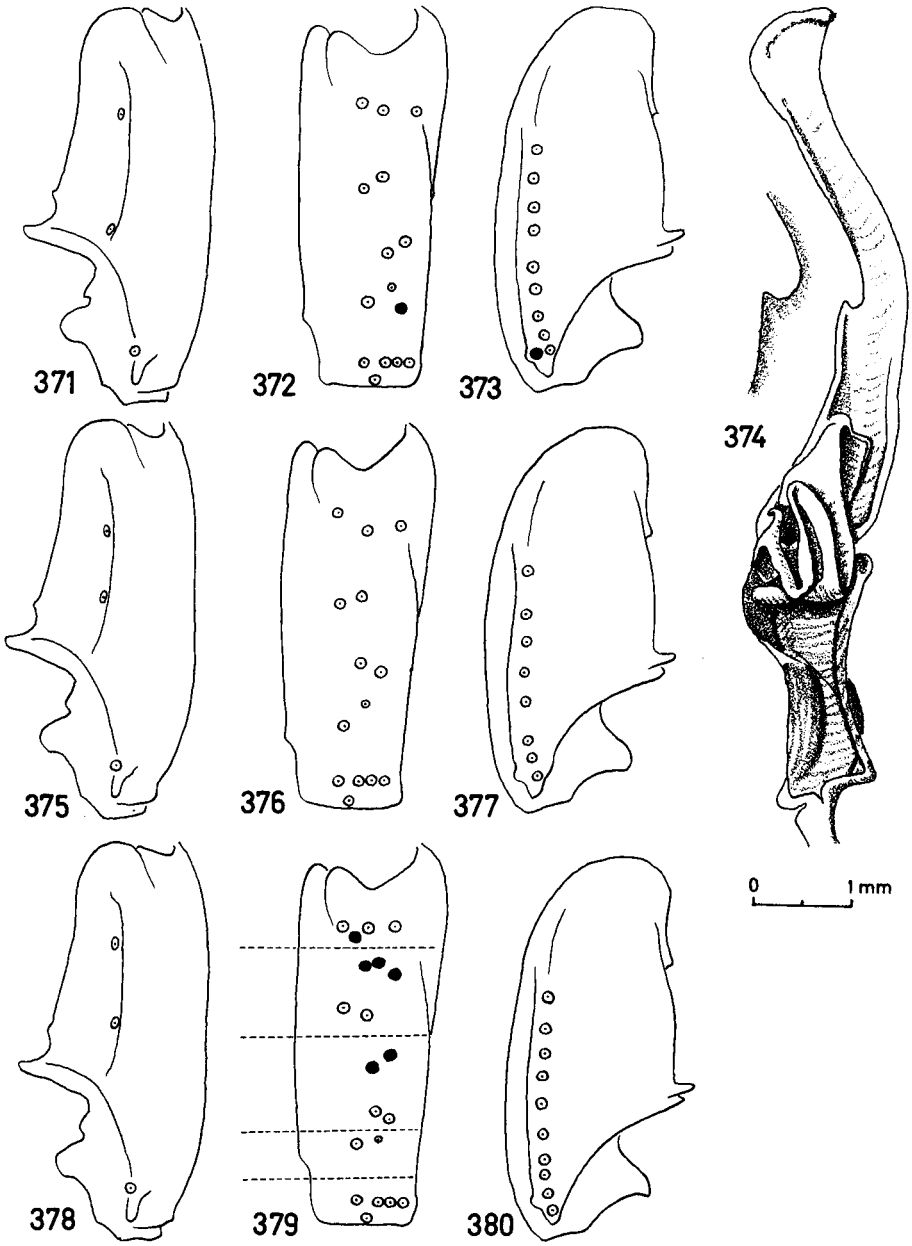
Description: The following account supplements Lawrence's (1928: 275–277) original description, Lawrence's original descriptions of the new synonyms listed above and Table 6. Lawrence's original description was based on a subadult ♂, that of *O. carinatus scabriceps* on an adult ♀ and that of *gaerdesi* on an adult ♂. Access to additional material and examination of the above types have shown that all the diagnostic characters selected by Lawrence are so variable as to bridge the particular character sets proposed by him to separate these species.
Pedipalps: Chela: upper surface in ♂ almost flat and smooth, in ♀ slightly convex and shallowly reticulated; finger keel well-developed; outer surface granular, with accessory keel as shown in Figs 568–569 for *O. ugabensis*; movable finger length/handback length ratio 1,50 (1,45–1,55) in adult ♂ and 1,35 (1,30–1,40) in adult ♀; handback of adults distinctly wider in ♀ than ♂ with handback width/carapace length ratios 0,70 (0,65–0,75) in ♀ and 0,50 (0,45–0,55) in ♂.
Carapace: Median eyes distinctly posterior in position lc/x ratio 1,60 (1,50–1,70) for ♂ and ♀.
Sternites: Smooth and shiny, sternite VII occasionally very slightly wrinkled in ♂.
Legs: Basitarsi of legs I–II with three distinct spine-like setae on postero-lateral margins.
Cauda: Entire cauda distinctly shorter than trunk in ♀, occasionally as long as trunk in ♂; ventral and ventro-lateral keels of cauda I absent, of II obsolete, of III present and costate, of IV costate granular; dorsal keels of I–IV well-developed, distal spine enlarged; telson vesicle agranular, smooth and shiny.



Figs 369–370. *Opisthophthalmus brevicauda*, ♂ (NM 8292—holotype of *O. gaerdesi* syn. nov). Scale in mm.

Trichobothria: See diagnosis. In addition, pedipalp chela as shown for *O. ugabensis* in Figs 568–570; τ *est* distinctly distal to *dst*; τ *esb* distal to *dsb*; distance $\tau V_4 \rightarrow Et_1/V_3 \rightarrow Et_1$ ratio 2,05 (1,95–2,15) in ♀ & ♂.
Pedipalp tibia: As in Figs 371–373; single accessory τ to esb_2 and v_1 always present; distance between τi and d_1 twice that between i and d_2.
Setation: Moderately pilose. ♂ pedipalp chela with thicker vestiture than ♀. Legs II–IV: telotarsi ventrally with an anterior row of 3–4 and a posterior row of 5–6 short, stiff spine-like setae.
Hemispermatophore: As in Fig. 374. Hook notch shallowly excavated; percentage ha → bsh distance of ha → w distance 45% (44–46%); position of hook apex almost halfway of total distal lamina length, with percentage ha → w distance of dcr → w distance 46% (44–48%).

Variation: Sexual dimorphism: In adults males differ from females in the following characters: ♂ trunk proportionally smaller and more slender with width sternite V/carapace length ratios 0,75 (0,70–0,80) for ♂ and 1,00 (0,90–1,10) for ♀. ♂ cauda equal or subequal to trunk length, in ♀ three-quarters as long while total body length is usually the same; pedipalp handback of ♂ distinctly narrower and fingers longer than in ♀; first proximal middle lamella of each pecten mesially only slightly curved to angular with pectinal teeth along entire posterior margin in ♂, distinctly curved with proximal half of posterior margin devoid of teeth in ♀, ♂ with 22–26 and ♀ 16–20 teeth per pecten. ♂ genital operculum suboval, ♀ subcordate.



Figs 371–380. *Opisthophthalmus* species. 371–374, *O. brevicauda*; 371–373, semidiagrammatic aspects of right pedipalp tibia; 371, dorsal; 372, outer; 373, ventral; 374, right hemispermatophore, ventral aspect with hook notch also shown in lateral outline; 375–380, *O. ugabensis*, semidiagrammatic aspects of right pedipalp tibia; 375, 378, dorsal; 376, 379, outer; 377, 380, ventral. *Scales:* 374, as shown; other illustrations with no specific scales. *Note:* Black dots indicate position of accessory trichobothria.

Intraspecific variation: Little variation observed in studied material, except in colour as reported in diagnosis.

Measurements: Maximum recorded body length of adult ♂ 10,0 cm (carapace 1,7 cm), ♀ 10,0 cm (carapace 1,95 cm).

Type material: Lawrence's ♂ holotype is deposited in the collection of the South African Museum (SAM B6090). It has become dismembered and is in poor condition.

Material examined: ♂ holotype, Sesfontein, 1926 South African Museum expedition (SAM B6090); *Opisthophthalmus carinatus scabriceps* ♀ holotype, Welwitschia (NM 9051); *Opisthophthalmus gaerdesi* ♂ holotype, mountains near Marienfluss valley, northern Kaokoveld (NM 8292). 1 ♂ 1 ♀ juv, Otjinungwa, 22 Nov 1970, P. Olivier (SMN 250); 1 juv ♀, 6,5 km E. Sanitatas, 26 Nov 1970, M-L. Penrith (SMN 212); 1 ♀ juv, Otjinungwa, 19 Aug 1973, State Museum Staff (SMN 468); 1 ♀ 1 subad ♂, Sesfontein, 4 Apr 1976, B. Lamoral (NM 10827).

Distribution: O. brevicauda has so far been recorded only from Kaokoland.

Bionomics: The only specimens personally collected were found at night, resting on the surface of gritty consolidated sandy soil of hardness category VII (Table 2). No specimens were excavated from burrows.

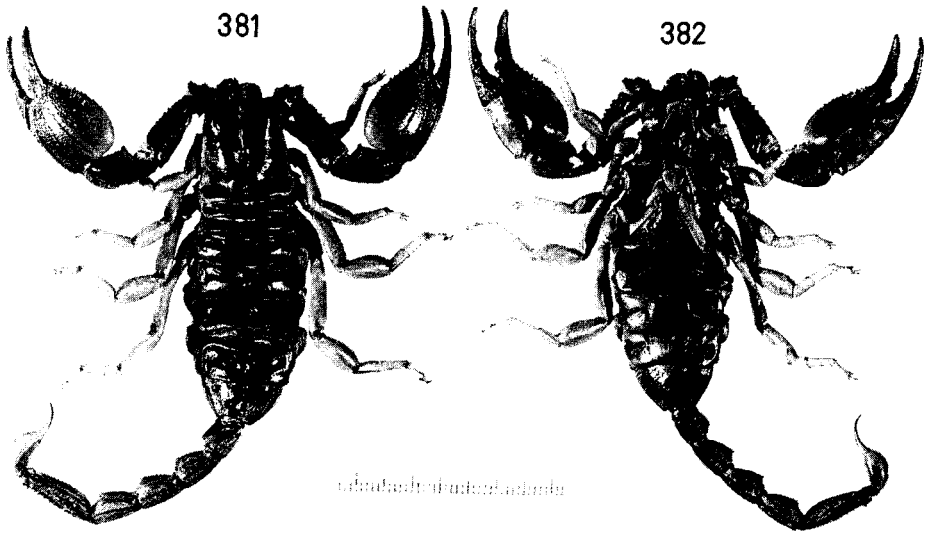
Opisthophthalmus carinatus (Peters, 1861). Figs 27, 345, 381–387, 389. Table 7

Heterometrus carinatus Peters, 1861: 515.
Petrovicus furcatus E. Simon, 1887; see Kraepelin, 1894: 85.
Opisthophthalmus histrio Thorell, 1877: 242–243. **Syn. n.**

Diagnosis: O. carinatus is most closely related to *O. litoralis* but can be separated from it and other species of the genus on the following combination of characters. Carapace, Fig. 345: anterior median furrow with a distinct longitudinal suture, anterior bifurcation very distinct and moderately long, occupying at least one-fifth of total carapace length; median ocular furrow with a distinct longitudinal suture bifurcating posteriorly. Pedipalp chela: upper surface of handback agranular and smooth to shallowly reticular; finger keel of ♀ and ♂ distinctly costate; outer ventro-lateral keel of handback predominantly costate. Cauda IV, ventral and ventro-lateral keels costate granular.

Description: The following account supplements Peters's (1861: 515) short original description, Hewitt's (1918: 131–132) comprehensive supplement, the original descriptions of the species synonymised above and Table 6. *O. carinatus* is the most common and most widely distributed species of *Opisthophthalmus* in Namibia. Populations at opposite extremes of the species distribution range exhibit character states which could warrant non-conspecific status but it was found that all of these character states are subject to clines along intermediate regions. *O. carinatus histrio* is synonymised with the typical form as a result of this. See Table 7 for examples of the extremes and intermediate states of two characters.

Granulation: As following for specimens from the central regions of Namibia. Carapace of ♀ & ♂: interocular surface smooth and shiny, lateral surfaces moderately granular, posterior median surface lightly granular to smooth. Ter-



Figs 381–382. *Opisthophthalmus carinatus*, ♀ (NM 10670). Scale in mm.

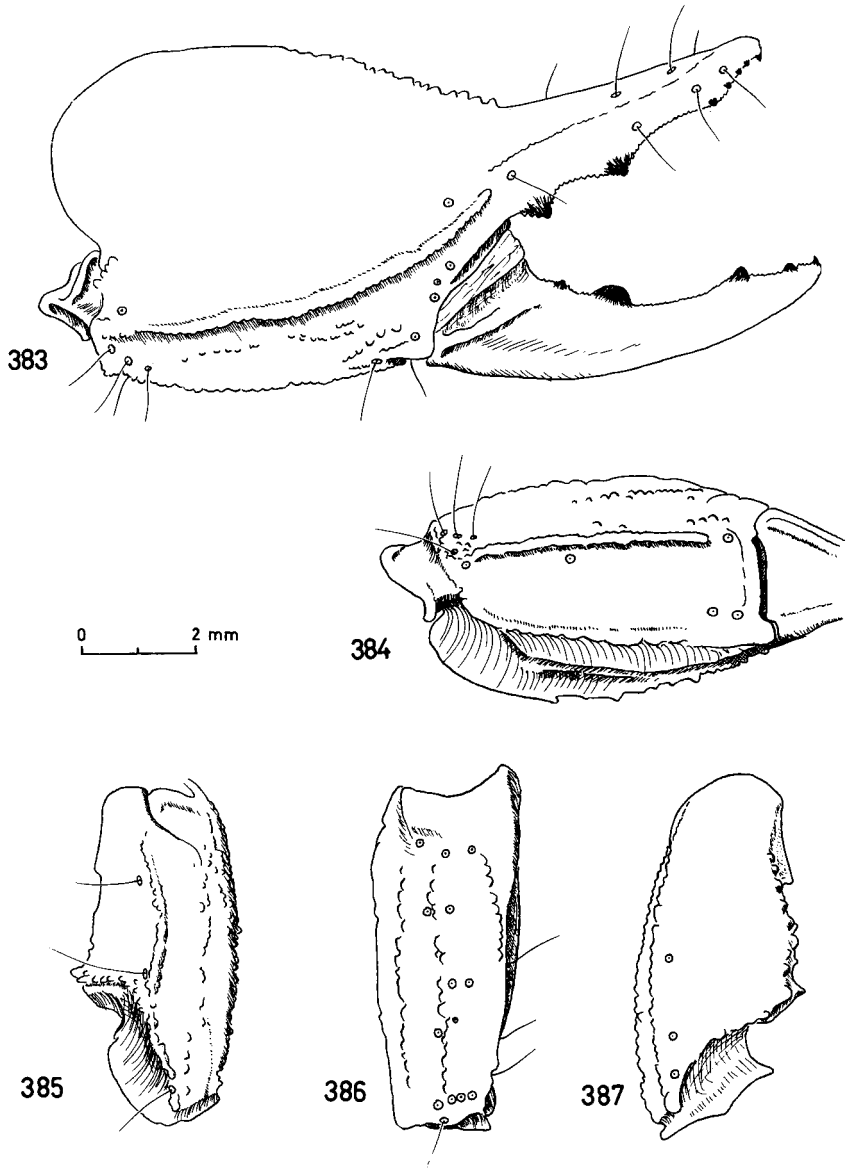
gites: smooth in ♀, finely shagreened in ♂. Cauda: I–V lateral surfaces, lightly and shallowly granular. Upper surface of handback of ♀ and ♂ very shallowly reticulated to very shallowly granular.

Colour: Females and males from near Windhoek and central Namibia have the following coloration: Carapace and upper surfaces of pedipalp femur and tibia, strong brown No. 55; anterior two-thirds of tergites I–VI and anterior half of tergite VII, dark yellowish brown No. 78, remaining posterior portions of these tergites moderate orange yellow No. 71; pedipalp chela fingers, handback finger keel, outer and inner ventro-lateral keels and keels of pedipalp tibia and femur dark reddish brown No. 44; upper, outer and inner surfaces of pedipalp handback, ventral surfaces of pedipalp tibia and femur dark orange yellow No. 72; sternites and cauda I–V strong yellowish brown No. 74; legs and telson brilliant yellow No. 83; pectines light yellow No. 86.

Setation: As for specimens from the central region of Namibia. ♀ with body and appendages nearly apilose, ♂ with body, legs, pedipalp femur and tibia and cauda with few setae, pedipalp chela and telson moderately pilose.

Trichobothria: As in Figs 383–387. (+1) neobothriotaxic for group C with 14 external τ on tibia. Chela: τ *est* distal to *dst*; distance between τ *est* and *esb* approximately equal to half that between *esb* and *eb*; τV_3 situated in proximal half of ventral surface; τEt_4 small, nearly in line with *Et* series and closer to Et_3 than Et_5. Tibia: τd_2 approximately equidistant from d_1 and i; τv_2 distinctly closer to v_1 than v_3. All the specimens in the list of material examined have 3 ventral τ on the pedipalp tibia with the notable exception of all the specimens from the mid-SW subregion. This aberration is discussed under the section on intraspecific variation.

Hemispermatophore: As in Figs 27, 389.



Figs 383–387. *Opisthophthalmus carinatus*, ♀ from Windhoek; 383–384, right hand; 383, outer aspect; 384, ventral aspect; 385–387, right pedipalp tibia; 385, dorsal aspect; 386, outer aspect; 387, ventral aspect.

Variation: Sexual dimorphism: In adults, males differ from females in the following characters: ♂ trunk proportionately smaller and more slender with width sternite V/carapace length ratios 0,90 (0,86–0,94) for ♂ and 1,10 (1,05–1,15) for ♀; ♂ cauda approximately 20% longer than trunk length, in ♀ equal to subequal while total body length is approximately only 10% greater in ♀; pedipalp handback of ♂ narrower and fingers longer than in ♀ with width handback/carapace length ratios 0,68 (0,64–0,71) in ♂ and 0,80 (0,76–0,84) in ♀ and length movable finger/handback length ratios 1,50 (1,45–1,55) in ♂ and 1,40 (1,34–1,44) in ♀; first proximal middle lamella of each pecten with mesial margin strongly angular while pectinal teeth are present along entire posterior margin of pecten in ♂, very shallowly curved while proximal one-fifth of posterior of pecten devoid of teeth in ♀; ♂ genital operculum suboval in outline, and twice as wide as long, ♀ subcordate with width one and a quarter times greater than length; in approximately the northern two-thirds of Namibia, most ♂ have sternite VII and ventral surfaces of cauda I and II transversely wrinkled and in ♀ these surfaces are smooth (see Table 7); ♂ with 18–30 and ♀ 12–20 teeth per pecten.

Intraspecific variation: Variation in the number of pectinal teeth and extent of wrinkling of sternite VII and ventral surface of cauda I is shown in Table 7. The list of material examined has been divided into broad subregions in which variation of the habitus can be referred to as follows:

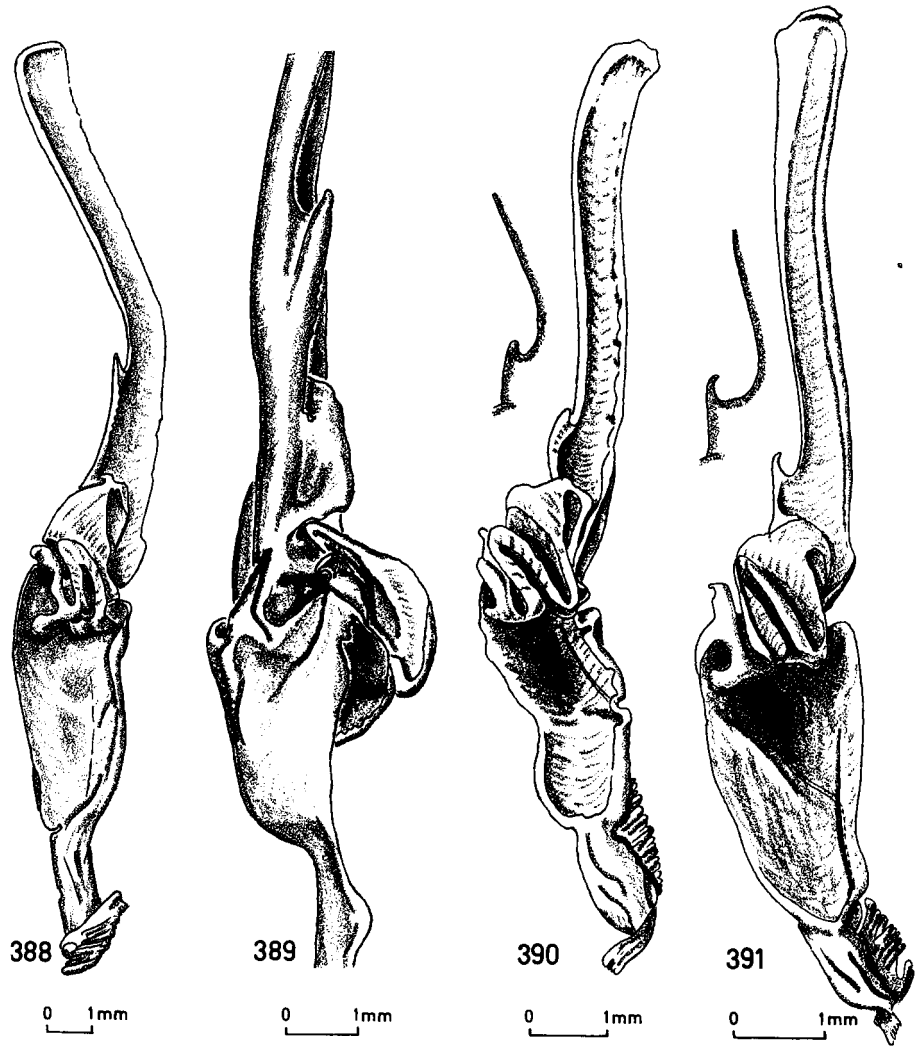
—North-western (NW): Coastal populations lighter in overall colour than in central region, upper surface of handback nearly smooth, caudal keels infuscated; inland populations with granulation as central region, overall colour almost uniformly strong yellow brown No. 74 and with little contrast between the various body parts and appendages.

—West (W): Intermediate between NW and central.

—Mid-south-west (Mid-SW): Samples from this sub-region differ fairly uniformly from those of surrounding sub-regions as follows: Colour: entire surfaces of tergites I–VII, sternite VII and cauda I–V dark olive brown No. 96; Carapace interocular surface more lightly coloured than rest of carapace; legs dark orange yellow No 72; telson deep orange yellow No. 69. Pedipalp tibia with 4 ventral τ instead of the normal 3. It is considered that these character state differences do not warrant conferring a different taxonomic status on this group until such time as additional material from adjacent areas can be studied to establish whether the differences are consistent enough and not variable.

—South-west (SW): Only one specimen available. Overall colour much darker than in specimens from the central region, with anterior margin and portion of lateral surface of carapace infuscated; cauda I–V with reticulated infuscations; telson dorsally infuscated, lateral and ventral surfaces with a longitudinal, lightly infuscated band.

—North (N): Overall colour very dark with carapace, tergites and dorsal surfaces of pedipalp femur, tibia and chela fingers dark brown No. 59 to almost brown black No. 65; cauda I–V deep brown No. 56, and keels infuscated; telson strong brown No. 55 to brown orange No. 54, with longitudinal, lightly infuscated bands on latero-dorsal and ventral surfaces. Upper surface of handback smooth to obsoletely reticulated.



Figs 388–391. *Opisthophthalmus* species, right hemispermatophore. 388, *O. adustus* (NM 10713) ventral aspect; 389, *O. carinatus* (SMN 11) ental aspect of middle portion; 390, *O. cavimanus* paralectotype (SAM B6095) ventral aspect with hook notch also shown in lateral outline; 391, *O. chrysites* (NM 11092) ventral aspect, with hook notch also shown in lateral outline.

—Central: As treated earlier.
—South (S): Intermediate between SW and SE. Upper surface of handback very shallowly and sparsely granular.
—North-east (NE): Tergites very dark as in specimens from N but with cauda, legs, carapace and pedipalp chela lighter. Upper surface of handback smooth to very lightly and shallowly reticular.
—East (E): Intermediate between NE and SE.
—South-east (SE): Colour patterns and contrasts as for specimens from the central region but with all colours much darker. Upper surface of handback very shallowly granular.

Measurements: Maximum recorded adult body lengths of ♂ 10,5 cm (carapace 1,6 cm), of ♀ 11,0 cm (carapace 1,7 cm).

Type material: At the time of writing all efforts to locate the type(s) of *O. carinatus* have failed to yield results. No definite proof that this material has been lost or destroyed has been obtained. It is felt that the designation of a neotype should be postponed until such proof is available.

Material examined: Petrovicus furcatus ♀ type, Afrique Australe (MNHP RS 0230); *Opisthophthalmus histrio* ♂ holotype, 'Caffraria' (Namibia), (KM 42).

NW

1 ♀, many juv, Kamanjab, 20 Mar 1966, H. Steenkamp (SMN 107); 1 ♂, Plaas 6312? (possibly 631), 30 Mar 1966, H. Steenkamp (SMN 107); 1 ♀, Orumana, 27 Nov 1970, F. Schutz (SMN 218); 1 juv ♂, Sesfontein, 26 Apr 1976, W. Haacke (TM 11220); 1 juv ♀, Sesfontein, 26 Apr 1976, W. Haacke (TM 11225); 1 ♀, Warmquelle, Jan 1968, T. Botes (SMN 128); 1 ♂, Swartboys Drift, Dec–Feb 1972, J. Menge (TM 10434); 1 ♀, Warmquelle, 16 Jan 1965, P. Buys (SMN 112); 1 ♂, Hazeldene, J. Steenkamp (SMN 106); 1 ♂, Ondarusu Falls, 17 Oct 1973 (SMN 491); 1 ♀, Welwitchia, 17 Feb 1966, W. Smit (SMN 134); 3 subad ♀ 1 subad ♂ 2 juv ♀ 5 juv ♂, Otjitambi 25, 14–15 Feb 1972, C. Schlettwein (SMN 338); 1 juv ♂, Orumana, 10 Feb 1975 (SMN 595); 1 ♀, Ohopoho, 6 Nov 1962, B. Marais (SMN 111); 1 subad ♀, Dunedin Star, 27 Sep 1968, P. Olivier (SMN 125); many juv, Kaoko Otavi, 27 Nov 1970, J. Batista, (SMN 202); 1 juv ♀, Purros, 6 Oct 1968 (SMN 274); 2 ♀ 2 ♂ 1 juv ♀, Farm Kuyper, 5 May 1968 (SMN 235); 1 subad ♂, Onguati, 24 Feb 1962, E. von Koenen (SMN 110); 2 juv ♀ 1 juv ♂, Truidia, Mar 1973, Dr Germs (SMN 446); 1 ♀, Hoas, 1971, J. Labuschagne (TM 10131); 1 ♂ 1 subad ♂, Kaoko Otavi, 27 Nov 1970, P. Olivier (SMN 236); 1 juv ♀, Otjikoko-Süd, 10–13 Feb 1972, C. G. C. (SMN 335); 5 ♀ 6 ♂ 1 subad ♀ 2 subad ♂, Kaoko Otavi, 27 Nov 1970, J. Batista (SMN 201); 1 juv ♂, Hoas, 1971, J. Labuschagne (TM 10138); 1 ♀, Sesfontein, 26 Apr 1976, W. Haacke (TM 11218); 3 subad ♀ 3 juv ♂, Annabis, 24–25 Feb 1969, B. Lamoral (NM 10057); 5 juv ♀ 1 juv ♂, Groot Spitzkoppe Mts, 11 Feb 1969, B. Lamoral (NM 10045); 1 ♀, Grootberg, 2 Apr 1976, B. Lamoral (NM 10826); 1 juv ♂ 1 subad ♀ 1 subad ♂, Kamanjab, 25 Feb 1969, B. Lamoral (NM 10052); 1 juv ♀, Ohopoho, 8 Feb 1975 (SMN 591); 1 ♀, Sesfontein, 4 Apr 1976, B. Lamoral (NM 10828).

W

1 ♂ 1 juv ♂ 1 juv ♀, Spitzkoppe, 4 Mar 1960, P. J. Buys (SMN 152); 1 ♀, many juv, Kaap Kruis, 8 June 1963, A. Els (SMN 156); 1 ♂, Emeritus, 9 June 1967, Kapt. Pietersen (SMN 64); 1 juv ♂, Ameib, 1–2 Feb 1972, C. G. C. (SMN 332); 1 ♀, Emeritus, 29 July 1965, J. Pietersen (SMN 176); 1 ♀ 1 juv ♀, Emeritus, 18 Mar 1968, Kapt. Pietersen (SMN 67); 1 juv ♀, Gobabeb, C. Koch (SAIMR 866); 1 ♂ 2 ♀ 1 subad ♀, Gobabeb, 26 Jan 1975, S. Endrödy Younga (TM 11109–11110, 11112–11113); 1 subad ♀, Namib Desert Park, 17 Mar 1970, S. W. Goussard (NM 10656); 2 juv ♀, Zebra Pan, 14 Feb 1972, Jenssen, Robinson (NM 10666); 1 ♀, Sandamap, 13 Feb 1969, B. Lamoral (NM 10047); 1 ♀, Gobabeb, 19 Apr 1972, M. K. Jensen (NM 10631); 1 ♀, Swakopmund, June 1969, C. Koch (NM 10018).

Mid-SW

1 ♀ 1 subad ♂, Neisip, 21 Oct 1970, F. Burger (NM 11090); 1 ♀, Zaris, 16 Nov 1971, P. Olivier (SMN 318); 1 subad ♀ 7 juv, Neisip, 21 Oct 1970, F. Burger (SMN 198); 1 ♂ 1 ♀ 1 juv ♀, Witmanshaar, 8 Oct 1972, H. Strauss (SMN 396); 16 juv, Neisip, 21 Oct 1970, J. Batista (SMN 190).

SW

1 subad ♀, Anenous Pass, May 1972, John Visser (NM 10637).

N

1 juv ♂ 1 juv ♀, Ovambo Grens No. 1, Oct 1961, P. J. Buys (SMN 148); 1 juv ♀, Homob, 27 Sept 1965, T. Spence (SMN 209); 1 juv ♂, Okondeka, Oct 1961, P. Buys (SMN 68); 1 juv ♀, Gaseb, Oct 1961, P. Buys (SMN 216); 1 juv ♀, Hoasas, Nov 1965, W. Steyn (SMN 81); 1 juv ♂, SWA Administration borehole 6453 (SMN 248); 2 ♂, Homob, Oct 1961, P. Buys (SMN 239); 1 ♀, Okaukuejo, Oct 1961, P. Buys (SMN 108); 1 ♂ 1 ♀ 1 juv ♀, Government Borehole 6453, D. Fulkerson (SMN 155); 1 subad ♂, Hoasas, 27 Nov 1965, W. Steyn (SMN 76); 1 juv ♂, Elorha Pfanne, June 1909, Prince von Bayern (MNHP RS 3564); 1 subad ♂, Hoas, 1971, J. Laubuschagne (TM 10150); 1 juv ♂, Sukses Dam, 2 Mar 1969, B. Lamoral (NM 10046); 4 juv ♀ 2 subad ♀ 2 ♀ 1 juv ♂ 2 subad ♂ 1 ♂, Gemsbokvlakte, 4 Mar 1969, B. Lamoral (NM 10058); 2 ♂ 1 juv ♂ 3 ♀, Oncocua, Angola, 1947–1949?, O.U. Gulf of Guinea Expedition (NM 10692); 4 ♀ 2 ♂ 3 juv ♂ 2 juv ♀, Aus, 2 Mar 1969, B. Lamoral (NM 10685).

Central

1 ♀, Windhoek, 28 Aug 1970, Leslie McCullum (SMN 175); 6 ♀ 7 ♂ 8 juv ♂, Keres, 5 Dec 1960, P. Pretorius (SMN 140); 1 ♀, Windhoek, 20 Oct 1966, S. von Schalscha (SMN 43); 1 ♂, Windhoek, 19 Feb 1962, P. van der Byl (SMN 8); 1 ♀, Okahandja, 9 Aug 1965, D. Schultze (SMN 63); 1 ♀, Windhoek, 17 Apr 1964, Smit (SMN 3); 1 ♂ 1 juv ♀, Windhoek, 10 Aug 1961, C. Campbell (SMN 54); 3 juv ♂, Scheidthof, 14–17 Nov 1972, P. G. O. (SMN 402); 1 ♂, Windhoek, 22 Feb 1966, W. Esterhuizen (SMN 27); 1 ♀, Windhoek, 22 Nov 1965, K. Pieters (SMN 23); 1 ♂, Pioneer's Park, 1 Jan 1974, M. J. Penrith (SMN 507); 1 ♀, Windhoek, 20 Apr 1957, K. Welch (SMN 32); 1 ♀ 1 subad ♀ 1 juv ♀ 3 juv ♂, Wasservallei, 21–23 Dec

1973, M-L. P. (SMN 504); 1 juv ♂, Otjombane, 8 Sept 1961, P. Buys (SMN 142); 2 ♀, Windhoek, 6–13 June 1972, P. G. O. (SMN 383); 1 ♀, Tantus, 16 Nov 1966, W. Kannegiesser (SMN 48); 2 ♀, Windhoek, 17 Sep 1963, P. Kellerman (SMN 2); 1 juv ♀ 1 juv ♂, Koreangab Dam, 18 May 1972, P. G. O. (SMN 381); 4 ♀ 4 ♂ 1 juv ♀, Keres, 15 Feb 1961, P. Pretorius (SMN 154); 1 ♀, Windhoek, 1 June 1965, J. Steenkamp (SMN 55); 1 ♀, Windhoek, 22 Nov 1965, R. Horn (SMN 44); 1 ♂, Windhoek, 5 Jan 1967, P. Grobler (SMN 39); 2 ♀, Windhoek, 5 Dec 1967 (SMN 159); 1 ♀, Windhoek, 20 Apr 1965, W. Giess (SMN 33); 1 ♂, Lichtenstein Mitte, 21 Jan 1962, E. Rusch (SMN 53); 3 ♀, Windhoek, 15–16 Apr 1972, P. G. O. (SMN 357); 1 ♂, Windhoek, 28 Nov 1962, H. de Waal (SMN 10); 1 juv ♀ 1 juv ♂, Djab, 14 Aug 1961, E. Rusch (SMN 143); 1 ♀, Windhoek, 16 Mar 1966, H. Göttert (SMN 4); 1 ♀, Windhoek, 2 Nov 1958 (SMN 22); 1 juv ♀, Aris, 10 June 1966, C. van den Hooven (SMN 49); 1 subad ♂, Tantus, 8 Feb 1966, W. Kannegiesser (SMN 57); 1 juv ♂, Arnhem, 23–27 Oct 1972, H. Strauss (SMN 397); 1 ♀, Goreangab Dam, 2 Feb 1974, Harms (SMN 513); 2 juv ♂ 1 juv ♀, Windhoek, 16 Nov 1962 (SMN 208); 1 ♂, Windhoek, Jan 1972, J. Slade (SMN 330); 2 juv ♀ 2 juv ♂, Windhoek, 27 Nov 1961, D. Campbell (SMN 17) 1 ♀ 1 juv ♀ Arnhem, 23 Oct 1972, H. C. S. (SMN 412); 1 juv ♂ 1 juv ♀, Windhoek, 16 Nov 1962 (SMN 206); 1 ♂, Brakwater, Mar 1976, B. Loutit (SMN 601); 1 ♀, Windhoek, 16 Dec 1963, W. Snyman (SMN 25); 1 ♂, Windhoek, 10 Jan 1966, A. Coombe-Davis (SMN 85); 1 subad ♂, Brakwater, May 1959, C. Buys (SMN 240); 1 ♀, Windhoek, 10 July 1970, C. Coetzee (SMN 52); 1 ♂ Kamombonde, 5–7 Jan 1975 (SMN 588); 2 ♂ 1 ♀, Windhoek, 16 Nov 1962 (SMN 205); 1 ♀, Windhoek, 1 Jan 1973, Mr Dean (SMN 417); 4 juv ♂ 1 juv ♀, Regenstein, 30 Nov 1972, P. Olivier (SMN 408); 1 subad ♂ 1 subad ♀, Windhoek, 27 Dec 1961, P. van der Byl (SMN 9); 2 juv ♀, Paulinehof, 20–22 Nov 1972, P. G. O. (SMN 405); 2 juv ♂, Finkenstein, 21 Mar 1972, P. Olivier (SMN 346); 2 ♂, Lichtenstein Mitte, 21 Jan 1960, E. Rusch (SMN 87); 1 ♂, Windhoek, 26 Nov 1973, A. Bensen (SMN 494); 1 ♂, Windhoek, 7 Dec 1966, Mr F. van Sittert (SMN 20); 3 juv ♀ 1 juv ♂, Windhoek, 6–13 June 1972, P. G. O. (SMN 384); 1 ♂ 1 subad ♀, Windhoek, 16 Nov 1963, J. Nganga (SMN 47); 1 ♀ many juv, Windhoek, 11 Jan 1963, F. Daalen (SMN 45); 2 ♀ 1 ♂, Windhoek, 9 Dec 1963, P. Kellerman (SMN 24); 1 ♂, Finkenstein, 21 Mar 1972, P. Olivier (SMN 345); 2 juv ♂, Windhoek, 4 May 1972, P. Olivier (SMN 378); 1 juv ♀, Windhoek, 10 Aug 1961, W. Cloete (SMN 16); 1 subad ♂, Goreangab Dam, 18 May 1972, P. G. O. (SMN 379); 1 ♂, Windhoek, 26 Sep 1973, E. Mokgoabone (SMN 490); 1 juv ♂, Wasservallei, 1–3 Apr 1972, C. Coetzee (SMN 350); 1 juv ♂, Goreangab Dam, 12 Feb 1971 (SMN 272); 3 juv ♀ 2 juv ♂, Windhoek, 19 Apr 1972, P. G. O. (SMN 358); 1 juv ♀, Wasservallei, 30 Dec 1973–2 Jan 1974, J. Wasserfall (SMN 506); 1 ♀ Windhoek, 31 July 1967, F. Hoebel (SMN 36); 1 ♀, Windhoek, 3 May 1965, Dr Watt (SMN 29); 1 juv ♂, Goreangab Dam, 20 Feb 1972 (NM 10652); 2 ♂ 1 ♀, Valencia, 6 Feb 1969, B. Lamoral (NM 10686); 3 ♂ 2 ♀ 2 juv ♂ 5 juv, Portsmut, 7 Feb 1969, B. Lamoral (NM 10051); 2 ♀, Windhoek, May 1977, S. Louw (NM 11060); 1 ♂, Ghobab, 12 Mar 1976, B. Lamoral (NM 10810); 1 juv ♂, Auas Mts., Sep 1973, G. Sander (NM 10600); 1 juv ♂, Okahandja, 13–14 Mar 1969, B. Lamoral (NM 10056); 1 juv ♀, Nauzerus, Dec 1973–Jan 1974, Chris Kingsley (NM 10550); 1 subad ♂, Windhoek, 5 Feb 1969,

B. Lamoral (NM 10048); 1 juv ♂, Rehoboth, 17 Jan 1972, R. Taylor (NM 10655); 1 subad ♀ 10 juv ♀ 6 juv ♂, Portsmut, 19 Apr 1972, A. Port (NM 10538); 1 ♂ 1 ♀, Rehoboth, 15 Nov 1974, S. Endrödy-Younga (TM 11073–11074); 1 ♂, Windhoek, 30 Dec 1970, S. Brits (SMN 260); 1 ♀, Windhoek, 9 Aug 1961, B. Verwey (SMN 31); 1 ♀ many juveniles, Windhoek, 10 Nov 1962, Mr Kühn (SMN 30); 2 ♂, Windhoek, 12 Apr 1961, J. Jenkins (SMN 11); 1 ♀, Windhoek, 16 Dec 1963, W. Snyman (SMN 26); 1 juv ♂ 2 juv ♀, Regenstein, 12 Dec 1973, C. G. C. (SMN 497); 1 juv ♀, Goreangab Dam, 19 Dec 1973, C. G. C. (SMN 500); 1 ♂, Windhoek, 1968, Smith (NM 9959); 2 ♀, Okahandja, Mar 1966, F. Gaerdes (NM 9108–9109); 4 ♂, Okahandja, Mar 1966, F. Gaerdes (NM 9110–9111); 1 ♂, Okahandja, Mar 1966, F. Gaerdes (NM 9112); 2 ♀, Okahandja, May 1960, F. Gaerdes (NM 7312–7313); 3 ♂, Okahandja, May 1960, F. Gaerdes (NM 7314–7316); 1 ♀, Okahandja, May 1960, F. Gaerdes (NM 7317); 1 ♂ 1 juv ♂, Okahandja, Aug 1960, F. Gaerdes (NM 7320); 1 juv ♀, Hohenheim, May 1959, R. Lawrence (NM 7268).

S

2 ♀ 1 juv, Berseba, 27 February 1976, B. Lamoral (NM 10719); 1 ♂, Skaap River, Mar 1973, C. Coetzee (NM 10619); 1 ♀, Bethanie, Aug 1959, F. Gaerdes (NM 7277).

NE

1 ♂, Rundu, 10 Jan 1970, Capt Booysen (SMN 261); 2 ♀, Rundu, Apr 1965, L. Jacobs (SMN 116); 6 juv, Andara, 19–25 Aug 1971 (SMN 303); 2 subad ♂ 2 subad ♀ 3 juv, Andara, 30 June 1969, P. Olivier (SMN 136); 1 subad ♂ 1 juv ♂, Andara, 2 July 1969, P. Olivier (SMN 136); 3 ♀, Elandshoek, 8 Mar 1969, B. Lamoral (NM 10054); 3 ♂ 1 ♀ 2 juv ♂ 1 juv ♀, Waltersdorf, 11–12 Mar 1969, B. Lamoral (NM 10049); 3 juv ♂, Gautsche Pan, 27 Apr 1973, P. Buys (SMN 443); 1 ♀ 1 juv ♂ 2 juv, Andara, 1 July 1969, P. Olivier (SMN 136); 1 ♂ 1 ♀ 1 subad ♀ 1 subad ♂ 5 juv ♂ 1 juv ♀, Ghaub, 19–30 Nov 1972, H. Strauss (SMN 424); 1 ♀, Gautsche Pan, 9–13 June 1971, J. Batista (SMN 299); 1 subad ♂ 1 juv ♂ 1 juv ♀, Namutoni, P. Buys (SMN 109); 5 ♀ 1 ♂ 2 juv ♂ 1 juv ♀ 2 juv, Ghaub, 19–30 Nov 1972, H. Strauss (SMN 423); 1 ♀, Andara, 19–24 Aug 1971, E. Mokgoabone (SMN 348); 16 juv, Otjikoto, 20–23 Nov 1972, J. Batista (SMN 428); 1 ♂ 5 ♀ 2 juv ♀, Otjikoto, 20–23 Nov 1972, J. Batista (SMN 427); 2 subad ♀ 1 juv ♀, Ghaub, 19–30 Nov 1972, H. Strauss (SMN 422); 1 subad ♀, Andara, 2 July 1969, P. Olivier (SMN 233); 1 ♀ 1 juv ♀, Gautsche Pan, 9–13 June 1971, J. Batista (SMN 293–4); 1 ♀, Uithoek, 28 Apr 1974, W. Haacke (TM 10932); 1 subad ♂, Gautsche Pan, 19–13 June 1971, J. Batista (SMN 295); 1 juv ♂, Gautsche Pan, 9–13 June 1971, J. Batista (SMN 283); 1 juv ♂, Onguma, 7–18 Feb 1972, M-L. Penrith (SMN 340); 1 subad ♂ 1 juv ♀, Gautsche Pan, 9–13 June 1971, J. Batista (SMN 281); 1 juv ♂ 1 juv ♀, Andara, 2 July 1969, P. Olivier (SMN 214–215); 1 juv ♀, Aha Mts, D. Krynauw (SMN 85); 1 subad ♂, Gautsche Pan, 9–13 June 1971, J. Batista (SMN 287); 1 ♂ 1 ♀, Grootfontein, Aug 1962, F. Gaerdes (NM 8374).

E

1 ♂ 2 ♀, Rietfontein, W. D. H. (NM 10664); 1 ♂ 1 ♀, De Hoek, 10 Sep 1970, P. Buys (SMN 204); 1 ♂, Eava, 27 Apr 1966, R. Pack (SMN 70); Many ♂ ♀ & juv, De Waal, 17 Mar 1969, B. Lamoral (NM 10055).

SE

1 ♀ 2 ♂, Auob River, 1968–1970, E. Leriche (NM 10693–10694); 1 juv ♀, Jansdraai, 19 Apr 1970, B. Lamoral (NM 10621); 1 ♂ 1 subad ♀, Auob River, Apr 1970, B. Lamoral (NM 10651); 2 subad ♂, Xendang, 22 Sep 1970, N. Swart (SMN 194); 2 ♀, Twee Rivieren, 10 Apr 1970, B. Lamoral (NM 11089); 4 juv ♀, 3 juv ♂, Auob River, 18 Apr 1970, B. Lamoral (NM 10649); 1 juv ♀, Upington, 27 Jan 1969, B. Lamoral (NM 10681); 2 juv ♂ 2 juv ♀, Kalahari Gemsbok National Park, 10 Jan 1972, Eastwood (NM 10640); 1 ♂, Jansdraai, 19 Apr 1970 (NM 10658); 1 ♂, Rooibrak, Apr 1970, B. Lamoral (NM 10647); 1 ♀, Nossob R., Feb 1961, D. Brown (NM 8290). 1 juv, Bayip Pan, South Africa, 3 Apr 1970, B. Lamoral (NM 10460).

Distribution: The whole of Namibia excepting the shifting sand dune systems of the Namib and Kalahari.

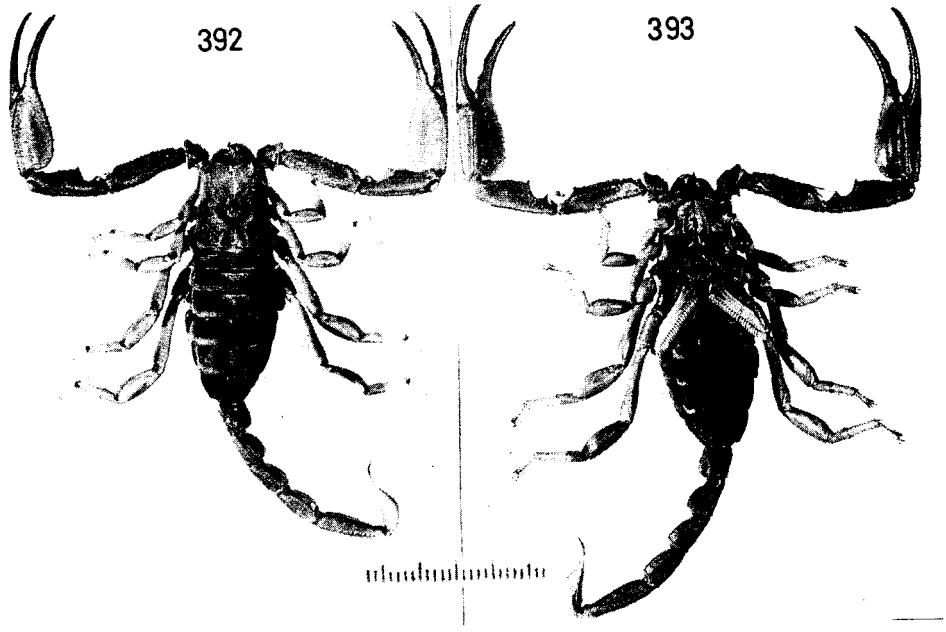
Bionomics: The burrowing activities and soil predilections of *O. carinatus* are treated fully by Lamoral (1978). Burrow entrances are usually situated at the side of large stones or rocks and occasionally in open ground (soils of hardness categories VII–IX, Table 2). In the Kalahari, specimens have sometimes been found in shallow scrapes under large calcrete stones or dead vegetation on consolidated sand and occasionally under the loose bark of dead trees lying on the ground. *O. carinatus* is hemiedaphic and nocturnal. Specimens have on occasion been found wandering about in daytime but this is a rare occurrence.

Opisthophthalmus cavimanus Lawrence, 1928. Figs. 354, 390, 392–399

Opisthophthalmus cavimanus Lawrence, 1928: 274–275.

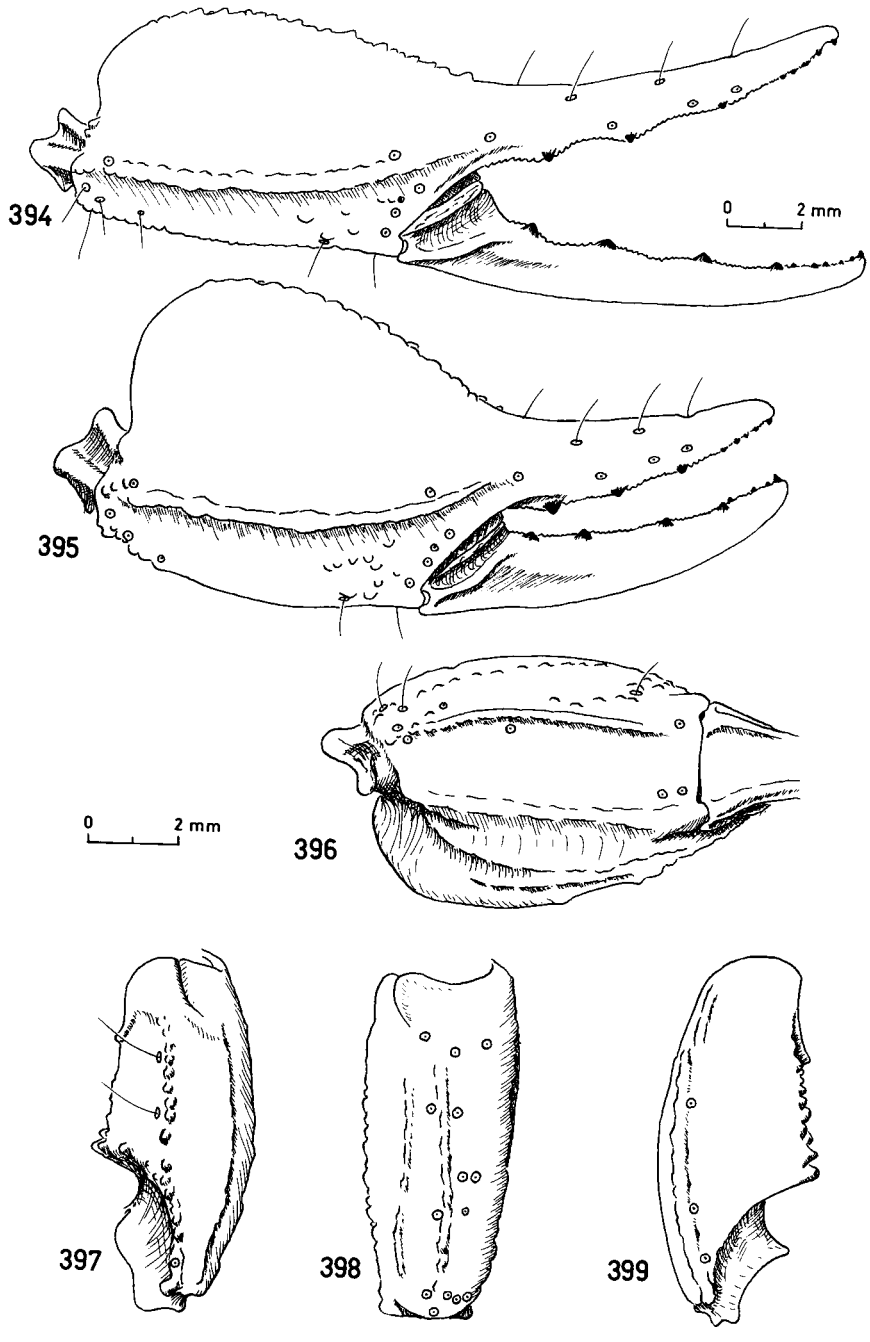
Diagnosis: No sister species has yet been found for *O. cavimanus*, which is most closely related to species within the *carinatus* group. *O. cavimanus* can be separated from this group and other species of the genus on the following combination of characters. Carapace Fig. 354: anterior median furrow with a distinct longitudinal suture and somewhat less distinct anterior bifurcating suture: median ocular furrow with a moderately distinct longitudinal suture; interocular surface granular. Ventral surface of telson vesicle smooth and agranular. Cauda II–IV, ventral and ventro-lateral keels absent, ventral surfaces transversely lightly corrugated in ♂, smooth in ♀.

Description: The following account supplements Lawrence's (1928: 274–275) original description, the present diagnosis and Table 6. The ♀ of this species was unknown and a description of relevant character states is included herein.
Granulation: Pedipalp: handback very shallowly reticulated in ♀, smooth, occasionally with a few scattered, shallow punctations and matt in ♂; dorsal surface of femur and outer intercarinal surface of tibia granular in ♀, almost agranular in



Figs 392–393. *Opisthophthalmus cavimanus*, ♂ (NM 10830). Scale in mm.

♂. Carapace, entire surface, including interocular, moderately to distinctly granular. Ventral surface of cauda V granular.
Colour: In ♀: pedipalps, carapace strong brown No. 55 to deep brown No. 56; tergites deep brown No. 56 to dark brown No. 59; cauda I–V brown orange No. 54 to strong brown No. 55; telson and legs I–IV dark orange yellow No. 72 to strong yellow brown No. 74; sternites III–VII moderate orange yellow No. 71 to dark orange yellow No. 72; pectines light orange yellow No. 70; handback of chelicerae dark orange yellow No. 72; chelicerae fingers very lightly infuscated. Males have the same colour distribution but tend to be slightly more lightly coloured.
Carapace: lc/x ratio 1,88 (1,86–1,90) for ♀ and ♂.
Pedipalps: Tibia and femora lengths distinctly greater in ♂ than ♀.
Legs: Posterior margins of basitarsi I and II with many scattered setae as well as a longitudinal row of 2–3 spine-like setae.
Setation: Legs and cauda of ♀ and ♂ moderately pilose. Pedipalps of ♀ moderately pilose while those of ♂ are much more pilose than in ♀.
Trichobothria: As in Figs 394–399. (+1) neobothriotaxic for group C with 14 external τ on tibia.
Hemispermatophore: As in Fig. 390. Differing distinctly from those of *O. carinatus* and *litoralis* as following: basal portion and distal lamina narrower; subapical lateral margin of hook strongly curved. In addition the following percentages are different from those of the above species.



Figs 394–399. *Opisthophthalmus cavimanus*. 394, ♂ (NM 10830) right hand, outer aspect; 395–399, ♀ (NM 10830); 395–396, right hand; 395, outer aspect; 396, ventral aspect; 397–399, right pedipalp tibia; 397, dorsal aspect; 398, outer aspect; 399, ventral aspect. *Scales*: 394, upper right; 395–399, middle left.

1. ha → w distance × 100/dcr → w distance = 32,3 (31,5–33,2)
2. ha → bsh distance × 100/ha → w distance = 44,0 (43,5–44,5)
3. ha → bsh distance × 100/dcr → bsh distance = 17,8 (17,4–18,2)

Variation: Sexual dimorphism: In adults, males differ from females in the following characters: while there is little difference in the overall length in specimens of the available material, ♂ trunk is proportionally smaller and more slender with width sternite V/carapace length ratios 0,87 (0,83–0,91) for ♂ and 1,00–1,04 for ♀ (only two adult ♀ available); ♂ cauda is as long or slightly longer than trunk length while in ♀ it is 20% shorter; pedipalp handback of ♂ narrower and fingers longer than in ♀ with width handback/carapace length ratios 0,51 (0,47–0,54) in ♂ and 0,63–0,69 in 2 ♀ and length movable finger/handback length ratios 1,50 (1,45–1,55) in ♂ and 1,12–1,20 in 2 ♀; first proximal middle lamella of each pecten with mesial margin angular while pectinal teeth are present along entire posterior margin of pecten in ♂, very shallowly curved while proximal one-third of posterior margin of pecten devoid of teeth in ♀; ♂ genital operculum suboval in outline, subcordate in ♀; tergites I–VII finely shagreened and matt in ♂, smooth and shiny in ♀. ♂ with sternites IV–VII and ventral surface of cauda I–III transversely shallowly corrugated and in ♀ these surfaces are smooth; ♂ with 21–27 and ♀ 16–18 teeth per pecten.
Intraspecific variation: Little except in overall colour which tends to be darker in specimens from the eastern region of the distribution range.

Measurements: Maximum recorded adult body lengths of ♂ 7,5 cm (carapace 1,2 cm) of ♀ 7,0 cm (carapace 1,1 cm).

Type material: According to Lawrence (1928: 274) the type series consists of 3 ♂ (SAM B6094–6095). Only 2 ♂ syntypes were received on loan. One ♂ (SAM B6094), is hereby selected as lectotype of *Opisthophthalmus cavimanus* and the other ♂ (SAM B6095) as paralectotype. This material is deposited in the South African Museum.

Material examined: ♂ Lectotype, Sesfontein, 1926, Museum Expedition (SAM B6094); ♂ Paralectotype, Camaeis 1926, Museum Expedition (SAM B6095); *Opisthophthalmus undulatus ugabensis* ♂ syntype, Ugab River (AM 6574). 1 ♂, Central Kaokoveld, May 1961, F. Gaerdes (NM 8304); 1 ♂ 2 subad ♂ 2 subad ♀ 2 juv ♀, Sesfontein 3 Apr 1976, B. Lamoral (NM 10834); 1 subad ♀, Fonteine (NM 10646); 3 ♂ 1 subad ♀ 2 subad ♂ 1 juv ♂, Sesfontein, 4 Apr 1976, B. Lamoral (NM 10830); 1 ♂, Vrede, 31 Mar 1976, B. Lamoral (NM 10832); 1 subad ♂, Okonjambo, 21 May 1970, P. J. Buys (SMN 247); 1 ♂, Sanitatas, 26 Nov 1970, E. Motgoabone (SMN 214); 1 ♂, Torrabaai, Sep 1961, A. van Koenen (SMN 124); 1 ♂, Hoab River, 7 June 1964, W. Steyn (SMN 133).

Distribution: Within zones of vegetation types 1, 5 and northern one-third of 2 (Fig. 4).

Bionomics: Nocturnal, hemiedaphic and burrows 15–20 cm in moderately hard soils with surface hardness ranging from categories IX–X (Table 2). Burrow entrances are usually situated at the side of stones or rocks and occasionally in open ground. *O. cavimanus* was found to be sympatric with *carinatus*.

See distribution above for vegetation types within species range.

Remark: See remark on ♂ syntype of *O. undulatus ugabensis* under *O. ugabensis*.

Opisthophthalmus chrysites Lawrence, 1967. Figs 391, 400–409

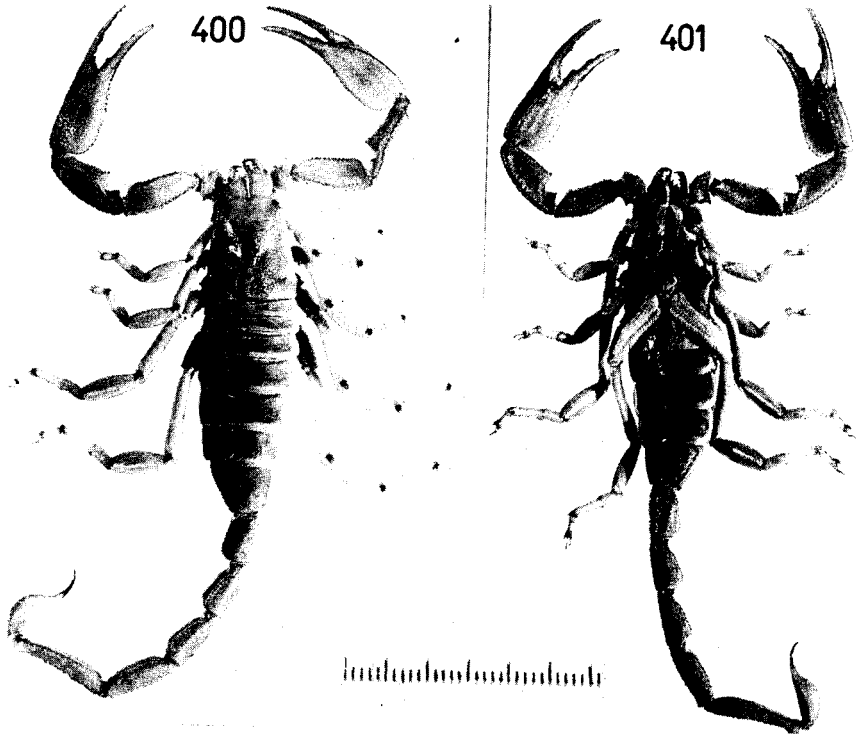
Opisthophthalmus chrysites Lawrence, 1967: 13–16.

Diagnosis: O. chrysites is most closely related to *O. wahlbergi* but can be separated from it and other species of the genus on the following combination of characters: carapace anterior and median ocular furrows without sutures; lc/x ratio falling between 1,85–1,95. Upper surface of pedipalp handback granular. Pedipalp tibia with 20–23 *e* τ and 7–9 *v* τ.

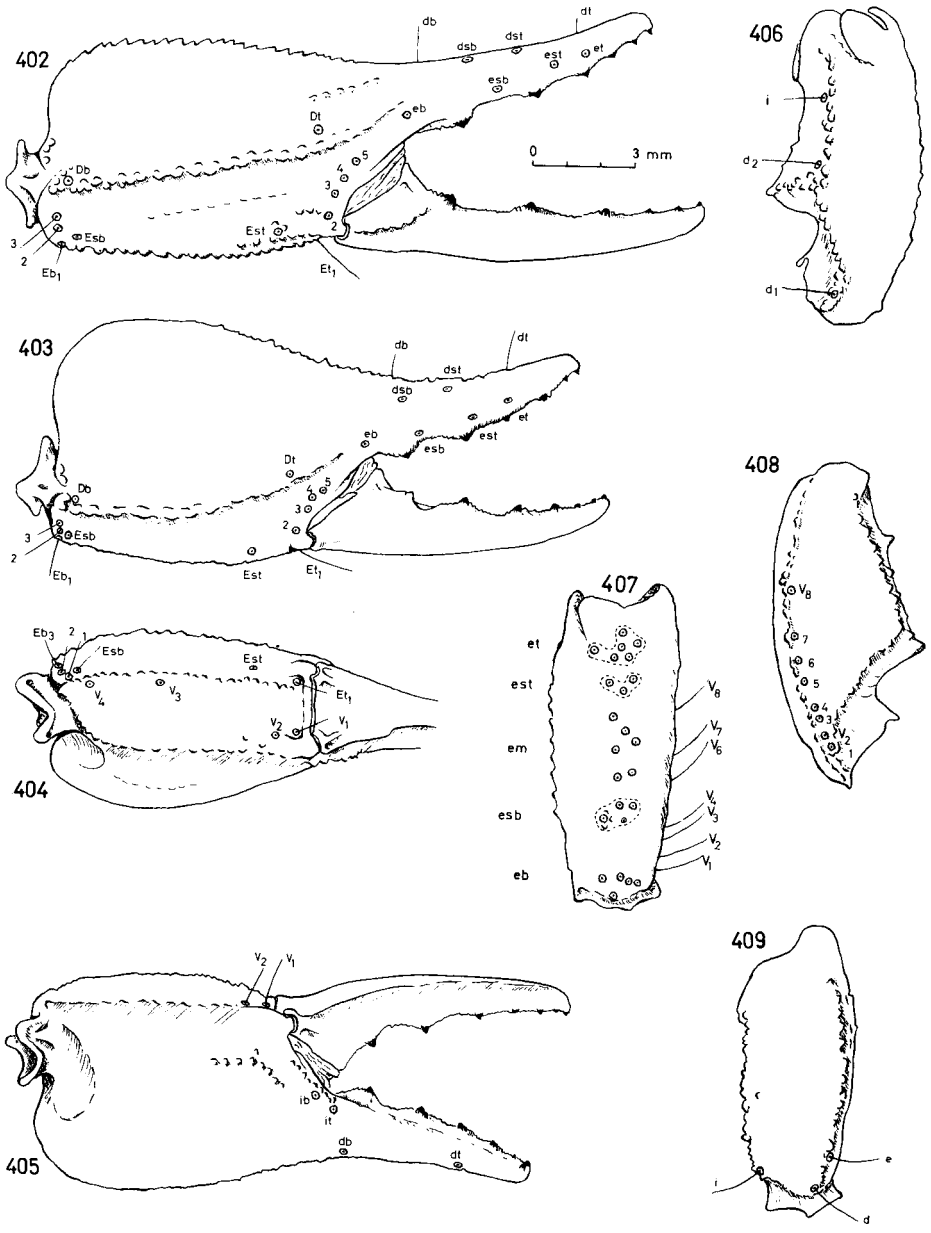
Description: The following account supplements Lawrence's (1967: 13–16) comprehensive original description and Table 6.

Trichobothria: As in Figs 402–409. Neobothriotaxic for group C with external τ of tibia varying from 20–23 and ventral τ from 7 to 9. τ d_2 of tibia distinctly closer to *i* than d_1.

Hemispermatophore: As in Fig. 391. Differing diagnostically from that of *O. wahlbergi* (Figs 527–528) in shapes and sizes of hook notch, distal lamina, basal



Figs 400–401. *Opisthophthalmus chrysites*, ♂ lectotype (TM 9437). Scale in mm.



Figs 402–409. *Opisthophthalmus chrysites*. 402, ♂ lectotype (TM 9437), right hand, outer aspect; 403–409, ♀ paralectotype (TM 9438); 403–405, right hand; 403, outer aspect; 404, ventral aspect; 405, inner aspect; 406–408, right pedipalp tibia; 406, dorsal aspect; 407, outer aspect; 408, ventral aspect; 409, right pedipalp femur, dorsal aspect.

portion and foot. In addition the following percentages are diagnostic for *O. chrysites* (NM 11092):

1. ha → w distance × 100/dcr → w distance = 28,1%
2. ha → bsh distance × 100/ha → w distance = 46,4%
3. ha → bsh distance × 100/dcr → bsh distance = 15,1%

Variation: Sexual dimorphism: Only four adult specimens of this species (2 ♂, 2 ♀) have been collected to date. Of these, 2 ♂ and 1 ♀ were examined. The males differ from the female in the following characters: ♂ trunk is more slender with width sternite V/carapace length ratios 0,88–0,90 for ♂ and 1,00 for ♀; ♂ tergites finely shagreened, ♀ smooth and shiny; median one-third of sternites VI and VII and ventral surface of cauda I transversely wrinkled in ♂, smooth and shiny in ♀; ♂ pedipalp chela fingers longer than ♀ with length movable finger/handback length ratios 1,29–1,32 in ♂ and 1,18 in ♀; first proximal middle lamella of each pecten with mesial margin obtusely angular and bearing teeth along entire length of posterior margin of pecten in ♂, in ♀ shallowly convex and with proximal half of pectinal posterior margin devoid of teeth; ♂ with 20–23 and ♀ 12 teeth per pecten.
Intraspecific variation: No variation in the material studied.

Measurements: Maximum recorded body lengths in adult ♂ 8,1 cm (carapace 10,8 mm) of adult ♀ 7,1 cm (carapace 10,5 mm).

Type material: The type series consists of 1 ♂ and 1 ♀ syntypes. The ♂ (TM 9437) is hereby selected as the lectotype of *Opisthophthalmus chrysites* and the ♀ (TM 9438) as paralectotype. These types are in the collection of the Transvaal Museum, Pretoria.

Material examined: ♂ lectotype and ♀ paralectotype, 30 miles NW of Ouhandjo, Kaokoveld, South West Africa, May 1966, W. Haacke (TM 9437 and 9438). 1 ♂, 6 km from Hoanib River mouth, 28 Mar 1976, B. Lamoral (NM 11092).

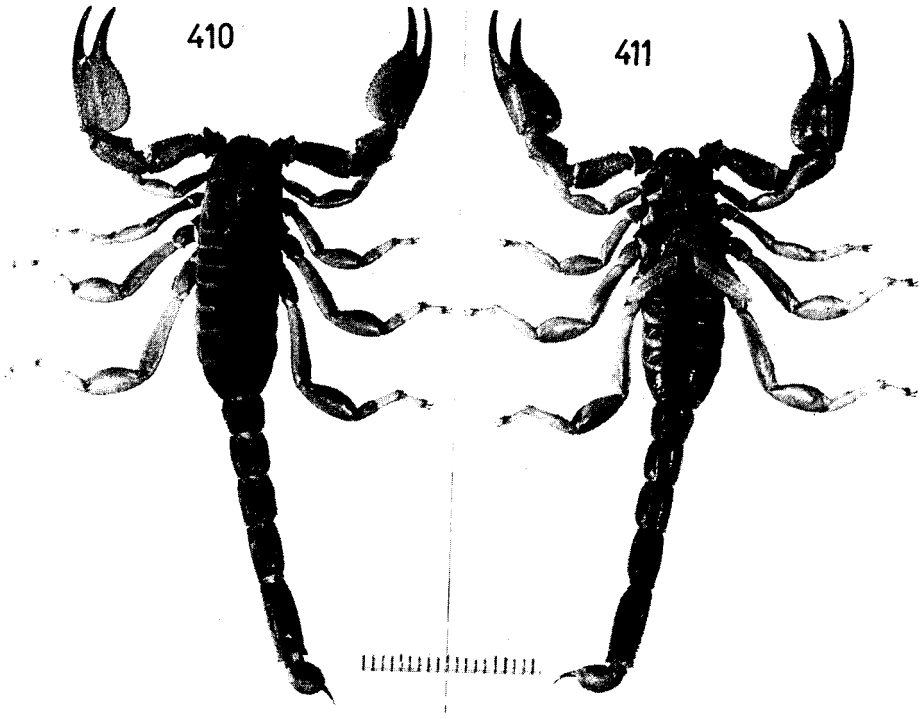
Distribution: Kaokoveld and Skeleton Coast Park in north-western Namibia.

Bionomics: The only specimen personally collected was dug out of a burrow at the side of a small sand dune with surface hardness ranging from categories III–IV (Table 2). The known localities fall within areas of vegetation types 1 and 5 (Fig. 4). *O. chrysites* is hemiedaphic and presumably nocturnal. Its habitat and habitus indicate that it is a psammophilous species.

Opisthophthalmus coetzeei sp. n. Figs 348, 410–417, 427

Derivation: Named in honour of Mr C. G. Coetzee, Director of the State Museum in Windhoek.

Diagnosis: O. coetzeei can be separated from other species of the genus on the following combination of characters: Carapace Fig. 348: anterior median furrow with longitudinal and anterior bifurcating sutures present but poorly discernible; median ocular furrow with longitudinal suture present but visible only on ventral side of dissected carapace. Pedipalp chela as in *O. opinatus*. Pedipalp tibia: τ d_2 distinctly closer to i than d_1. Telson vesicle: as in *O. opinatus* but with posterior



Figs 410–411. *Opisthophthalmus coetzeei* sp. n., ♂ holotype (NM 10627). Scale in mm.

upper lateral surfaces with spiniform granules including numerous minute spicules. *O. coetzeei* is much smaller than *O. opinatus*, its most closely related species.

Description: The type series consists of several males and two females. The following description is based on the holotype ♂, unless otherwise indicated, and supplements Table 6.

Granulation: Following surfaces distinctly granular: upper and outer pedipalp handback; pedipalp tibia, externally; pedipalp femur, anteriorly and dorsally; entire carapace (in ♀ paratypes, interocular surface only lightly to obsoletely granular); telson vesicle, ventrally and laterally. The following surfaces are sparsely granular: inner pedipalp handback; cauda I–V, dorsal and upper lateral intercarinal surfaces (in ♀ these virtually smooth); cauda IV and V, ventrally. Tergites I–VI entirely finely shagreened (in ♀ smooth and shiny); tergite VII, finely shagreened medially, granular laterally (in ♀ smooth medially, lightly granular laterally). Sternites III–VII and all other body surfaces smooth.

Colour: Tergites dark yellowish brown No. 78, with a moderate orange yellow No. 71 border on posterior and lateral margins. Telson vesicle and legs I–IV moderate orange yellow No. 71. Genital operculum and pectines pale orange yellow No. 73. Cheliceral fingers and distal dorsal portion of each handback

melanous, remaining dorsal surface of handback with melanous reticulations. Movable and fixed fingers of pedipalp chela and telson aculeus dark yellowish brown No. 78. All other surfaces dark orange yellow No. 72.

Pedipalps: Handback: finger keel strongly costate granular throughout; upper surface with two longitudinal granular accessory keels; outer surface with one longitudinal granular accessory keel; outer ventral keel predominantly granular; inner ventral keel broadly costate (these accessory keels almost obsolete in ♀).

Carapace: Median eyes nearly medial, with lc/x ratio 1,90 in holotype and a range of 1,86–1,94 in ♂ and ♀ paratypes.

Legs: Telotarsi I & II with 3 short spine-like setae on posterior margin. Telotarsi III & IV with a ventral anterior row of 2 spine-like setae and a ventral posterior row of 5 spine-like setae. Lateral claws short, distinctly curved and of equal length. Telotarsal median dorsal lobes much shorter than lateral lobes.

Cauda: See Table 6. Dorsal keels obsolete to shallowly granular with distal spine only slightly larger than penultimate ones. Telson aculeus short and only slightly curved.

Pectines: 18–19 teeth. In paratypes ♂ with 17–21 and ♀ 12–14 teeth per pecten.

Setation: Pedipalps, legs, lateral and posterior margins of sternites III–VII and caudal segments moderately pilose. Pedipalp chela and telson more distinctly pilose than above surfaces.

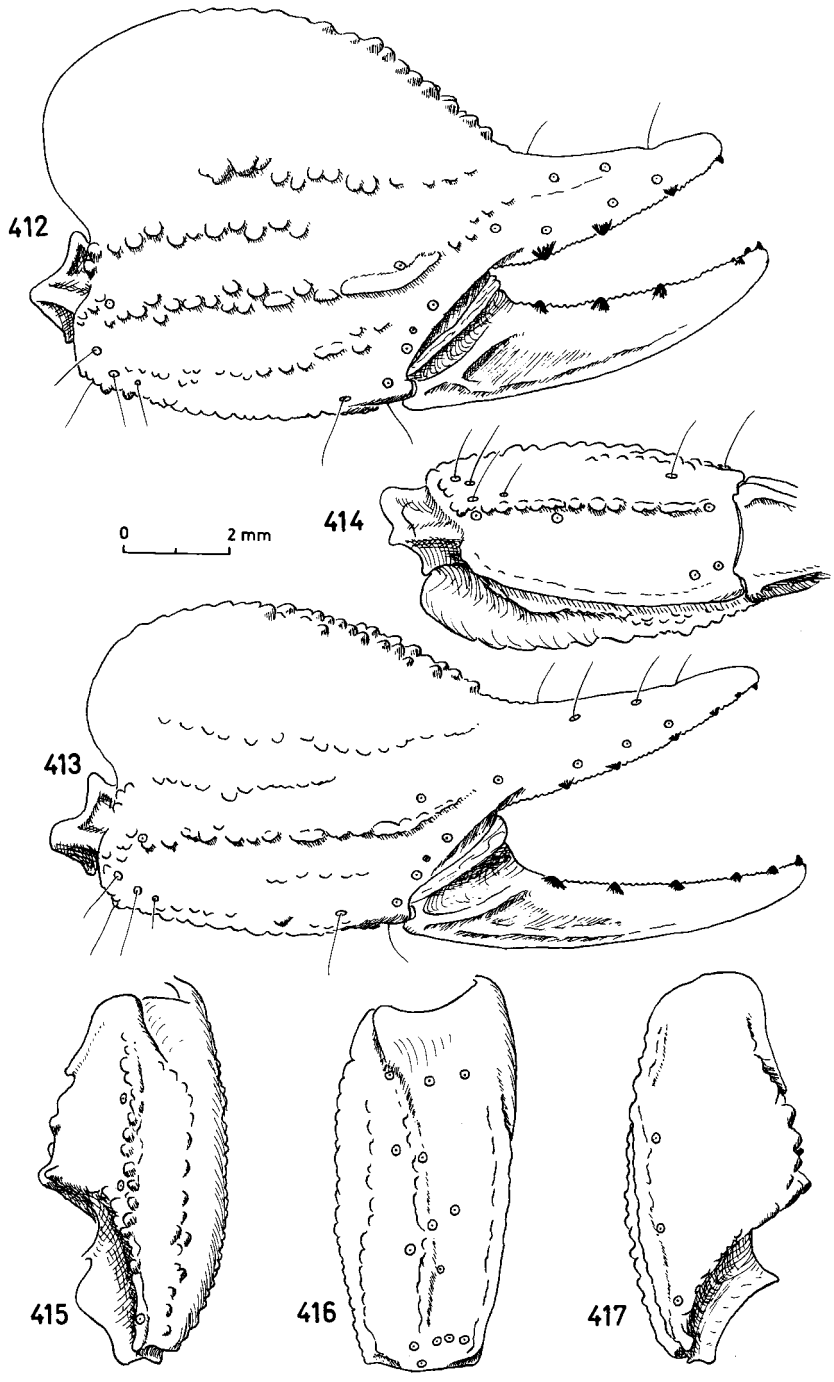
Trichobothria: As in Figs 412–417 (+1) neobothriotaxic for group C with 14 external τ on tibia. Chela: τ *est* proximal to *dst*; distance *est–esb* approximately equal to *esb–eb*; τV_3 situated in proximal half of ventral surface; τEt_4 small, nearly in line with *Et* series and closer to Et_3 than Et_5. Tibia: τd_2 closer to *i* than d_1; τv_2 nearly equidistant from v_1 and v_3. These character states apply also to ♀ and ♂ paratypes.

Hemispermatophore: As in Fig. 427. The following percentages apply to hemispermatophores of a paratype ♂:

1. ha → w distance × 100/dcr → w distance = 25,5%
2. ha → bsh distance × 100/ha → w distance = 34,5%
3. ha → bsh distance × 100/dcr → bsh distance = 10,5%

These percentages vary quite considerably from those of sympatric populations of *O. opinatus*.

Variation: Sexual dimorphism: Holotype and paratypes. Adult males differ from females in the following characters: ♂ trunk proportionately smaller and more slender with width sternite V/carapace length ratios 0,89 (0,86–0,92) for ♂ and 1,11 & 1,12 for the two ♀ paratypes; ♂ cauda approximately 35% longer than trunk length, in ♀ approximately equal while total body length is usually only slightly greater in ♀; pedipalp handback of ♂ narrower and fingers longer than ♀ with width handback/carapace length ratios 0,66 (0,63–0,68) in ♂ and 0,77 & 0,78 in ♀ and length movable finger/handback length ratios 1,32 (1,30–1,35) in ♂ and 1,17 & 1,19 in ♀; first proximal middle lamella of each pecten with mesial margin strongly curved to angular and with pectinal teeth along entire posterior margin of pecten in ♂, very shallowly curved and with proximal one-quarter of posterior margin of pecten devoid of teeth in ♀; ♂ genital operculum suboval in outline, ♀



Figs 412–417. *Opisthophthalmus coetzeei* sp. n. 412, ♀ paratype (NM 10795) right hand, outer aspect; 413–417, ♂ holotype (NM 10627); 413–414, right hand; 413, outer aspect; 414, ventral aspect; 415–417, right pedipalp tibia; 415, dorsal aspect; 416, outer aspect; 417, ventral aspect.

subcordate; ♂ with 17–21 and ♀ 12 & 14 teeth per pecten; overall colour of ♂ lighter than ♀.

Intraspecific variation: Males and females from the central Namib gravel plains are lighter in overall colour than those from further inland.

Type material: Holotype ♂ in Natal Museum collection. Paratypes: in Natal Museum, Transvaal Museum and State Museum as indicated in the list of material examined.

Material examined: ♂ holotype, Bloedkoppie, Namib Desert Park, 8 Feb 1972, B. Lamoral (NM 10627). Paratypes: ♂, Ganab, Namib Desert Park, 3 Feb 1972, W. Goussard (NM 10690); 1 ♂, Narib, 9 Mar 1976, B. Lamoral (NM 10796); 1 ♀, 2 subad ♂, Narib, 10 Mar 1976, B. Lamoral (NM 10795); 1 juv ♀, Klein Aub, 11 Mar 1976, B. Lamoral (NM 10797); 1 ♂, Valencia (TM 9652); 1 ♀, Gorob mine, 29 May 1965, W. Haacke (TM 9305); 1 ♂, Gobabeb, 28 Feb 1975, S. Endrödy Younga (TM 11102).

Distribution: Western central and central regions of Namibia.

Bionomics: O. coetzeei digs shallow burrows to depths of 10–15 cm in soils with hardness ranging from categories V–VI (Table 2). Burrow entrances are situated at the side of large stones or rocks. See bionomics of *O. opinatus* for one exception to this at farm Klein Aub 350 and for sympatry with this species. In the central Namib gravel plains a few specimens were found in shallow scrapes under rocks on soils with hardness ranges well above category VII. The distribution range of *O. coetzeei* includes vegetation types 2, 4 and western parts of 8 (see Fig. 4). *O. coetzeei* is nocturnal and hemiedaphic.

Remark: There are only a few morphological criteria separating *O. coetzeei* from *opinatus*, but the occurrence of these differences in sympatric populations of the two species serves to confirm their non-conspecificity.

Opisthophthalmus concinnus Newlands, 1972*b*. Figs 418–426, 428

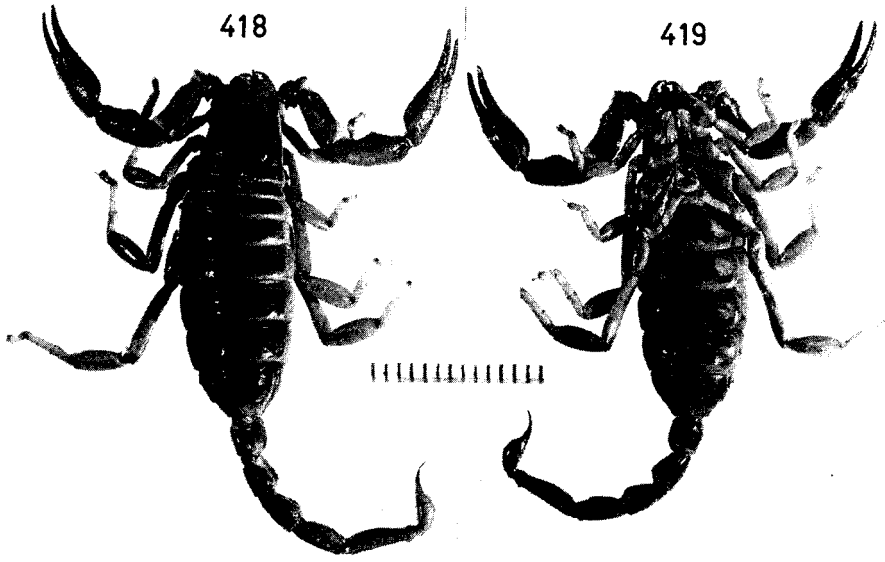
Opisthophthalmus concinnus Newlands, 1972*b*: 241–243.

Diagnosis: O. concinnus is most closely related to *O. pygmaeus* but can be separated from it and other species of the genus on the following combination of characters. Carapace: anterior and median ocular furrows without sutures; lc/x ratio falling between 2,05–2,15. Pedipalp chela with 4 *V* τ. Pedipalp tibia with 21–24 *e* τ and 10–13 *v* τ. Leg telotarsi with median dorsal lobe length at least equal to that of lateral lobes.

Description: The following account supplements Newlands' (1972*b*: 241–243) comprehensive original description and Table 6.

Trichobothria: As in Figs 420–426. Neobothriotaxic for group C with external τ of tibia varying from 24 to 28 and ventral τ from 9 to 13. τd_2 of tibia approximately equidistant from d_1 and i, and distinctly dorsal in position.

Hemispermatophore: As in Fig. 428. Differing diagnostically from that of *O. pygmaeus* (Fig. 544) in shape and size of distal lamina, hook notch and distal crest of median lobe. In addition the following percentages are diagnostic for *O. concinnus* (NM 11108):



Figs 418–419. *Opisthophthalmus concinnus*, ♀ paratype (TM 8796). Scale in mm.

1. ha → w distance × 100/dcr → w distance = 22,8%
2. ha → bsh distance × 100/ha → w distance = 38,6%
3. ha → bsh distance × 100/dcr → bsh distance = 10,3%

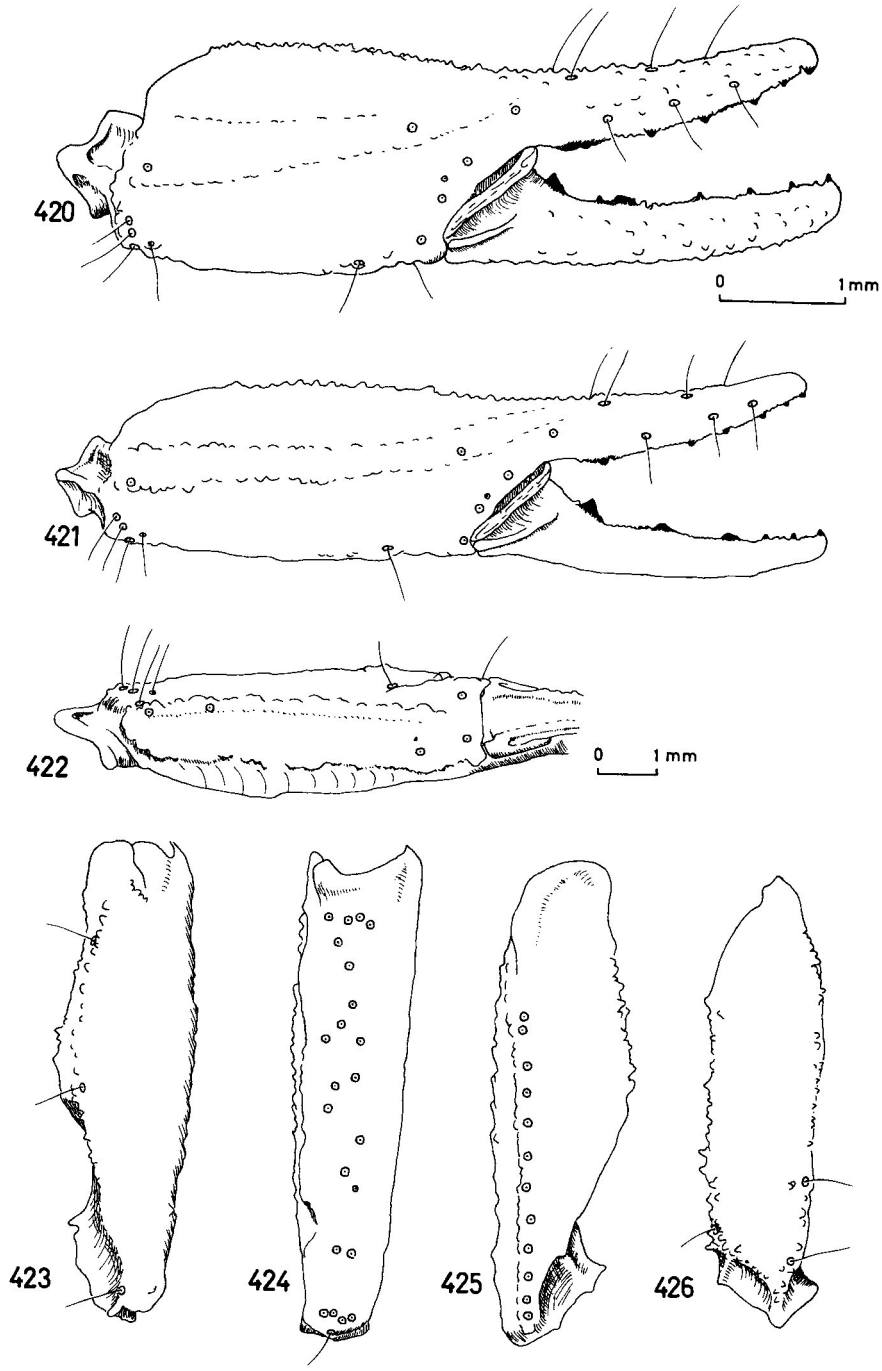
Variation: Sexual dimorphism: In adults, males differ from females in the following characters: ♂ trunk is more slender with width sternite V/carapace length ratios 0,85–0,87 for ♂ and 0,98–1,00 for ♀; ♂ tergites finely shagreened, ♀ smooth and shiny; ♂ pedipalp chela handback longer than ♀ with length movable finger/handback length ratios 0,88–0,92 in ♂ and 1,20 in ♀ while movable finger length is proportionally 7 to 9% longer in ♂; ♂ pedipalp femur and tibia 33–35% and 28–30% longer respectively in specimens with identical carapace lengths; pectines of ♂ very long, projecting beyond trochanter IV, with 24–28 teeth per pecten; pectines of ♀ very short, not projecting beyond two-thirds of coxa IV, with 4–7 teeth per pecten; first proximal middle lamella of each pecten with mesial margin sharply angular and bearing teeth along entire length of posterior margin of pecten in ♂, in ♀ sublinear and with proximal half of pectinal posterior margin devoid of teeth.

Intraspecific variation: No distinctive variation in the material studied.

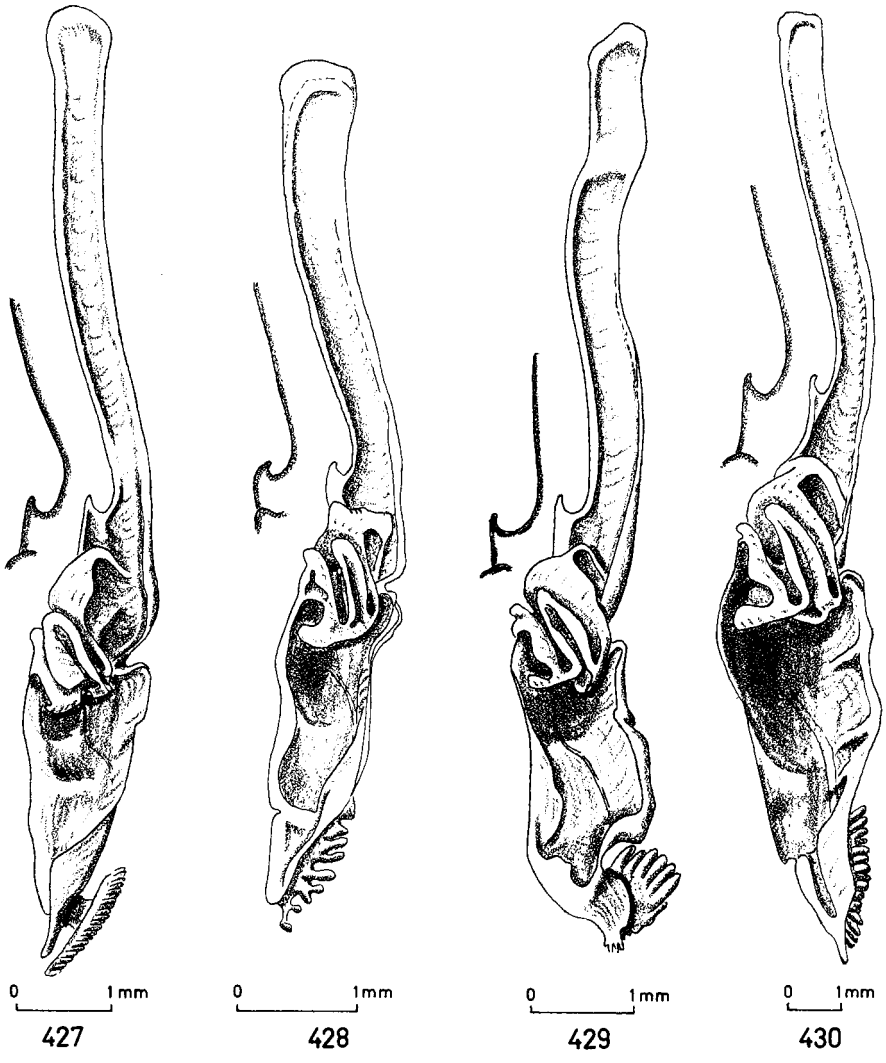
Measurements: Maximum recorded body length in adult ♂ 5,0 cm (carapace 7,2 mm) in adult ♀ 4,9 cm (carapace 7,2 mm).

Type material: The type series consists of 1 ♂ holotype (TM 9580), 2 ♂ 3 ♀ paratypes (TM 8796, 9581, 9582, 9506, 9908) all deposited in the Transvaal Museum.

Material examined: ♂ holotype, Groot Aarpan farm, Gordonia District, Cape Province, 12 Feb 1970, L. Coons (TM 9580). Paratypes: 1 ♀, Kwang Pan, Nossob



Figs 420–426. *Opisthophthalmus concinnus*. 420, ♀ (NM 10360) right hand, outer aspect; 421–426, ♂ holotype (TM 9580); 421–422, right hand; 421, outer aspect; 422, ventral aspect; 423–425, right pedipalp tibia; 423, dorsal aspect; 424, outer aspect; 425, ventral aspect; 426, right pedipalp femur, dorsal aspect. *Scales:* 420, upper right; 421–426, middle right.



Figs 427–430. *Opisthophthalmus* species, ventral aspect of right hemispermatophore with hook notch also shown in lateral outline; 427, *O. coetzeei* sp. n. paratype (NM 10690); 428, *O. concinnus* (NM 11108); 429, *O. fitzsimonsi* (NM 11109); 430, *O. flavescens* (NM 10623).

River, Botswana, 19 May 1956, V. FitzSimons (TM 8796); 1 subad ♂ Leeudril, Botswana, 3 Feb 1970, W. Haacke (TM 9582); 1 subad ♂, Leeudril, Botswana, 4 Feb 1970, H. Brown (TM 9581); 1 subad ♀, Kameelsleep, Kalahari Gemsbok National Park, 6 June 1970, R. Huey (TM 9908); 1 subad ♀ (not ♂ as stated by Newlands, 1972: 242), Leeudril, 28 Nov 1969, L. Coons (TM 9506). The following non-types: 1 ♂, Union's End, Kalahari Gemsbok Park, Park Staff (NM 11108); 3 ♀, Mata Mata, Kalahari Gemsbok Park, Park Staff (SAIMR 912–913, 915); 1 ♀, Swartmodder farm, Cape Province, 15 Apr 1970, B. Lamoral (NM 10360); 2 juv ♂, id., 26 Feb 1973, B. Lamoral (NM 10363); 1 juv ♀, 5 km North of Mata Mata, Kalahari Gemsbok Park, 25 Apr 1970, B. Lamoral (NM 10362); 1 juv ♂, Moravet, Kalahari Gemsbok Park, 24 Apr 1970, B. Lamoral (NM 10361).

Distribution: South-western Botswana and Kalahari Gemsbok Park in South Africa. Although no specimens have as yet been recorded from Namibia its association with the Kalahari sand system in the above regions strongly indicates that it is only a matter of time before specimens are collected from the Kalahari sands in the south-eastern region of Namibia.

Bionomics: Specimens personally collected were found either resting on sandy surfaces at night, or under small rocks and small logs on sand with surface hardness ranging from categories III–IV (Table 2). It is not known yet whether this species also burrows. The known localities fall within an area of vegetation type 13 (Fig. 4). *O. concinnus* is hemiedaphic and nocturnal. Its habitat and habitus indicate that it is a psammophilous species.

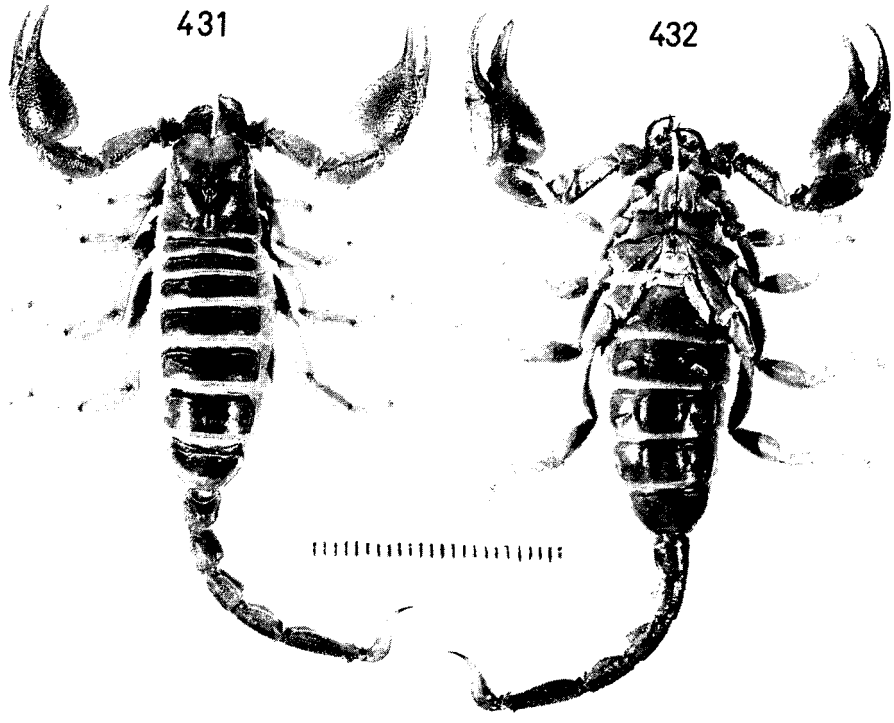
Opisthophthalmus fitzsimonsi Hewitt, 1935, **stat. n.** Figs 351, 429, 431–432, 483
Opisthophthalmus intercedens fitzsimonsi Hewitt, 1935: 47.

Diagnosis: O. fitzsimonsi is most closely related to *O. intercedens* but can be separated from it and other species of the genus on the following combination of characters. Carapace Fig. 351: anterior median furrow with longitudinal suture distinct, anterior bifurcating suture obsolete; median ocular furrow with longitudinal suture obsolete. Pedipalp chela, outer ventro-lateral keel predominantly costate. Cauda V: ventral surface with unevenly distributed granules; ventral keel distinct and granular. Sternites III–VII and ventral surfaces of cauda I–III smooth in ♀ & ♂.

Description: The following description supplements Hewitt's (1935: 47) original description and Table 6.

Granulation: As for *O. intercedens*, with granulations in ♂ slightly more pronounced. This applies particularly to the interocular surface of ♂ which is lightly to moderately granular in anterior half and smooth in posterior half, just anterior to the median eyes.

Colour: Pedipalps and carapace varying from deep brown No. 56 to strong brown No. 55; anterior three-quarters of tergites brown black No. 65 to dark grayish brown No. 62; cauda strong brown No. 55; caudal keels or their normal emplacement if keels are absent, infuscated; legs and pectines strong yellowish brown No. 74; pedipalp chela fingers dark reddish brown No. 44 to brown black



Figs 431–432. *Opisthophthalmus fitzsimonsi*, ♀ (NM 10077). Scale in mm.

No. 65; chelicerae handback, anterior margin of dorsal surface blackened, remaining portion with light infuscated reticulations.
Carapace: See Table 6.
Pedipalps: As for *intercedens* but with outer ventral keel of handback distinctly costate. Length movable finger/length handback ratios 1,34 (1,30–1,37) for ♂ and ♀. Width handback/carapace length ratios 0,69 (0,66–0,70) for ♂ and ♀.
Cauda: As in Table 6 and diagnosis.
Pectines: ♂ with 11–14 and ♀ 9–12 teeth per pecten.
Setation: As for *O. lornae*.
Trichobothria: In ♂ as illustrated for *O. lornae* in Figs 504–510 and in ♀ as illustrated for *O. intercedens* in Figs 477–481, with the exception of the tibia dorsal series in which $\tau\, d_2$ is approximately equidistant from i and d_1 in *fitzsimonsi*. (+1) neobothriotaxic for group C with 14 external τ on tibia.
Hemispermatophore: As in Fig. 429. Distal lamina long and sub-apical lateral margin of hook (salmh) very short. Percentages of distances of hook apex (ha) to other structures in relation to various sets of distances as follows:

1. ha → w distance × 100/dcr → w distance = 25,0%
2. ha → bsh distance × 100/ha → w distance = 8,8%
3. ha → bsh distance × 100/dcr → bsh distance = 10,4%

Percentage 2 differs quite considerably from that obtained for *O. lornae* while 1 and 3 are fairly similar.

Variation: Sexual dimorphism: In adults, males differ from females in the following characters: while there is little size difference, ♂ trunk is more slender with width sternite V/carapace length ratios 0,96 (0,91–1,00) for ♂ and 1,20 (1,15–1,26) for ♀; ♂ tergites finely shagreened, ♀ smooth and shiny; first proximal middle lamella of each pecten with mesial margin shallowly curved (occasionally shallowly angular in some ♂) and with proximal one-quarter of posterior margin of pecten devoid of teeth in ♂ and ♀. ♂ with 11–14 and ♀ 8–12 teeth per pecten. In all other characters ♂ differ little from ♀.
Intraspecific variation: Specimens in the northern regions of the known species range are darker in overall colour and the keels of cauda I–V on their normal emplacements are more strongly infuscated.

Measurements: Maximum recorded adult body lengths of ♂ 6,3 cm (carapace 9,8 mm) of ♀ 6,8 cm (carapace 10 mm).

Type material: The type series consists of a ♂ holotype (TM 5478) ♂ paratype (TM 5558) and subadult ♀ paratype (TM 5482) which are in good condition and are deposited in the Transvaal Museum collection.

Material examined: Holotype ♂, Gemsbok Pan, Botswana, Vernay Lang Kalahari Expedition (TM 5478); Paratype subad ♀, Gemsbok Pan, Botswana, Vernay Lang Kalahari Expedition (TM 5482); Paratype ♂, Gemsbok Pan, Botswana, Vernay Lang Kalahari Expedition (TM 5558). 1 ♀, Okahandja, 13–14 Mar 1969, B. Lamoral (NM 10073); 2 ♂, Hoasas 12 Mar 1969, B. Lamoral (NM 11083); 3 ♀ 2 juv ♀, Portsmut, 7 Feb 1969, B. Lamoral (NM 10077); 1 ♂, Richthofen, 23–26 Jan 1975 (SMN 553); 2 ♂, Richthofen, 4–31 Jan 1975 (SMN 551); 5 ♂ 9 ♀ 1 subad ♂ 2 subad ♀, Kuke Pan, Botswana (TM 5459–5475); 1 subad ♂, Gaberones, Botswana (TM 5476); 1 ♂, Kuke Pan (TM 5477); 1 subad ♀, Kuke Pan (TM 5479); 1 subad ♀, Kaotwe Pan, Botswana (TM 5480); 1 ♂ Kuke Pan (TM 5481); 1 ♂, Kuke Pan, (TM 5780); 5 ♀ 1 subad ♀ 1 subad ♂, Kuke Pan (TM 5788–5794).

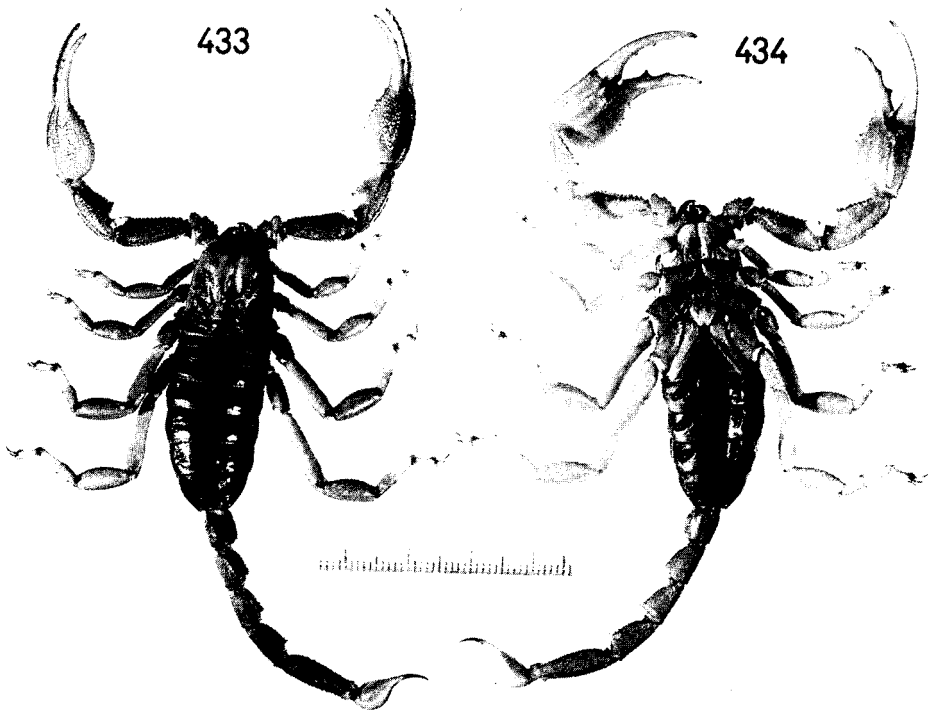
Distribution: Central and eastern regions of Namibia (Fig. 483) with vegetation types 7, 8 and 12 (Fig. 4) and Botswana.

Bionomics: Specimens collected in Namibia were dug out of burrows 10–15 cm deep in fairly hard soils with surface hardness ranging from categories VIII–X (Table 2). Burrow entrances are usually situated in open ground, near the base of grass tufts and occasionally at the side of stones or rocks. *O. fitzsimonsi* was found to be sympatric with *carinatus* in the Hakos mountains. The distribution range of *fitzsimonsi* falls within vegetation types 7, 8 and 12 (see Fig. 4). *O. fitzsimonsi* is nocturnal and hemiedaphic.

Opisthophthalmus flavescens Purcell, 1898. Figs 349, 430, 433–440

Opisthophthalmus flavescens Purcell, 1898: 7–9.

Diagnosis: O. flavescens is most closely related to *O. penrithorum*, but can be separated from it and other species of the genus on the following combination of characters. Carapace: anterior and median ocular furrows without sutures; lc/x



Figs 433–434. *Opisthophthalmus flavescens*, ♀ (NM 10641). Scale in mm.

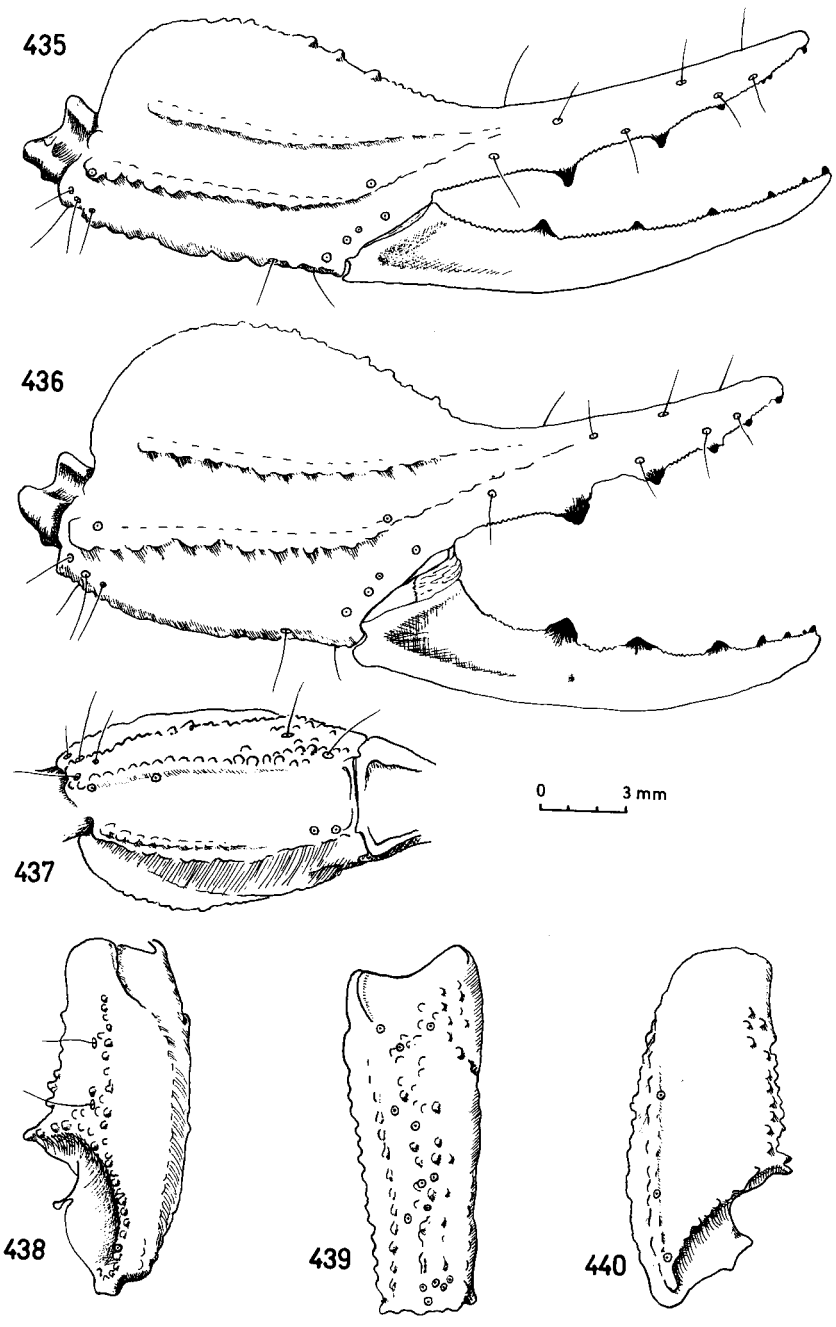
ratio falling between 1,50 to 1,60 (Fig. 349). Upper surface of pedipalp handback reticularly granular. Pedipalp tibia with 14 *e* τ and 3 *v* τ. Chelicerae chelae distinctly infuscated.

Description: The following account supplements Purcell's (1898: 7–9) comprehensive original description, Kraepelin's (1908: 267) supplement and Table 6. Trichobothria: As in Figs 435–440. (+1) neobothriotaxic for group C with 14 external τ on tibia. Pedipalp tibia Fig. 438, with τ d_2 distinctly closer to τ *i* than d_1.

Hemispermatophore: As in Fig. 430. Differing diagnostically from that of *penrithorum* (Fig. 526) in shapes and sizes of hook notch, distal lamina, basal portion and foot. In addition the following percentages are diagnostic for *O. flavescens:*

1. ha → w distance × 100/dcr → w distance = 33,5% (33,0–34,0%)
2. ha → bsh distance × 100/ha → w distance = 43,5% (43,0–44,0%)
3. ha → bsh distance × 100/dcr → bsh distance = 18,0% (17,5–18,5%)

Variation: Sexual dimorphism: In adults, males differ from females in the following characters: ♂ trunk more slender with width sternite V/carapace length ratios 0,90 (0,87–0,93) for ♂ and 1,00 (0,98–1,03) for ♀; ♂ tergites finely shagreened, ♀ smooth and shiny; ♂ pedipalp chela fingers longer than ♀ with length movable finger/handback length ratios 1,75 (1,72–1,78) in ♂ and 1,55 (1,52–1,58)



Figs 435–440. *Opisthophthalmus flavescens*. 435, ♂ (NM 10594) right hand, outer aspect; 436–440, ♀ (NM 10641); 436–437, right hand; 436, outer aspect; 437, ventral aspect; 438–440, right pedipalp tibia; 438, dorsal aspect; 439, outer aspect; 440, ventral aspect.

in ♀; ♂ pedipalp handback narrower than ♀ with width handback/carapace length ratio 0,52 (0,50–0,54) in ♂ and 0,67 (0,64–0,70) in ♀; first proximal middle lamella of each pecten with mesial margin sharply angular and bearing teeth along entire length of posterior margin of pecten in ♂, in ♀ shallowly convex and with proximal one-fifth of pectinal posterior margin devoid of teeth; ♂ with 33–39 and ♀ 21–25 teeth per pecten.

Intraspecific variation: No important variation in the material studied.

Measurements: Maximum recorded body lengths of adult ♂ 9,6 cm (carapace 14 mm) of ♀ 9,3 cm (carapace 16 mm).

Type material: Purcell's ♀ holotype was deposited in the collection of the South African Museum in Cape Town. A thorough search of the collection failed to yield the type and a letter from Mr E. Eastwood who was in charge of the collection confirmed that the type is to be considered as lost. The loss of Purcell's type has therefore been established beyond reasonable doubt and the following specimen is hereby designated as neotype of *Opisthophthalmus flavescens:* 1 ♀, Koichab River banks (26°13'S, 16°05'E), Lüderitz District, 10 February 1973, B. H. Lamoral (NM 11111). It is deposited in the type collection of the Natal Museum.

Material examined: 1 ♂ 1 ♀, Sesriem 137, 5–8 Apr 1972, M-L. P. (SMN 352); 1 ♀, Zuidrivier, Feb 1971, B. Lamoral (NM 10606); 2 ♀, Koichab River bed, 9–12 Feb 1973, B. Lamoral (NM 10641); 1 ♂, Meob Bay Camp, Mar 1973, C. Coetzee (NM 10623); 1 juv ♂, Gobabeb, Dec 1963, C. Koch (NM 9059); 1 ♂, Aandster farm, 16 Feb 1974, M. Irwin (NM 10594); 1 juv ♂, Bushman's Paradise, June–July 1969, C. Coetzee (SMN 238); 1 juv ♀, Namib, 5 Mar 1960, P. Buys (SMN 147); 1 ♀, Gobabeb, Nov 1969, Mathews (TM 9999); 1 ♂, Rooikop, 25 Apr 1969, H. Swanepoel (TM 9358); 1 subad ♂, Zuidrivier, Namib Desert Park, 29 Feb 1972, B. Lamoral (NM 10818); 1 subad ♀, Aandster 147, 6 Mar 1976, B. Lamoral (NM 10793); ♀ neotype designated above.

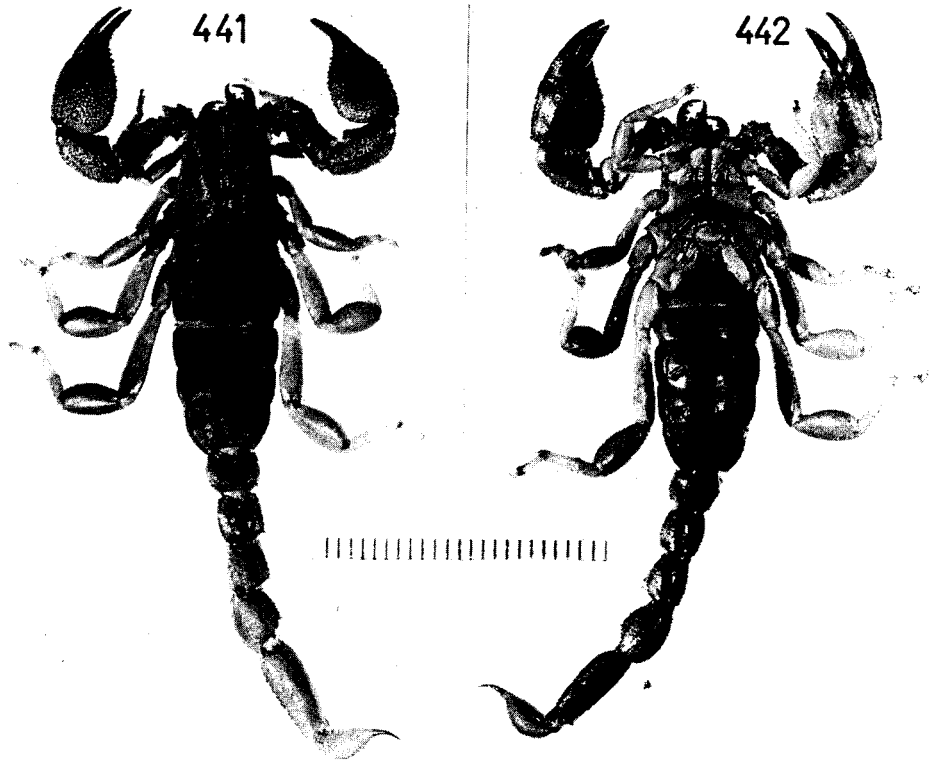
Distribution: Namib sand dune system within region with vegetation type 3 as shown in Fig. 4.

Bionomics: O. flavescens is nocturnal, hemiedaphic and digs 30 to 50 cm deep burrows at the side of small to large consolidated sand dunes with surface hardness ranging from categories IV–V (Table 2). Its habitat and habitus indicate that it is a psammophilous species. The known localities fall within areas of vegetation type 3 (Fig. 4). *O. flavescens* is sympatric with *O. holmi* within this distribution range.

Opisthophthalmus gibbericauda sp. n. Figs 356, 441–448

Derivation: Gibber (L.) = humped, swollen + cauda f. (L.) = tail.

Diagnosis: No sister species being available to *O. gibbericauda*, it has been found to be most closely related to the *opinatus–coetzeei* sister group. *O. gibbericauda* can be separated from this group and other species of the genus on the following combination of characters. Carapace, Fig. 356: anterior median furrow with a short longitudinal suture and anterior bifurcating suture indistinct;



Figs 441–442. *Opisthophthalmus gibbericauda* sp. n., ♂ holotype (NM 11068). Scale in mm.

longitudinal suture of median ocular furrow indistinct. Cauda IV: ventral and ventro-lateral keels absent; lateral profile of ventral surface arcuate, entire segment unusually globose.

Description: See also Table 6. The type series is composed of 7 ♂ 1 subadult ♀. The following description is based on the adult ♂ holotype, unless otherwise indicated.

Granulation: Upper and outer surfaces of pedipalp handback, upper and outer surfaces of pedipalp tibia and upper surface of femur distinctly and evenly granular; handback finger keel granular throughout and moderately prominent; upper inner marginal keel of handback composed of subspiniform granules; inner surface of handback with scattered large and small granules. Carapace, entire surface granular. Cauda: dorsal surface of I granular; dorsal surfaces of II–III lightly granular, of IV–V very lightly and unevenly granular; lateral and ventral surfaces of cauda V lightly and unevenly granular; proximal ventral half of telson vesicle surface moderately granular.

Colour: Pedipalp and carapace strong yellowish brown No. 74; pedipalp chela fingers strongly infuscated, anterior upper surface with reticulated infuscations, finger keel lightly infuscated. Carapace: lateral eyes and median eyes and ocular

tubercle strongly infuscated; median surface around ocular tubercle lightly infuscated. Tergites: anterior three-quarters of I–VI and anterior half of VII with partially reticulated infuscations, remaining surfaces strong yellowish brown No. 74. Cauda: I–III dark orange yellow No. 72, IV–V and telson moderate orange yellow No. 71. Sternites III–VII dark orange yellow No. 72. Legs moderate orange yellow No. 71. Pectines light orange yellow No. 70. Cauda II–IV with ventral and ventro-lateral keel emplacements and ventro-lateral keel of V lightly infuscated. Chelicerae: fingers partially strongly infuscated; anterior half of handback reticularly infuscated, remaining non-infuscated surfaces moderate orange yellow No. 71.

Pedipalps: Outer ventro-lateral keel of handback predominantly costate, inner ventro-lateral keel slightly costate.

Carapace: lc/x ratio 1,93 with median eyes nearly halfway between anterior and posterior margins.

Legs: Legs I and II: basitarsi posterior margin with 2 short spine-like setae, tibia posterior margin with a row of 3 very short spine-like setae. Also see Table 6.

Cauda: Entire cauda 15% longer than trunk. Cauda I ventral and ventro-lateral keels absent, dorsal keels obsolete, dorso-lateral poorly developed; II–IV, ventral and ventro-lateral keels absent, their emplacements indicated by a row of shallow punctations, dorsal and dorso-lateral keels poorly developed, distal granule of dorso-lateral keels moderately enlarged; cauda V, dorso-lateral keel indistinct, ventro-lateral keels composed of short spiniform granules, posteriorly convergent; ventral keel obsolete; anterior ventral surface of telson vesicle granular. Cauda IV unusually globose, with lateral profile of ventral surface arcuate.

Pectines: 7–8 teeth per pecten. First proximal middle lamina of each pecten with mesial margin obtusely angular and with proximal one-third of posterior margin of pecten devoid of teeth.

Sternum: Subpentagonal in outline, width subequal to length.

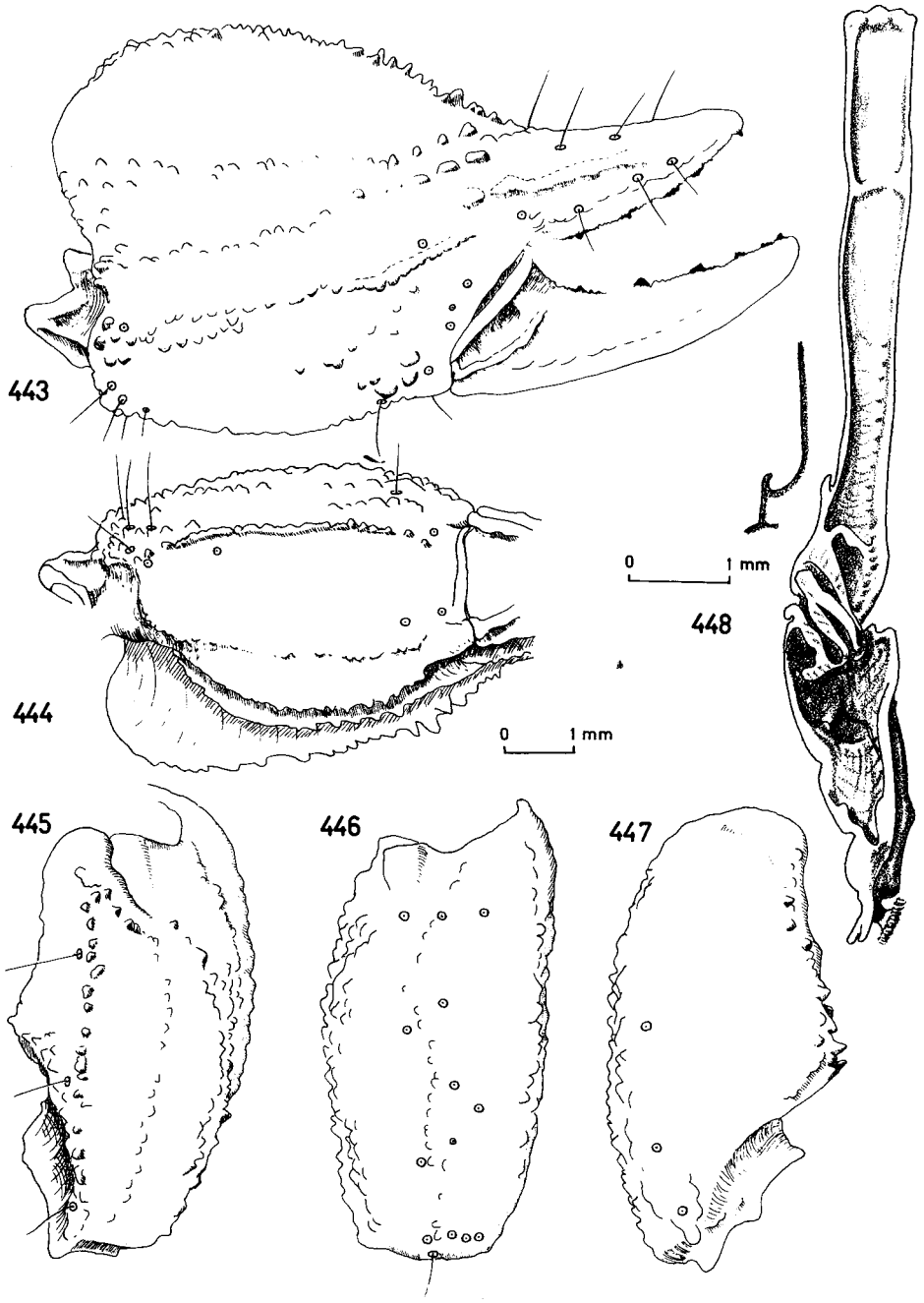
Setation: A moderately pilose species, with setation as for ♀ of *O. opinatus*.

Trichobothria: As in Figs 443–447. (+1) neobothriotaxic for group C with 14 external τ on tibia.

Hemispermatophore: As in Fig. 448. Differing diagnostically from that of *coetzeei* in the shape, length and size of the hook notch, distal lamina, basal portion and foot. Width of middle lamina unusually constricted in proximal median region. Percentages of distances of hook apex to other structures in relation to various sets of distances as follows for paratype (TM 10032):

1. ha→ w distance × 100/dcr → w distance = 24,0%
2. ha → bsh distance × 100/ha → w distance = 37,5%
3. ha → bsh distance × 100/dcr → bsh distance = 10,9%

Variation: Sexual dimorphism: Holotype and paratypes. Adult males differ from the subadult female in the following characters: ♂ trunk proportionally more slender with width sternite V/carapace length ratios 0,93 (0,91–0,95) for ♂ and 1,05 for the ♀; pedipalp chela fingers of ♂ longer than in ♀ with length movable finger/handback length ratios 1,25 (1,22–1,28) in ♂ and 1,04 in the ♀; ♂ tergites



Figs 443–448. *Opisthophthalmus gibbericauda* sp. n. 443–447, ♂ holotype (NM 11068); 443–444, right hand; 443, outer aspect; 444, ventral aspect; 445–447, right pedipalp tibia; 445, dorsal aspect; 446, outer aspect; 447, ventral aspect; 448, paratype (TM 10032) right hemispermatophore, ventral aspect with hook notch also shown in lateral outline. *Scales*: 443–447, middle; 448, middle right.

finely shagreened, ♀ smooth and shiny; ♂ with 6–11 and ♀ 7–8 teeth per pecten.
Intraspecific variation: Little variation in paratypes except for the lighter overall colour of specimens from southern Angola.

Measurements: Maximum recorded body length of adult paratype ♂ 6,0 cm (carapace 9,8 mm). Measurements for holotype as follows (in mm).
Carapace: length 8,8; posterior width 8,8; anterior width 6. Pedipalp chela: handback width 6,4; handback length 5,6; movable finger 6,2. Pedipalp tibia: length 6,6, width 3,6. Pedipalp femur: length 5,6; width 2,6. Cauda III: width 3,6; length 4,0; height 3,0. Cauda IV: width 3,6; length 5,0; height 3,4. Cauda V: width 3,6; length 8,0; height 2,6. Telson: width 2,8; length 8,0; height 2,4. Total body length of holotype 5,7 cm.

Type material: Holotype in Natal Museum. Paratypes in Natal Museum, Transvaal Museum and State Museum.

Material examined: Holotype ♂, Cunene River, Dec–Feb 1972, Y. Menge (NM 11068). Paratypes: 1 subad ♂, Onguati, 24 Feb 1962, E. von Koenen (NM 11066); 1 ♂, Sa Da Bandeira, Angola, 24 Dec 1970, E. Voigt (NM 11067); 1 subad ♂, Onguati, 24 Feb 1962, E. von Koenen (SMN 110); 1 ♂, Sa Da Bandeira, 24 Dec 1970, E. Voigt (TM 9984); 1 ♂, Sa Da Bandeira, 24 Dec 1970, E. Voigt (TM 9985); 1 ♂, Coroca River, Angola, 28 Oct 1970, I. Connell (TM 10032); 1 ♀, Orumana, 10 Feb 1975 (SMN 592).

Distribution: Kaokoland and south-western regions of Angola.

Bionomics: No specimens were personally collected and the only information available indicates that some of the specimens collected in Angola were found on fairly hard ground at night.

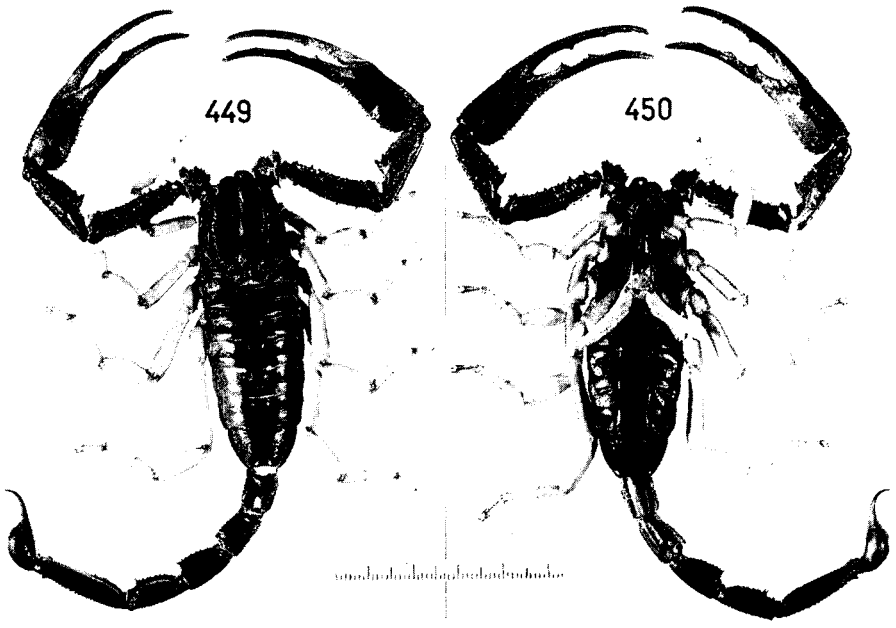
Opisthophthalmus gigas Purcell, 1898. Figs 343, 449–456, 521–522

Opisthophthalmus gigas Purcell, 1898: 5–7.

Diagnosis: O. gigas is most closely related to *O. haackei* but can be separated from it and other species of the genus on the following combination of characters. Carapace, Fig. 343: anterior median furrow with longitudinal suture only distinct medially and anterior bifurcating suture absent; median ocular furrow without a longitudinal suture; lc/x ratio falling between 1,30 and 1,45. Pedipalp chela: outer ventro-lateral keel of handback predominantly costate; ventral surface of handback with 4 *V* τ. Pedipalp tibia with 14 *e* τ and 3 *v* τ. The largest known species of *Opisthophthalmus*.

Description: The following account supplements Purcell's (1898: 5–7) comprehensive original description and Table 6.
Trichobothria: As in Figs 451–456. (+1) neobothriotaxic for group C with 14 external τ on tibia.
Hemispermatophore: As in Figs 521–522. Percentages of distances of hook apex to other structures in relation to various sets of distances are as follows:

1. ha → w distance × 100/dcr → w distance = 35,0% (34,5–35,5%)
2. ha → bsh distance × 100/ha → w distance = 50,0% (49,5–50,5%)
3. ha → bsh distance × 100/dcr → bsh distance = 20,5% (20,0–21,0%)



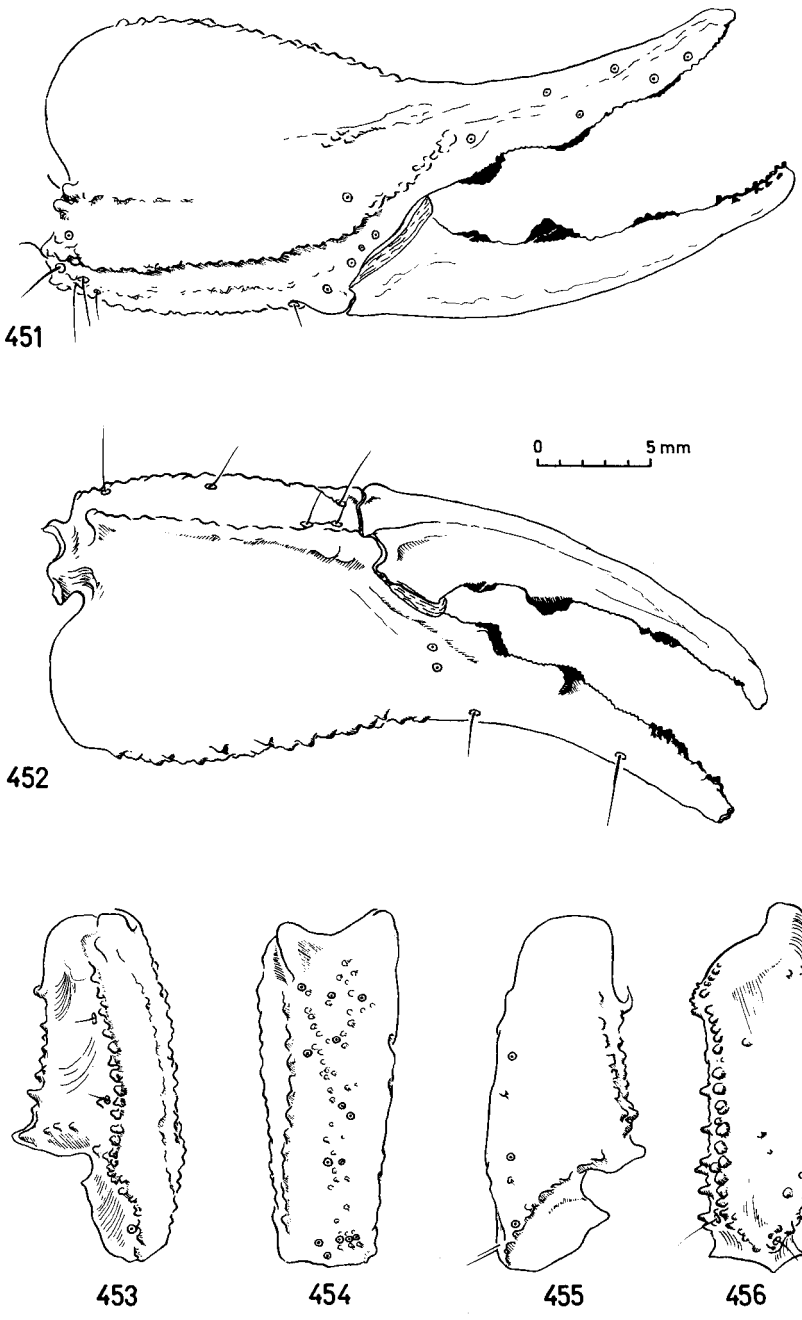
Figs 449–450. *Opisthophthalmus gigas*, ♂ (NM 10586). Scale in mm.

Variation: Sexual dimorphism: In adults, males differ quite distinctly from females in the following characters: ♂ trunk more slender with width sternite V/carapace length ratios 0,86 (0,82–0,90) for ♂ and 1,02 (0,98–1,06) for ♀; ♂ tergites finely shagreened, ♀ smooth and shiny; ♂ pedipalp chela finger much longer than ♀ with length movable finger/handback length ratios 2,00 (1,95–2,05) in ♂ and 1,50 (1,45–1,55) in ♀; ♂ pedipalp handback narrower than ♀ with width handback/carapace length ratio 0,45 (0,42–0,48) in ♂ and 0,60 (0,57–0,62) in ♀; ♂ with 24–29 and ♀ 20–24 teeth per pecten.
Intraspecific variation: No marked variation observed in the material studied.

Measurements: Maximum recorded body lengths of adults, 16,0 cm (carapace 24,0 mm) for ♂ and 15,5 cm (carapace 23,2 mm) for ♀.

Type material: Purcell's ♀ holotype (SAM B2231) is deposited in the collection of the South African Museum. The type locality and collector are unknown. The holotype was examined and found to be in good condition.

Material examined: ♀ holotype (SAM B2231). 1 ♂ 3 ♀, Ortmansbaum farm, 26–28 Jan 1973, B. Lamoral (NM 10599); 1 juv ♀, Noachabeb farm, 6 Feb 1973, Lamoral (NM 10691); 1 ♂, Hondeklipbaai, Dec 1971, J. Wiese (NM 10653); 1 subad ♀, Richtersveld, Blackies' Prospect (NM 10618); 1 ♀, Plateau/Aar, 5–18 Jan 1972 (SMN 331); 1 ♀, Namuskluft 88, 22 Sep 1973, J. Tebje (SMN 488); 1 subad ♀, Aus (Lüderitz), 16 Jan 1972, E. Eastwood (NM 10613); 3 juv ♀, Namuskluft 88, 9 Oct 1970, P. G. Olivier (SMN 197); 2 ♂ 2 ♀, Namuskluft 88, 12 Oct 1970, I. Mokgoabone (SMN 196); 1 ♂, Farm Plateau, Oct 1973, H. Erni (NM 10586); 1 ♀,



Figs 451–456. *Opisthophthalmus gigas*, ♀ (NM 10426). 451–452, right hand; 451, outer aspect; 452, inner-ventral aspect; 453–455, right pedipalp tibia; 453, dorsal aspect; 454, outer aspect; 455, ventral aspect; 456, right pedipalp femur, dorsal aspect.

Louwshoop farm 330, 3 Feb 1973, B. Lamoral (NM 10426); 1 ♂ 1 ♀, Jackalswater, 27 Nov 1897, M. Schlechter (SAM B2198).

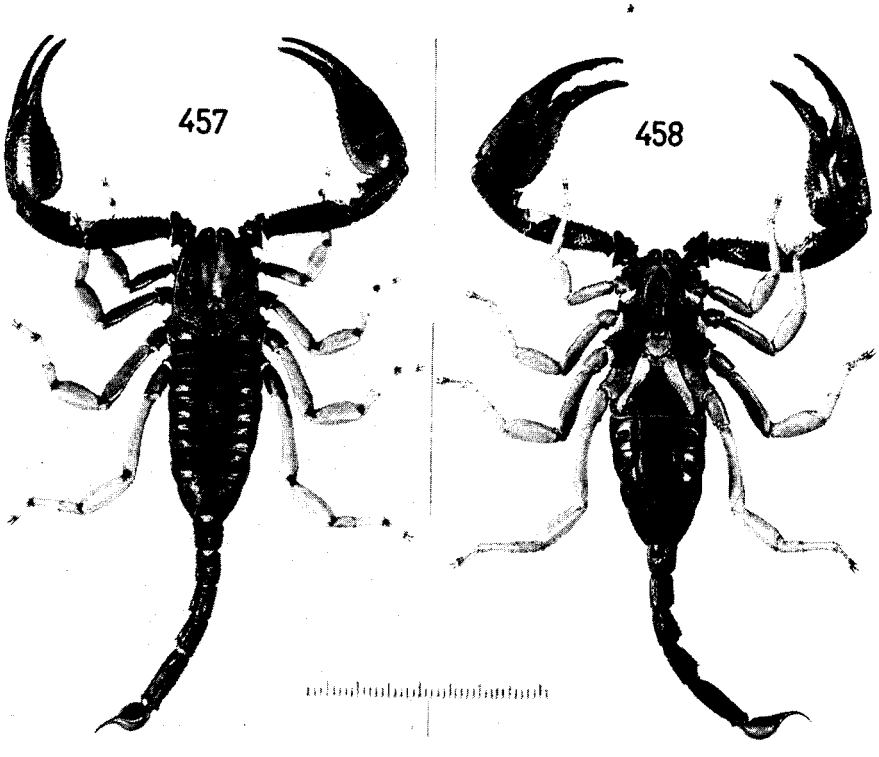
Distribution: Southern parts of Namibia and northern Cape Province of South Africa.

Bionomics: Nocturnal hemiedaphic and digs shallow burrows or scrapes under rocks on soils with surface hardness ranging from categories XV to XVIII (Table 2). The known localities in Namibia fall within areas of vegetation types 3A and 9 (Fig. 4). *O. gigas* is sympatric with *O. haackei* within this distribution range.

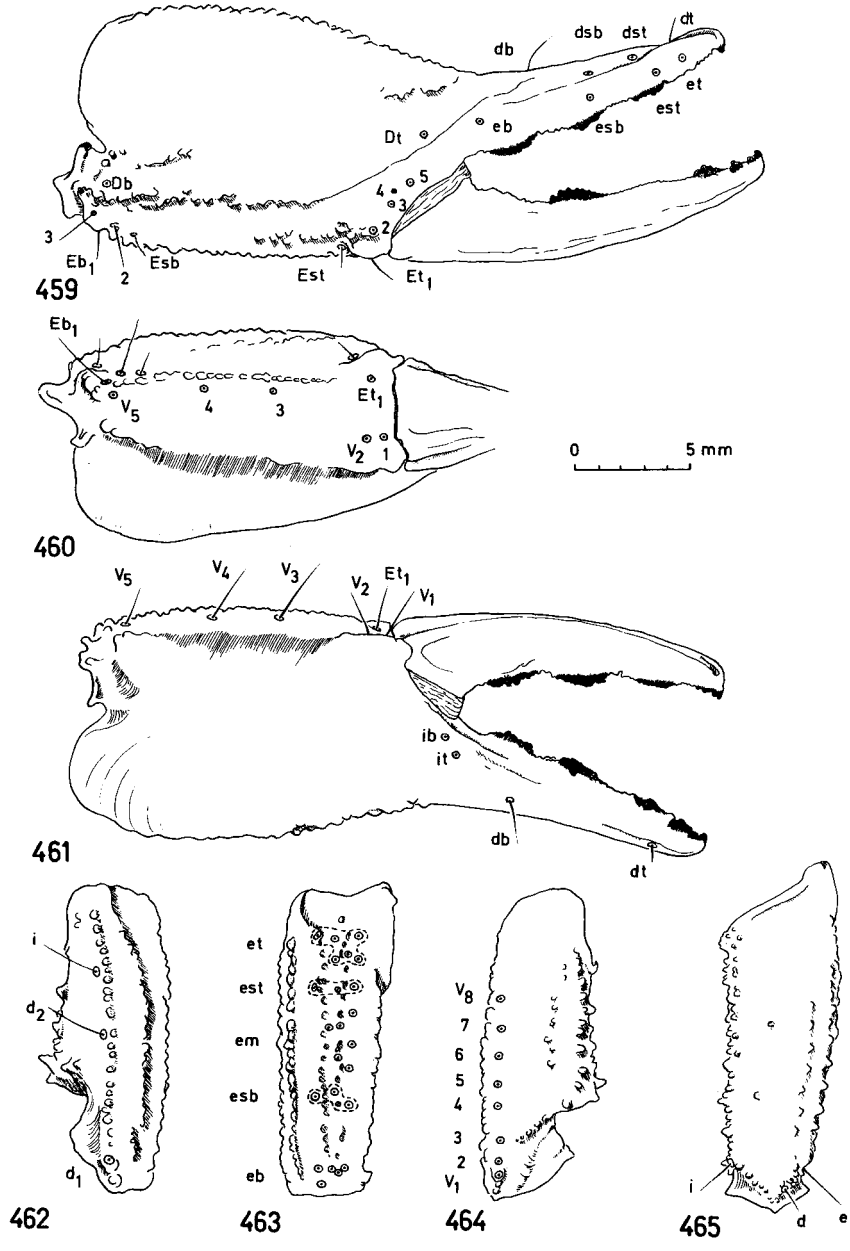
Opisthophthalmus haackei Lawrence, 1966, **stat. n.** Figs 344, 457–465

Opisthophthalmus gigas haackei Lawrence, 1966: 4–5.

Diagnosis: O. haackei is most closely related to *O. gigas* but can be separated from it and other species of the genus on the following combination of characters. Carapace, Fig. 344: anterior median furrow with longitudinal suture only distinct medially and anterior bifurcating suture absent; median ocular furrow with longitudinal suture absent to obsolete; lc/x ratio falling between 1,35 and 1,45. Pedipalp chela: outer ventro-lateral keel of handback predominantly granular; ventral surface of handback with 5 $V\tau$. Pedipalp tibia with 20–23 $e\ \tau$ and 9–12 $v\ \tau$.



Figs 457–458. *Opisthophthalmus haackei*, ♀ (NM 10543). Scale in mm.



Figs 459–465. *Opisthophthalmus haackei*, ♀ holotype (NM 9105). 459–461, right hand; 459, outer aspect; 460, ventral aspect; 461, inner aspect; 462–464, right pedipalp tibia; 462, dorsal aspect; 463, outer aspect; 464, ventral aspect; 465, right pedipalp femur, dorsal aspect.

Description: The following account supplements Lawrence's (1966: 4–5) comprehensive original description and Table 6.
Trichobothria: As in Fig. 459–465. Neobothriotaxic for group C with 5 *V* τ on pedipalp chela, 20–24 external and 7–8 ventral τ on pedipalp tibia. τ d_2 of tibia distinctly closer to *i* than d_1.
Hemispermatophore: No adult males available.

Variation: Sexual dimorphism: As for *O. gigas*.
Intraspecific variation: No variation in the material studied.

Measurements: Maximum recorded body length of adult ♀ 9,3 cm (carapace 17,6 mm). No adult ♂ available.

Type material: Lawrence's ♀ holotype is in the collection of the Natal Museum (NM 9105) and is in good condition.

Material examined: ♀ holotype, Fish River Canyon, Oct 1965, W. Haacke (NM 9105). 1 ♂, Farm Plateau, Oct 1973, H. Erni (NM 10595); 1 ♀, Springbokvlakte, 20 Mar 1973, B. Lamoral (NM 10543); 1 ♂, Ai-Ais, 20 Apr 1966 (SMN 178); 1 ♀, Fish River Canyon, Oct 1965, South African Museum (NM 9105).

Distribution: Southern part of Namibia and northern Cape Province of South Africa.

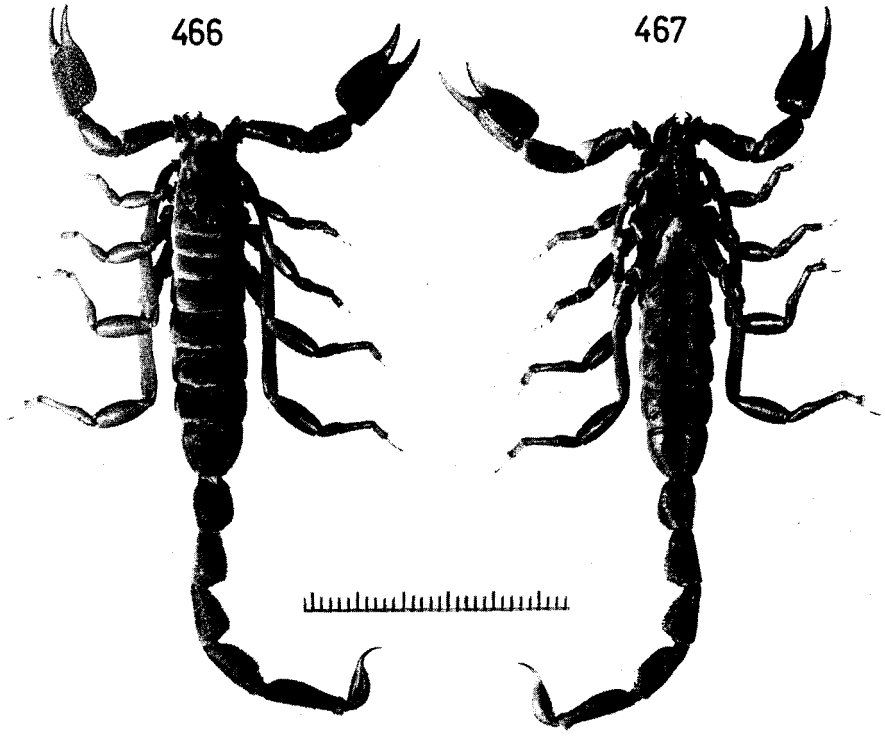
Bionomics: The only specimen personally collected was found resting on a rock at night and no additional ecological information is available.

Opisthophthalmus holmi (Lawrence, 1969). Figs 358, 466–474

Protophthalmus holmi Lawrence, 1969: 105–112; Lamoral & Reynders, 1975: 569.
Opisthophthalmus holmi (Lawrence, 1969); Newlands, 1972*b*: 241.

Diagnosis: O. holmi is most closely related to *O. jenseni* but can be separated from it and other species of the genus on the following combination of characters. Carapace, Fig. 358: anterior and median ocular furrows without sutures; lc/x ratio falling between 2,35 to 2,50. Pedipalp chela with 12–16 *V* τ; handback of ♂ and ♀ moderately wide, with width handback/carapace length ratio 0,53 (0,48–0,58); upper marginal keel of handback granular. Cauda V, lateral profile of ventral surface shallowly convex.

Description: The following account supplements Lawrence's (1969: 105–112) comprehensive original description, Lamoral's (1972: 117–118) supplement and Table 6.
Trichobothria: As in Figs 468–473. Neobothriotaxic for group C with 16–18 *V* τ on pedipalp chela, 26–30 external and 11–13 ventral τ on pedipalp tibia. The distribution of the external τ of the pedipalp tibia is so variable that it has been found impossible to allocate territories to the various groups. τ d_2 of tibia is distinctly closer to *i* than d_1. Vachon (1973: 943) correctly reported on information which I supplied to him (*in lit.*) that in *O. holmi* τ esb_2 of the tibia is also smaller than other external τ; this observation was based on the few specimens available at the time. Examination of large quantities of additional material has revealed that τ esb_2 is variable in size and that it cannot always be isolated and thus detected.

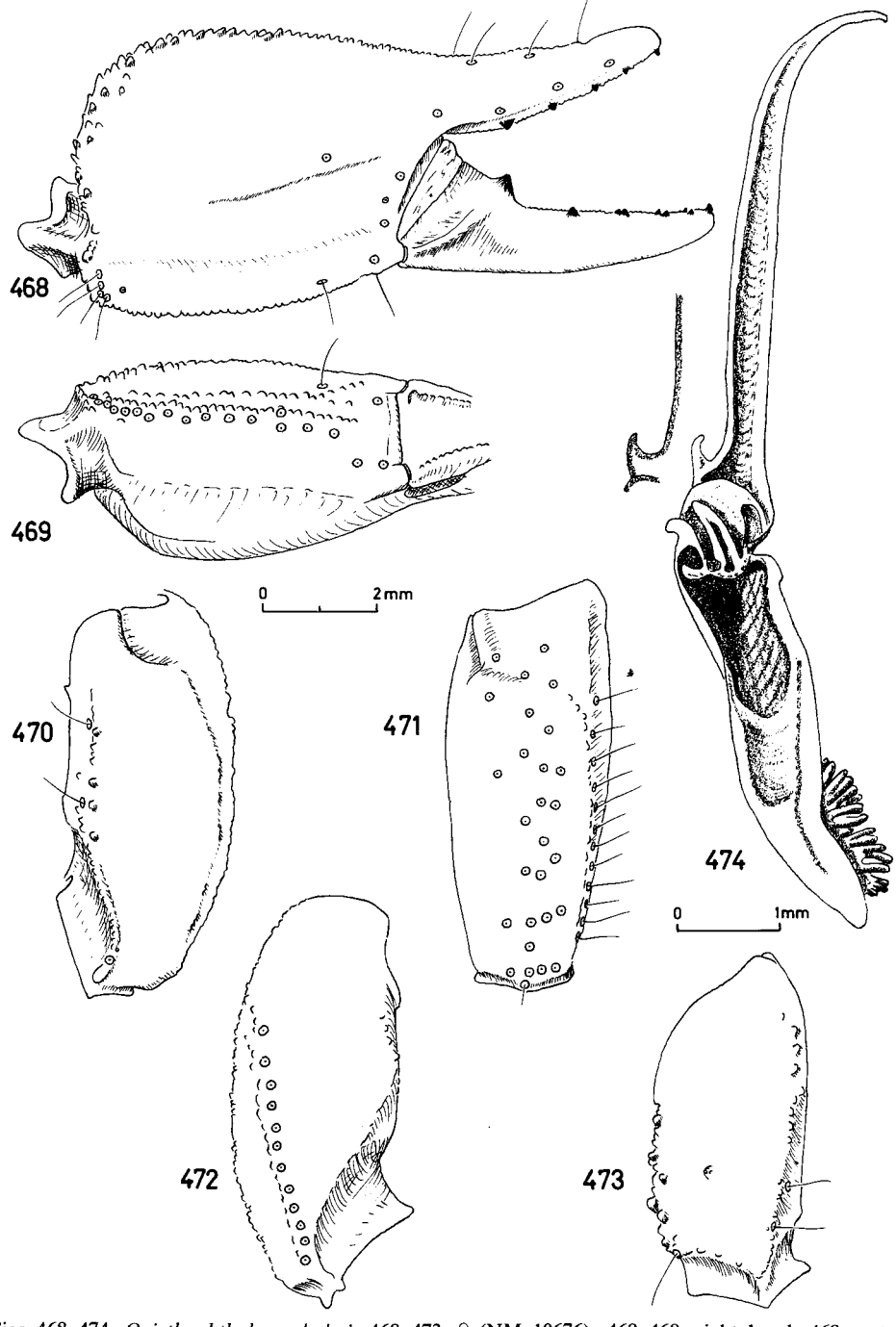


Figs 466–467. *Opisthophthalmus holmi*, ♂ (NM 10676). Scale in mm.

Hemispermatophore: As in Fig. 474. Differing quite strikingly from any other species of *Opisthopthalmus*, excepting *O. jenseni*, in having the distal end of the distal lamina tapering to a point and not truncated. In addition differing from that of *O. jenseni* (Fig. 525) in shape and size of distal lamina, hook notch, distal end of distal lamina, basal portion and foot. The following percentages are diagnostic for *O. holmi:*

1. ha → w distance × 100/dcr → w distance = 19,3% (19,0–19,7%)
2. ha → -bsh distance × 100/ha → w distance = 40,8% (40,4–41,2%)
3. ha → bsh distance × 100/dcr → bsh distance = 8,8% (8,5–9,0%)

Variation: Sexual dimorphism: Adult males differ little from females except in the following characters: ♂ genital operculum is elliptical in outline, that of ♀ nearly cordate; cauda I to V are proportionally wider and longer in ♂ than in ♀; ♂ are generally more heavily granular than ♀; see also Table 6.
Intraspecific variation: Adult specimens from the northern regions of the species range tend to be smaller and more lightly granular than those from the south. Specimens from the central regions of the species range have a vestiture of long stiff setae on the ventral surface of telotarsi III and IV while those from localities in the north and south have a ventral posterior row of 2, occasionally 3, spine-like setae.



Figs 468–474. *Opisthophthalmus holmi*. 468–473, ♀ (NM 10676); 468–469, right hand; 468, outer aspect; 469, ventral aspect; 470–472, right pedipalp tibia; 470, dorsal aspect; 471, outer aspect; 472, ventral aspect; 473, right pedipalp femur, dorsal aspect; 474, ♂ (NM 10676) right hemispermatophore, ventral aspect with hook notch also shown in lateral outline. *Scales*: 468–473, middle; 474, lower right.

Measurements: Maximum recorded body length in adult ♂ 7,5 cm (carapace 10,0 mm) in adult ♀ 7,5 cm (carapace 10,5 mm).

Type material: The type series consists of a subadult ♀ holotype and a subadult ♀ paratype deposited in the Albany Museum (no accession number).

Material examined: ♀ holotype ♀ paratype, Gobabeb, June 1968, E. Holm (AM no number); 1 ♂, Messum Crater, 26 Mar 1976, B. Lamoral (NM 10845); 1 ♂, Koichab River, Feb 1973, B. Lamoral (NM 10758); 6 ♂, 3 juv, Koichab River, 9–12 Feb 1973, B. Lamoral (NM 10677); 1 ♀, 2 ♂, Gobabeb, Feb 1972, B. Lamoral (NM 10675); 4 ♀, 6 ♂, Koichab River, 9–12 Feb 1973, B. Lamoral (NM 10678); 4 ♀, 19 ♂, Koichab River, 9–12 Feb 1973, B. Lamoral (NM 10676); 2 ♀, Zuid Rivier, Feb 1972, B. Lamoral (NM 10679); 1 ♀, Rosh Pinah, 16–19 Feb 1973, B. Lamoral (NM 10674); 1 ♀, Koichab River, Feb 1973, B. Lamoral (NM 10759); 1 ♀, Gobabeb, 26 Apr 1969, E. Holm (NM 9965); 1 ♂, Gobabeb, 14 Dec 1968, K. Schaer (NM 9964); 8 ♂, Gobabeb, Feb 1972, B. Lamoral (NM 10673).

Distribution: Central and southern Namib Desert within regions with vegetation types 2, 3 and 3A shown in Fig. 4.

Bionomics: See discussions on psammophilous habits of *O. holmi* in Lawrence (1969: 109–112), Lamoral (1972: 120) and Newlands (1972*b*: 245–249). *O. holmi* is nocturnal, hemiedaphic and its burrows are dug in sand dunes with surface hardness ranging from categories I–III (Table 2).

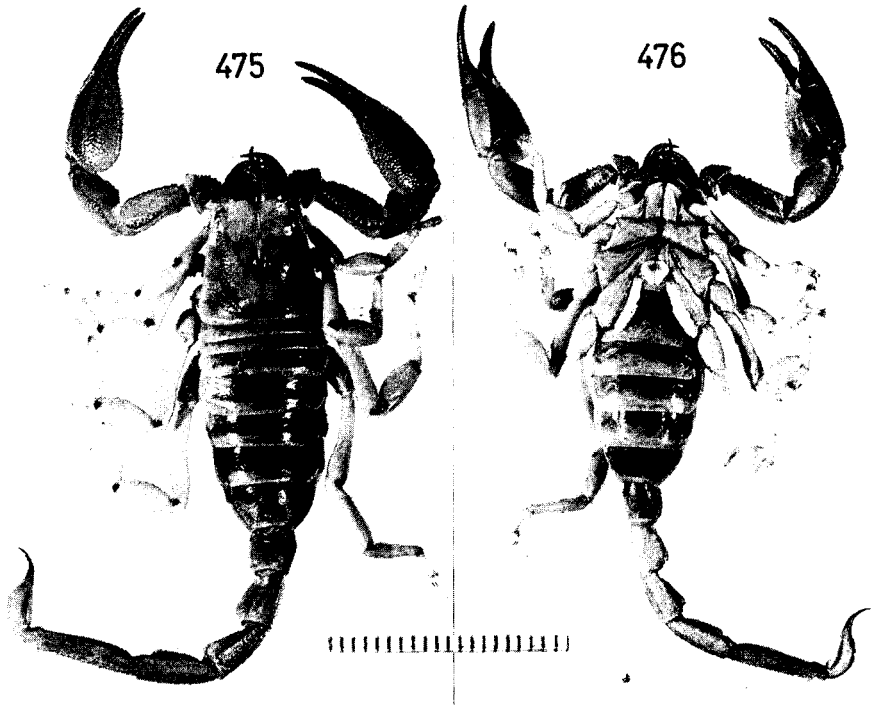
Remark: Lawrence, 1969 described *Protophthalmus* as a new genus with *holmi* as type species. Newlands (1972*b*: 241) synonymised *Protophthalmus* with *Opisthophthalmus* while Lamoral (1972: 118–119) described *jenseni* as a new species of *Protophthalmus*. Lamoral & Reynders (1975: 569) reinstated the genus *Protophthalmus* basing this decision on evidence available at the time. Additional comparative evidence obtained in this study has confirmed that *Protophthalmus* is congeneric with *Opisthophthalmus* and that *holmi* and *jenseni* represent an extreme sister group separated from other species by a series of derived character states. Also see introduction.

Opisthophthalmus intercedens Kraepelin, 1908. Figs 350, 475–483

Opisthophthalmus intercedens Kraepelin, 1908: 265.
Opisthophthalmus setiventer Lawrence, 1969: 115–116. **Syn. n.**

Diagnosis: O. intercedens is most closely related to *O. fitzsimonsi* but can be separated from it and other species of the genus on the following combination of characters. Carapace, Fig. 350: anterior median furrow with longitudinal suture distinct, anterior bifurcating suture obsolete; median ocular furrow with longitudinal suture indistinct. Pedipalp chela, outer ventro-lateral keel granular along entire length. Cauda V: ventral surface with unevenly distributed granules; ventral keel distinct and granular. Sternites III–VII and ventral surfaces of cauda I–II smooth in ♀, transversely lightly corrugated in ♂.

Description: The following description supplements Kraepelin's (1908: 265) original description, Lawrence's (1969: 115–116) original description of *setiventer*, now a new synonym of *intercedens* and Table 6. Comparison of Lawrence's ♀ holotype with Kraepelin's ♀ types leaves no doubt that *setiventer* is a



Figs 475–476. *Opisthophthalmus intercedens*, ♀ lectotype (ZMB 14973). Scale in mm.

synonym of *intercedens*. Lawrence erroneously listed *wahlbergi* and *adustus* as the most closely related species of *setiventer*. The ♂ of *O. intercedens* was unknown and a description of relevant character states is included herein.

Granulation: Upper and outer surfaces of pedipalp handback evenly granular in ♂, but more shallowly so in ♀; finger keel costate granular in ♂, in ♀ costate to granular in anterior half, posterior half granular and almost obsolete; accessory keel of outer surface obsolete. Outer surface of pedipalp tibia and upper surface of femur lightly granular. Carapace: interocular area virtually agranular and remaining surfaces granular in ♂; in ♀, interocular area and posterior median surface smooth and shiny, lateral surfaces very lightly granular and shiny. Caudal segments: ventral surface of cauda III granular; ventral intercarinal surface of IV and V lightly unevenly granular; proximal ventral surface of telson vesicle lightly granular.

Colour: As for *O. lornae*.

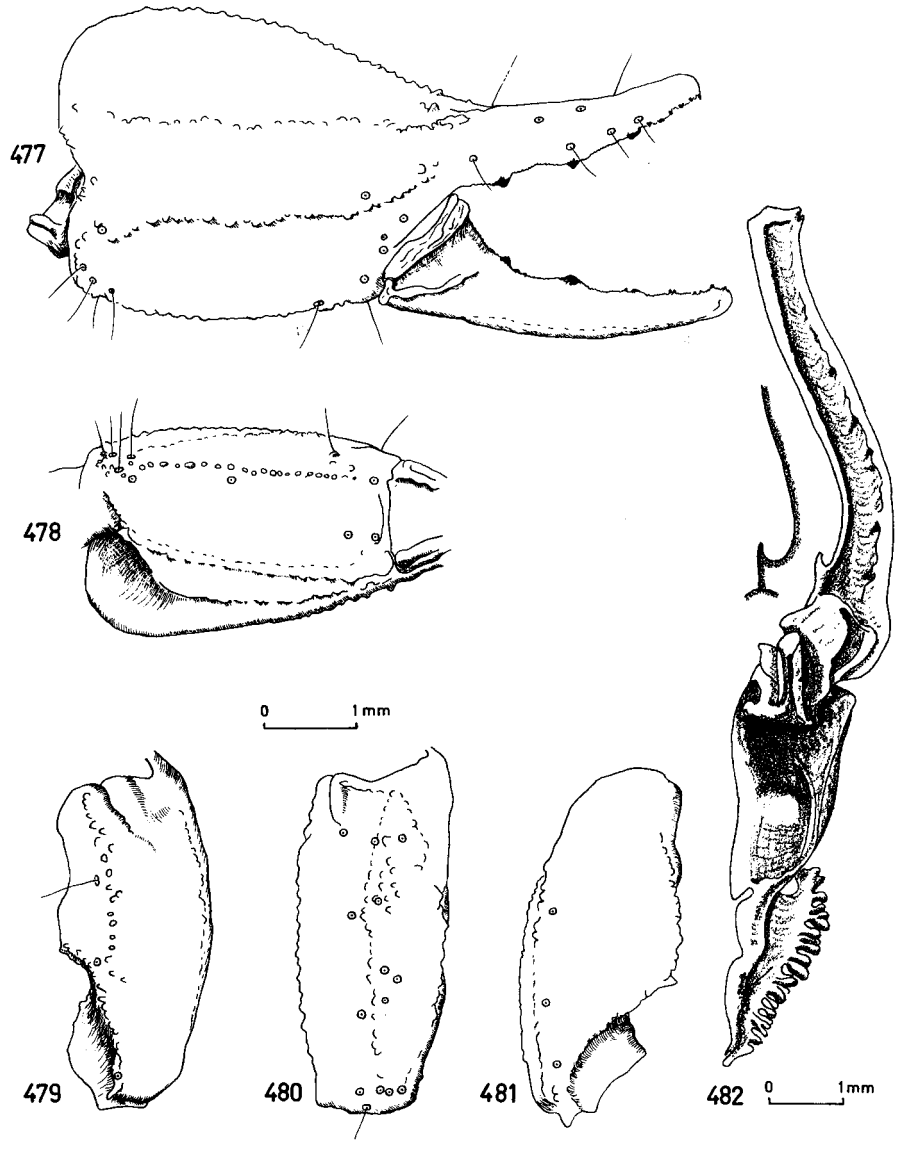
Chelicerae: As for *O. lornae*.

Carapace: lc/x ratio 1,84 (1,80–1,88). See also Table 6.

Pedipalps: Handback: inner ventral keel almost obsolete in ♀, lightly costate in ♂; outer ventro-lateral keel granular along entire length.

Cauda: As in Table 6 and diagnosis.

Pectines: ♂ with 17–21 and ♀ 11–13 teeth per pecten.



Figs 477–482. *Opisthophthalmus intercedens*. 477–481, ♀ lectotype (ZMB 14973); 477–478, right hand; 477, outer aspect, 478, ventral aspect; 479–481, right pedipalp tibia; 479, dorsal aspect; 480, outer aspect; 481, ventral aspect; 482, ♂ (NM 10726) right hemispermatophore, ventral aspect with hook notch also shown in lateral outline. *Scales:* 477–481, middle; 482, lower right.

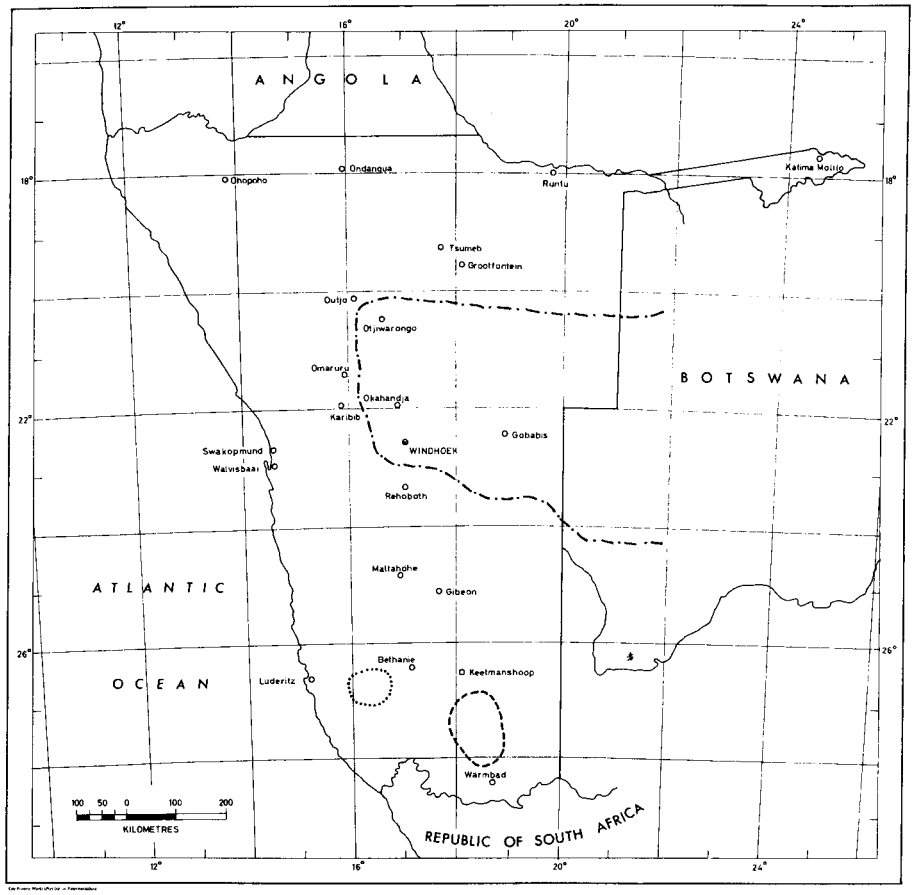


Fig 483. Distribution ranges of: Opisthophthalmus intercedens (.....); *O. lornae* sp. n. (_____); *O. fitzsimonsi* (-·-·-·-·-).

Setation: As for *O. lornae*.

Trichobothria: As in Figs 477–481. (+1) neobothriotaxic for group C with 14 external τ on tibia. Distribution not differing diagnostically from that in *O. lornae* and *O. fitzsimonsi*.

Hemispermatophore: As in Fig. 482. Differing diagnostically from those of *O. fitzsimonsi* (Fig. 429) and *O. lornae* (Fig. 511) in shapes and sizes of hook notch, distal lamina, basal portion and foot. In addition the following percentages are diagnostic for *O. intercedens* (NM 10726):

1. ha → w distance × 100/dcr → w distance = 28,9%
2. ha → bsh distance × 100/ha → w distance = 32,4%
3. ha → bsh distance × 100/dcr → bsh distance = 11,8%

Variation: Sexual dimorphism: In adults, males differ from available subadult females in the following characters: ♂ trunk more slender than ♀, with width sternite V/carapace length ratios 0,84 (0,80–0,88) for ♂ and 1,00 (0,96–1,04) for ♀;

♂ tergites finely shagreened, ♀ smooth and shiny; sternites III–VII and ventral surface cauda I–II transversely shallowly corrugated in ♂, smooth and shiny in ♀; ♂ pedipalp chela fingers longer than ♀ with length movable finger/handback length ratios 1,34 (1,30–1,38) in ♂ and 1,20 (1,17–1,24) in ♀; first proximal middle lamella of each pecten with mesial margin obtusely angular and with proximal one-sixth of posterior margin of pecten devoid of teeth in ♂, in ♀ almost sublinear and with proximal half of pectinal posterior margin devoid of teeth; ♂ with 17–21 and ♀ 11–13 teeth per pecten.

Intraspecific variation: No variation in the available material except for the darker overall colour and dark patterns described by Lawrence for *setiventer*, namely: interocular surface, anterior two-thirds of tergites I–VI, pedipalps, ventral surfaces of cauda I–V and telson dark yellowish brown No. 78.

Measurements: Maximum recorded body lengths of adult ♂ 7,5 cm (carapace 11,4 mm), of subadult ♀ 6,5 cm (carapace 10,6 mm).

Type material: The type series examined consists of 2 ♀ syntypes (ZMB 14973). The largest of these is hereby selected as the lectotype of *Opisthophthalmus intercedens* and the other ♀ (together with any other outstanding syntypes) as paralectotypes. This material is deposited in the collection of the Zoologisches Museum, Berlin.

Homotype: I have selected a ♀ homotype which is deposited in the Natal Museum collection (NM 11072).

Material examined: ♀ subadult lectotype, 1 juvenile ♀ paralectotype, Kubub, L. Schultze (ZMB 14973); *Opisthophthalmus setiventer* ♀ holotype, 8 miles west of Aus (Lüderitz district), (AM); 1 ♀ homotype, farm Plateau 38, 29 Feb 1976, B. Lamoral (NM 11072). 1 ♂, farm Plateau 38, 29 Feb 1976, B. Lamoral (NM 10726); 2 ♂, Aus, W. F. Purcell (NM 9121–9122).

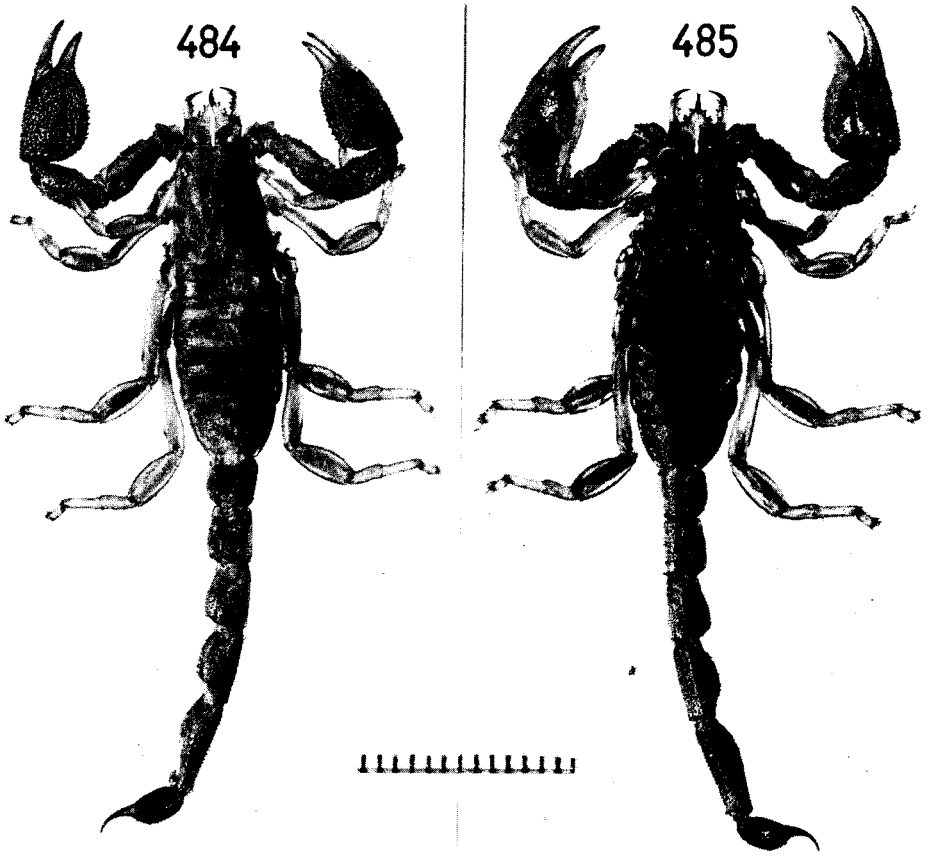
Distribution: All available localities are within a radius of 20 km from Aus in the Lüderitz district.

Bionomics: The only specimen personally collected was found resting on the surface of consolidated sandy ground with surface hardness ranging from categories VI–VII (Table 2). The known localities fall within an area of vegetation type 3A (Fig. 4). *O. intercedens* is nocturnal and hemiedaphic.

Opisthophthalmus jenseni (Lamoral, 1972), **comb. n.** Figs 484–492, 525

Protophthalmus jenseni Lamoral, 1972: 118–119.

Diagnosis: O. jenseni is most closely related to *O. holmi* but can be separated from it and other species of the genus on the following combination of characters. Carapace: anterior and median ocular furrows without sutures; lc/x ratio falling between 2,10 and 2,15. Pedipalp chela with 18–20 *V* τ; handback of ♂ (♀ unknown) distinctly wide, with width handback/carapace length ratio 0,70; upper marginal keel of handback composed of blunt spiniform tubercules, much longer and larger than those of handback upper surface. Cauda V, lateral profile of ventral surface shallowly concave.



Figs 484–485. *Opisthophthalmus jenseni*, ♂ holotype (TM 9504). Scale in mm.

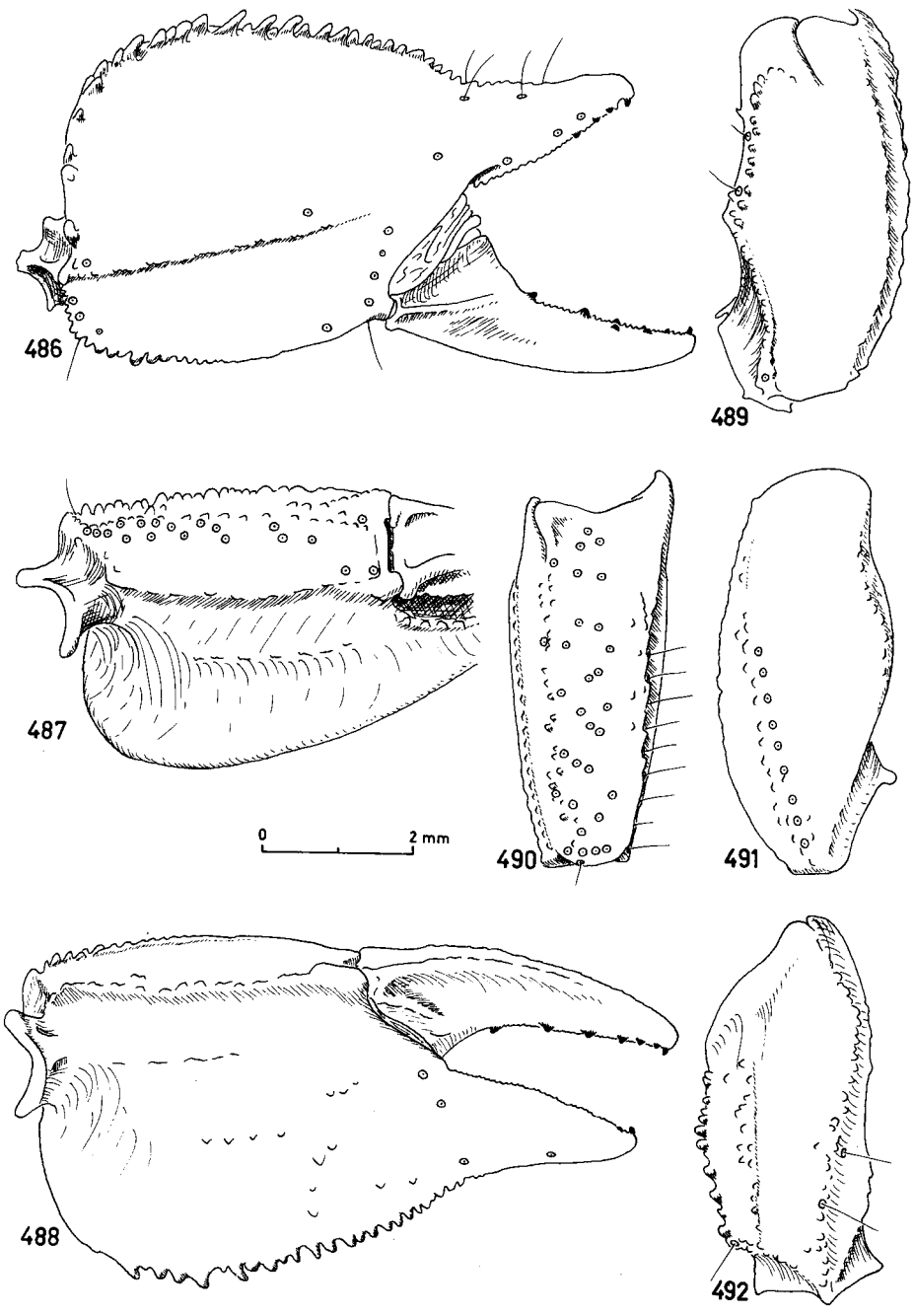
Description: The following account supplements Lamoral's (1972: 118–119) comprehensive original description and Table 6. No further specimens have been collected since the original description of this species based on 1 adult ♂ holotype.

Trichobothria: As in Figs 486–492. Neobothriotaxic for group C with 18–20 *V* τ on pedipalp chela, 30–31 external and 9–10 ventral τ on pedipalp tibia. Otherwise as for *O. holmi*.

Hemispermatophore: As in Fig. 525. Distal end of distal lamina tapering to a curved point and not truncated. Also see comments under *O. holmi*. The following percentages are diagnostic for *O. jenseni*:

1. ha → w distance × 100/dcr → w distance = 16,05%
2. ha → bsh distance × 100/ha → w distance = 38,5%
3. ha → bsh distance × 100/dcr → bsh distance = 6,8%

Measurements: Total body length 4,5 cm, carapace length 6,9 mm. Width sternite V/carapace length ratio 0,90.



Figs 486–492. *Opisthophthalmus jenseni*, ♂ holotype (TM 9504). 486–488, right hand; 486, outer aspect; 487, ventral aspect; 488, inner aspect; 489–491, right pedipalp tibia; 489, dorsal aspect; 490, outer aspect; 491, ventral aspect; 492, right pedipalp femur, dorsal aspect.

Material examined: ♂ holotype, Bethanis farm, 65 km west of Welwitschia (now called Khorixas) in Damaraland, 20 Dec 1968, R. & M. Jensen (TM 9504).

Distribution: Known only from the type locality.

Bionomics: See Lamoral (1972: 118). No additional information available since the original description.

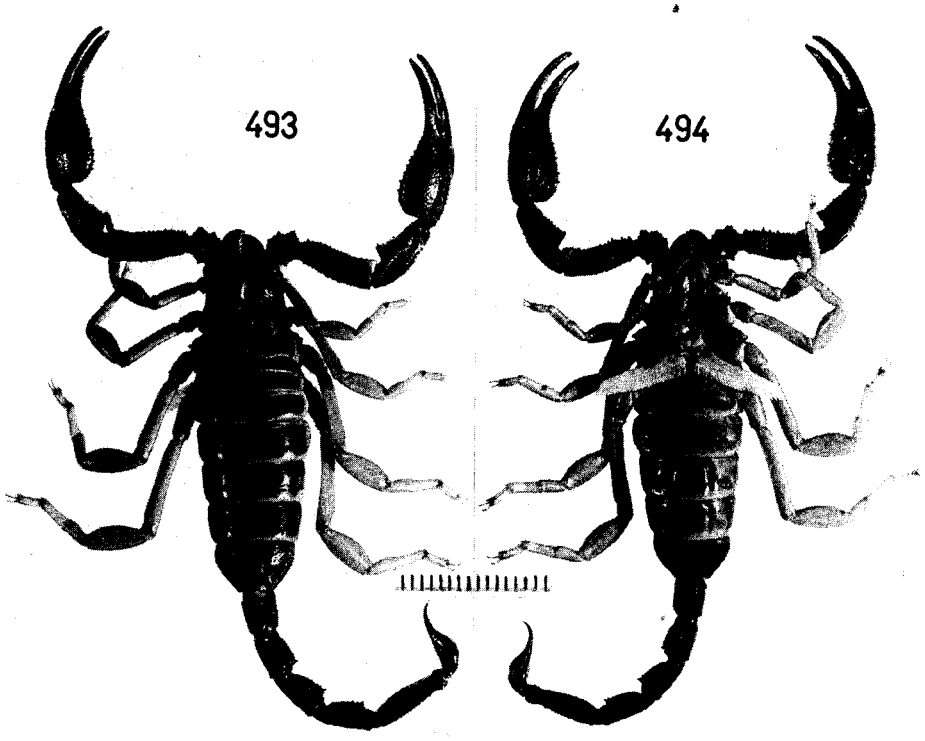
Remark: See remark under *O. holmi*.

Opisthophthalmus litoralis Lawrence, 1955. Figs 346, 493–501

Opisthophthalmus wahlbergi litoralis Lawrence, 1955: 216–217.

Diagnosis: O. litoralis is most closely related to *O. carinatus* but can be separated from it and other species of the genus on the following combination of characters. Carapace, Fig. 346: anterior median furrow with a poorly visible longitudinal suture, anterior bifurcation obsolete to indistinct; median ocular furrow with an obsolete longitudinal suture and no posterior bifurcation. Pedipalp chela: upper surface of handback agranular, smooth and shiny in ♀, smooth and matt in ♂, never with shallow reticulations; finger keel shallowly costate in ♀, strongly costate in ♂; outer ventro-lateral keel of handback predominently granular. Cauda IV ventral and ventro-lateral keels costate granular.

Description: The following description supplements Lawrence's (1955: 216–217) original description, his (1969: 115) supplement and Table 6.

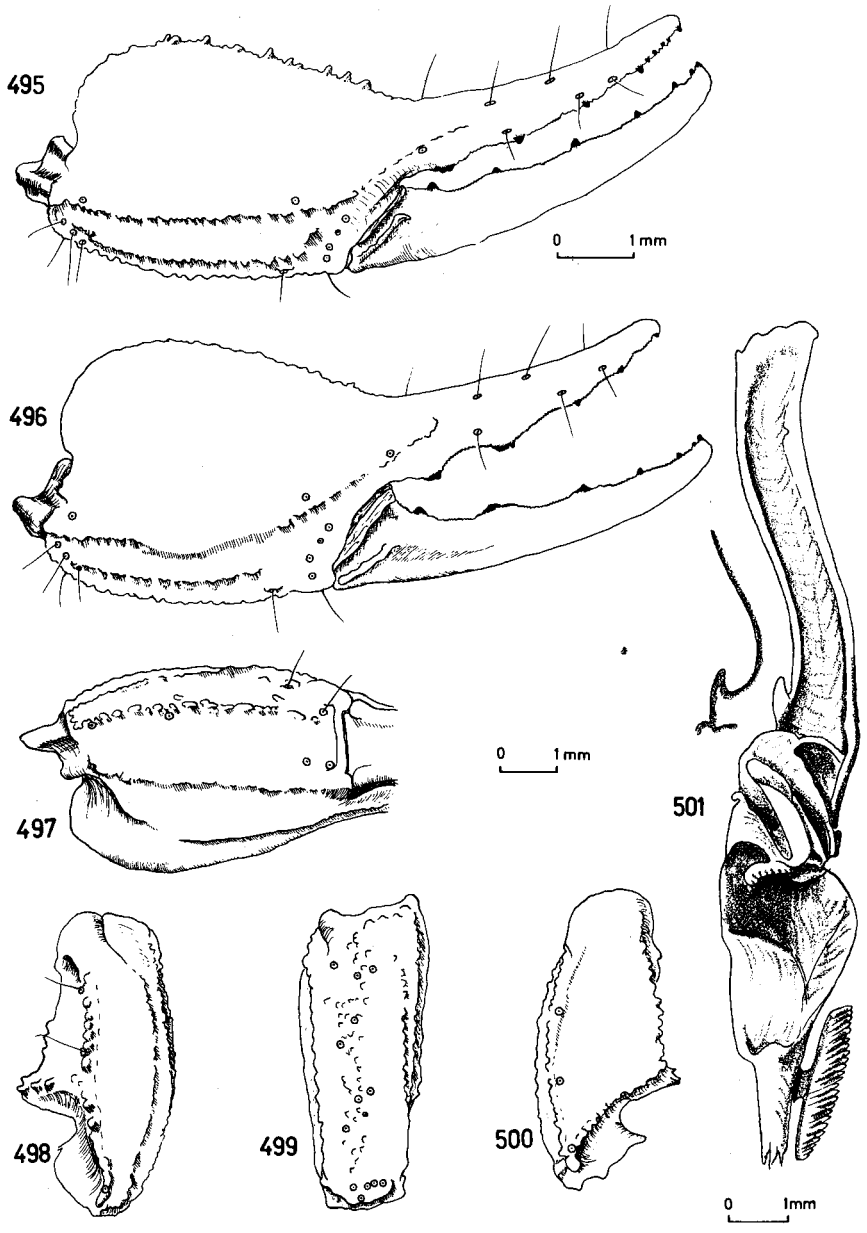


Figs 493–494. *Opisthophthalmus litoralis*, ♂ (SMN 122). Scale in mm.

Granulation: Differing little from *O. carinatus* except as listed in Table 6.
Colour: As described for *O. carinatus* from near Windhoek but with interocular surface distinctly lighter than rest of carapace.
Carapace: lc/x ratio 1,74 (1,72–1,76)
Legs: Basitarsi I and II with many scattered setae and a longitudinal row of 2–3 long stiff setae on posterior surface but no spine-like setae as in *O. carinatus*. Lateral claws of legs I–IV long, distally slightly curved and of unequal length, with posterior claw shorter than anterior. Median dorsal lobe of telotarsi I–IV subequal in length to lateral lobes.
Trichobothria: As in Figs 495–500. (+1) neobothriotaxic for group C with 14 external τ on tibia. Chela: τ *est* slightly distal to or level with *dst*; distance between τ *est* and *esb* approximately equal to that between *esb* and *eb*. Pedipalp tibia: $\tau\, d_2$ distinctly closer to i than d_1; $\tau\, v_2$ approximately equidistant to v_1 and v_3.
Hemispermatophore: As in Fig. 501. Differing distinctly from that of *O. carinatus* in the following character states: distal lamina very broad, hook broad, hook notch deeply excavated, hook apex obtuse, subapical lateral margin of hook short. The following percentages are diagnostic:

1. ha → w distance × 100/dcr → w distance = 31,5% (31,0–32,0%)
2. ha → bsh distance × 100/ha → w distance = 34,5% (34,0–35,0%)
3. ha → bsh distance × 100/dcr → bsh distance = 13,5% (13,0–14,0%)

Variation: Sexual dimorphism: In adults, males differ from females in the following characters: ♂ trunk proportionately smaller and more slender with width sternite V/carapace length ratios 0,90 (0,86–0,93) for ♂ and 1,04 (1,0–1,08) for ♀; ♂ cauda approximately 20% longer than trunk length, in ♀ approximately equal while total body length is approximately only 5% greater in ♀; pedipalp handback of ♂ narrower and fingers longer than ♀ with width handback/carapace length ratios 0,59 (0,57–0,61) in ♂ and 0,68 (0,66–0,70) in ♀ and length movable finger/handback length ratios 1,45 (1,41–1,51) in ♂ and 1,38 (1,35–1,40) in ♀; first proximal middle lamella of each pecten with mesial margin sharply angular while pectinal teeth are present along entire posterior margin of pecten in ♂, very shallowly curved while proximal one-eighth of posterior margin of pecten devoid of teeth in ♀; ♂ genital operculum suboval in outline, subcordate in ♀; ♂ distinctly more pilose than ♀; ♂ with 28–32 and ♀ 18–22 teeth per pecten.
Intraspecific variation: Little except in overall colour which tends to be darker in specimens south of the Cunene River and in southern Angola.
Measurements: Maximum recorded adult body lengths of ♂ 8,5 cm (carapace 12,8 mm) in ♀ 8,8 cm (carapace 13,6 mm).
Type material: Lawrence's ♂ holotype was examined and found to be a subadult. It is deposited in the collection of the Lund University Zoology Museum (LUZM 1540) and is in good condition.
Homotype: A male homotype has been selected and deposited in the Natal Museum collection (NM 10824).
Material examined: ♂ holotype, Rocky Point, Skeleton Coast, 10 June 1951, Lund University expedition (LUZM 1540);1 ♂ homotype, Unjab riv., 27 Mar



Figs 495–501. *Opisthophthalmus litoralis*. 495, ♂ (SMN 122) right hand, outer aspect; 496–500, ♀ (SMN 453); 496–497, right hand; 496, outer aspect; 497, ventral aspect; 498–500, right pedipalp tibia; 498, dorsal aspect; 499, outer aspect; 500, ventral aspect; 501, ♂ (NM 10821) right hemispermatophore, ventral aspect with hook notch also shown in lateral outline. *Scales*: 495, upper; 496–500, middle; 501, lower right.

1976, B. Lamoral (NM 10824). 3 ♂, Unjabmond, 2 Oct 1965, W. Steyn (SMN 132); 1 subad ♀, Hoanib R., 5 Dec 1972, C. Coetzee (SMN 416); 1 ♂, Ugabmond, 29 June 1964, F. Brown (SMN 131); 2 ♂ 3 ♀ many juv, Möwebaai, 11 Aug 1973, J. B. (SMN 453); 1 ♂, Huabmond, 10 Jan 1965, P. Buys (SMN 122); 12 ♂ 4 nymph ♀, Cunene, Angola, 23 Sep 1969, C. Coetzee (SMN 164); 1 juv ♂, Möwebaai, 16 Aug 1973, B. Kensley (SMN 457); 1 juv ♂, Khumibrivier, 12 June 1969, C. G. C. (SMN 220); 1 ♂ 2 juv, Cunene, Angola, 27 Sep 1969, C. Coetzee (SMN 163); 1 ♀, Möwebaai, 1 June 1969, B. Kensley (SMN 234); 1 ♂, Unjabriv., Sep 1966, W. Haacke (TM 9308); 1 ♀, Unjab river mouth, 30 Sep 1965, W. Haacke (TM 9788); 1 ♂, Torra Bay, 20 Mar 1972, H. Brown (TM 10652); 1 ♂, Möwebaai, 29 Mar 1976, B. Lamoral (NM 10748); 2 juv ♂, Möwebaai, 29 Mar 1976, B. Lamoral (NM 10808); 1 ♂, Brandberg Wes, 29 Apr 1964, W. Steyn (NM 10711); 1 ♀, Torra Bay, 30 Mar 1976, B. Lamoral (NM 10820); 1 ♂, Möwebaai, 28 Mar 1976, B. Lamoral (NM 10821); 1 ♀, Unjab River mouth, 28 Mar 1976, B. Lamoral (NM 10825); 1 ♂ 1 ♀, Möwebaai, Aug 1973, J. B. (NM 11070).

Distribution: Skeleton Coast Park with the southernmost recorded locality at Ugab River mouth. This species has also been recorded north of the Cunene River mouth in south-western Angola.

Bionomics: A large proportion of the material collected was found under driftwood and decaying carcasses of large marine mammals cast up by the sea on the littoral zone of the Skeleton Coast. Further inland, specimens were found in very shallow burrows or scrapes under large stones on ground with soil hardness ranging between categories VII–IX (see Table 2). The distribution range of *O. litoralis* falls within zones of vegetation types 1 and 2 (Fig. 4). *O. litoralis* is nocturnal and hemiedaphic.

Remark: Lawrence (1955: 244 and 1969: 115) indicated that *O. litoralis* is most closely related to *O. wahlbergi*. New evidence presented in this study, however, indicates a direct affiliation with *O. carinatus*.

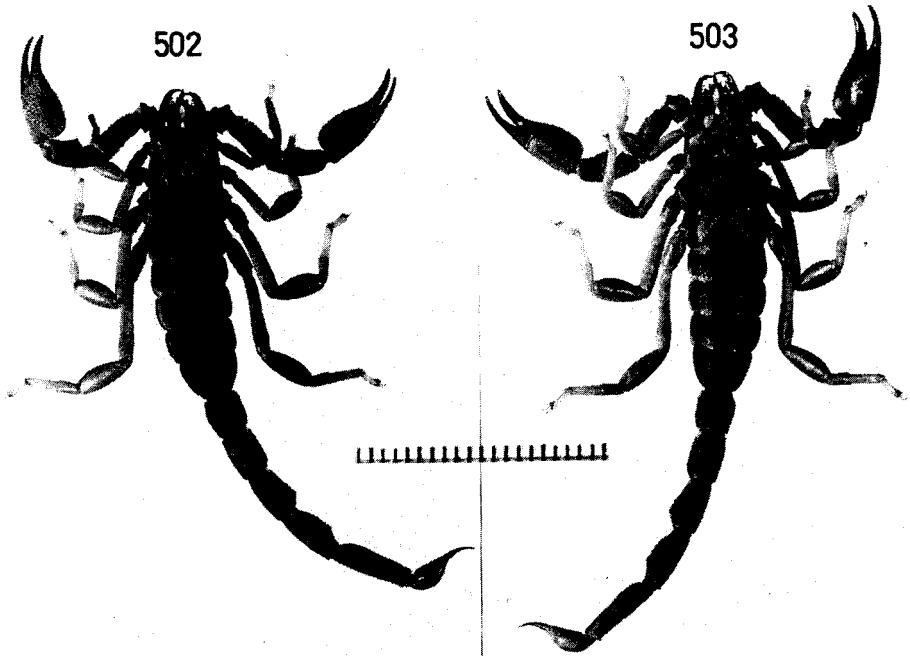
Opisthophthalmus lornae sp. n. Figs 355, 483, 502–511

Derivation: Named in honour of Lorna Ferguson.

Diagnosis: No sister species being available to *O. lornae*, it has been found to be most closely related to the *intercedens–fitzsimonsi* sister group. *O. lornae* can be separated from this group and other species of the genus on the following combination of characters. Carapace, Fig. 355: anterior median furrow with longitudinal and anterior bifurcating sutures present but poorly developed; median ocular furrow with an obsolete longitudinal suture. Pedipalp chela, outer ventro-lateral keel predominantly costate. Cauda V: ventral surface evenly granular; ventral keel absent or indistinct from adjacent granules. Sternites III–VII and ventral surfaces of cauda I–III evenly granular in ♂. Habitus of ♀ unknown.

Description: The type series is composed of males and no females have been collected yet. The following description is based on the adult holotype ♂, and supplements Table 6.

Granulation: The following surfaces distinctly and evenly granular: upper and outer handback; dorsal and outer pedipalp tibia; dorsal pedipalp femur; dorsal cauda I; lateral and ventral cauda V. Ventral surface of telson lightly granular. Upper lateral margin of cauda V granular but without a distinct dorsal keel.
Carapace: Interocular surface almost smooth to very lightly granular; lateral surfaces lightly granular. Tergites: I–VI finely shagreened throughout; VII finely shagreened medially, lightly granular laterally.
Colour: Overall colour orange yellow to yellowish brown. Pedipalps: all segments strong yellowish brown No. 74 with movable and fixed fingers strong brown No. 55. Chelicerae strong yellowish brown No. 74, with fingers and anterior margin of handback lightly infuscated. Carapace, tergites, sternites and cauda I–V deep yellowish brown No. 75. Anterior margin of tergites with light reticulated infuscations. Legs and telson moderate orange yellow No. 71. Pectines light orange yellow No. 70.
Chelicerae: Ventral surface of handback punctate; fingers distinctly longer than handback length.
Pedipalps: Handback: finger keel granular, composed of granules slightly larger than adjacent granules of either upper or outer surfaces; outer surface with a median longitudinal granular accessory keel; upper surface without traces of any accessory keels; outer ventral keel predominantly costate, with 3–4 notches along its length; inner ventral keel almost obsolete. Width handback/carapace length ratio 0,52. Length movable finger/handback length ratio 1,13.
Carapace: Median eyes posterior of medial, with lc/x ratio 1,77 in holotype and a range of 1,74–1,80 in paratypes.
Median eyes: Large, 2,5 times the diameter of lateral eyes and less than one diameter apart from each other. Legs: Telotarsi I & II with 2–3 spine-like setae on posterior margin. Telotarsi III with 1 ventral anterior and 4 ventral posterior spine-like setae. Telotarsi IV without any ventral anterior but 4 ventral posterior spine-like setae. Apotele lateral claws moderately long, distally curved and of equal length. Telotarsi median dorsal lobes distinctly shorter than lateral lobes.
Cauda: As in Table 6 and diagnosis. Telson aculeus, long and only slightly curved.
Pectines: 9–9 teeth. In paratype ♂ 5–9 per pecten. First proximal middle lamella of each pecten subtriangular in outline.
Sternum: Subpentagonal, slightly longer than wide.
Setation: Pedipalps, legs, lateral and posterior margins of sternites III–VII and caudal segments moderately pilose.
Trichobothria: As in Figs 504–510. (+1) neobothriotaxic for group C with 14 external τ on tibia. Chela: τ *est* distal to *dst*; distance *est–esb* approximately half of *esb–eb*; τV_3 situated in proximal half of ventral surface; τEt_4 small, nearly in line with *Et* series and closer to Et_4 that Et_5. Tibia: τd_2 closer to *i* than d_1 with distance i–d_2 equal to two-thirds of distance d_2–d_1; τv_2 distinctly closer to v_1 than v_3. These character states also apply to ♂ paratypes.
Hemispermatophore: As in Fig. 511. The following percentages apply to hemispermatophores of paratype ♂:



Figs 502–503. *Opisthophthalmus lornae* sp. n., ♂ holotype (NM 11106). Scale in mm.

1. ha → w distance × 100/dcr → w distance = 25%
2. ha → bsh distance × 100/ha → w distance = 28%
3. ha → bsh distance × 100/dcr → bsh distance = 8,6%

Variation: Intraspecific variation: Paratypes from the same locality as the holotype exhibit little variation worth mentioning except in the number of pectinal teeth which range from 5 to 9. Paratypes from Schwarzkuppen farm, which is further north and west of the Karasberge, are darker in overall colour and some specimens have light reticulated infuscations on the carapace, tergites, outer surfaces of femora and patella of legs I–IV. In some specimens cauda IV & V are lightly infuscated.

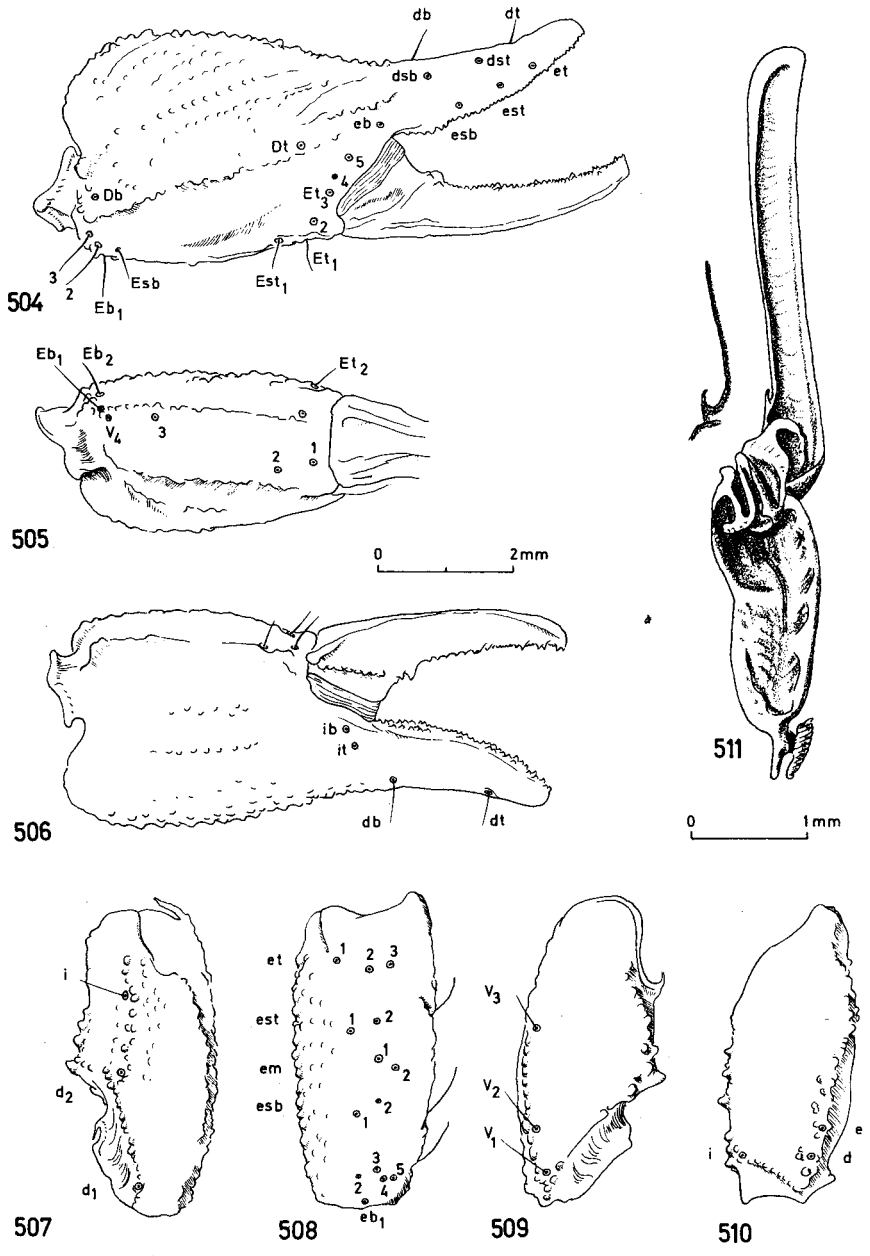
Measurements: Maximum recorded body length of adult ♂ 4,9 cm (carapace 7 mm).

Type material: Holotype ♂ in Natal Museum collection. Paratypes: in Natal Museum; 1 ♂, Transvaal Museum; 1 ♂, State Museum.

Material examined: Holotype ♂, Ortmansbaum, 26–28 Jan 1973, B. Lamoral (NM 11106). Paratypes: 6 ♂, Ortmansbaum, 26–28 Jan 1973, B. Lamoral (NM 10683); 14 ♂, Swarzkuppen, 8 Feb 1973, B. Lamoral (NM 10688, TM & SMN).

Distribution: Known from only two localities south of 27° of latitude in Namibia (Fig. 483).

Bionomics: All the specimens obtained were collected at night with the aid of an ultra-violet lamp and were found resting on sand dunes or sandy river banks with surface hardness ranging from categories IV–V (Table 2). No specimens were dug out of burrows and it is therefore impossible to verify whether these surfaces



Figs 504–511. *Opisthophthalmus lornae* sp. n. 504–510, ♂ holotype (NM 11106); 504–506, right hand, 504, outer aspect; 505, ventral aspect; 506, inner aspect; 507–509, right pedipalp tibia; 507, dorsal aspect; 508, outer aspect; 509, ventral aspect; 510, right pedipalp femur, dorsal aspect; 511, paratype (NM 10688), right hemispermatophore, ventral aspect with hook notch also shown in lateral outline. *Scales*: 504–510, middle; 511, middle right.

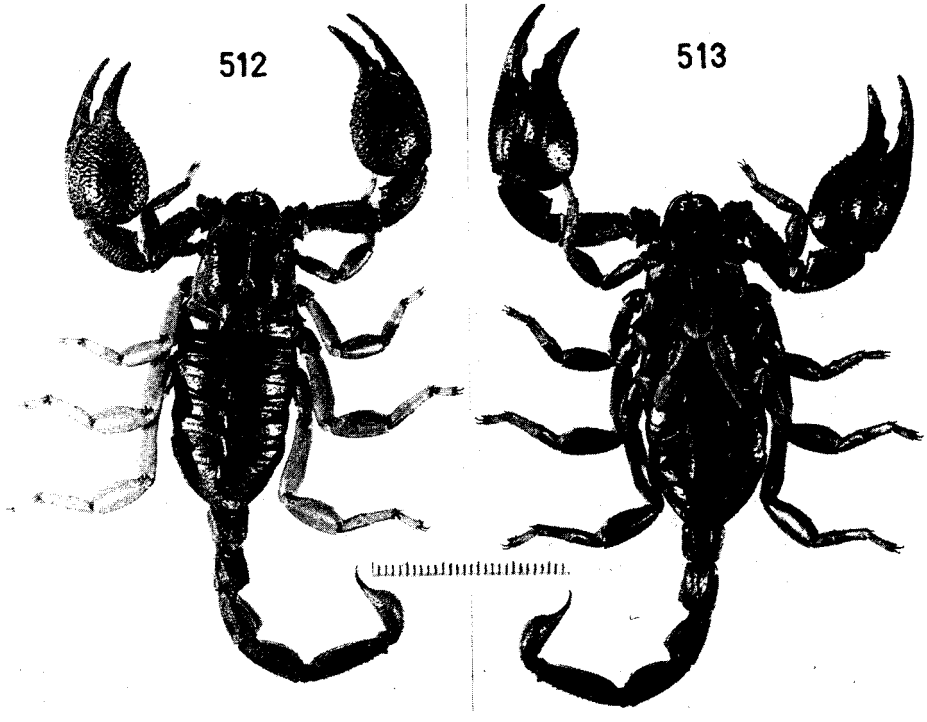
are the sites of this species' burrows. The two type localities fall within areas of vegetation type 9 (see Fig. 4).

Opisthophthalmus opinatus (E. Simon, 1887). Figs 347, 512–520, 523, Table 8

Mossamedes opinatus E. Simon, 1887: 382–383.
Opisthophthalmus scabrifrons Hewitt, 1918: 129–130. **Syn. n.**
Opisthophthalmus opinatus bradfieldi Hewitt, 1931: 97–99. **Syn. n.**

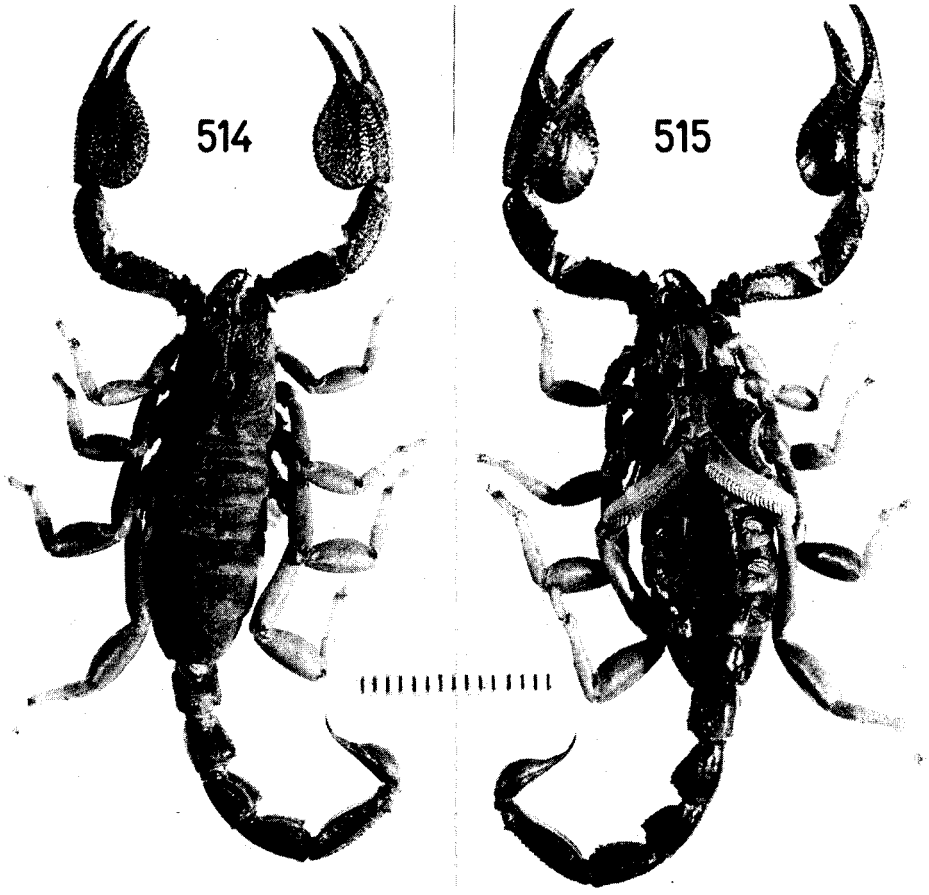
Diagnosis: Adult ♂ and ♀ are subject to clinal variation in overall size and other character states shown in Table 8. Notwithstanding this, the following combination of characters separates *O. opinatus* from other species of the genus. Carapace, Fig. 347: anterior median furrow with a distinct longitudinal suture but poorly developed to obsolete anterior bifurcating suture; median ocular furrow with a distinct longitudinal suture. Pedipalp chela: upper surface of handback with numerous rounded, occasionally anastomosing granules. Pedipalp tibia: τ d_2 approximately equidistant from d_1 and i. Telson vesicle: ventral and lateral surfaces always lightly to heavily granular; posterior upper lateral surfaces with spiniform granules but never including numerous minute spicules. *O. opinatus* is most closely related to *coetzeei*.

Description: The following description supplements E. Simon's (1887: 382–383) original description, Hewitt's original descriptions of the new synonyms listed above and Table 6. Material available for this revision and examination of the types of *scabrifrons* and *bradfieldi* have led to the conclusion that the diagnostic



Figs 512–513. *Opisthophthalmus opinatus*, ♀ holotype (MNHP RS 0235). Scale in mm.

characters selected by Hewitt are so variable as to bridge the character sets proposed by him to separate these species. This variability is the result of hitherto unsuspected clinal differences in what were thought to be diagnostic ones. Habitus extremes are illustrated in Figs 512–515.



Figs 514–515. *Opisthophthalmus opinatus* ♂ (TM 411—syntype of *O. scabrifrons*). Scale in mm.

Colour: Females, overall dark brown No. 59 to deep brown No. 56; telson, chelicerae and legs strong yellowish brown No. 74. Males are usually more lightly coloured than females.
Pedipalps: Finger keels usually predominantly granular, anterior half occasionally costate in some specimens, particularly in populations from the northern regions of the species range.
Cauda: Lateral and ventral intercarinal surfaces of I–III smooth and agranular.
Setation: A sparsely to moderately pilose species.
Trichobothria: As in Figs 516–520. (+1) neobothriotaxic for group C with 14 external τ on tibia. Chela: τ *est* proximal to or level with *dst*; distance *est–esb*

approximately equal to *esb–eb*; τV_3 situated in proximal half of ventral surface; τEt_4 small and in line with *Et* series. Tibia: τd_2 approximately equidistant from d_1 and *i*.

Hemispermatophore: As in Fig. 523. See also Table 8.

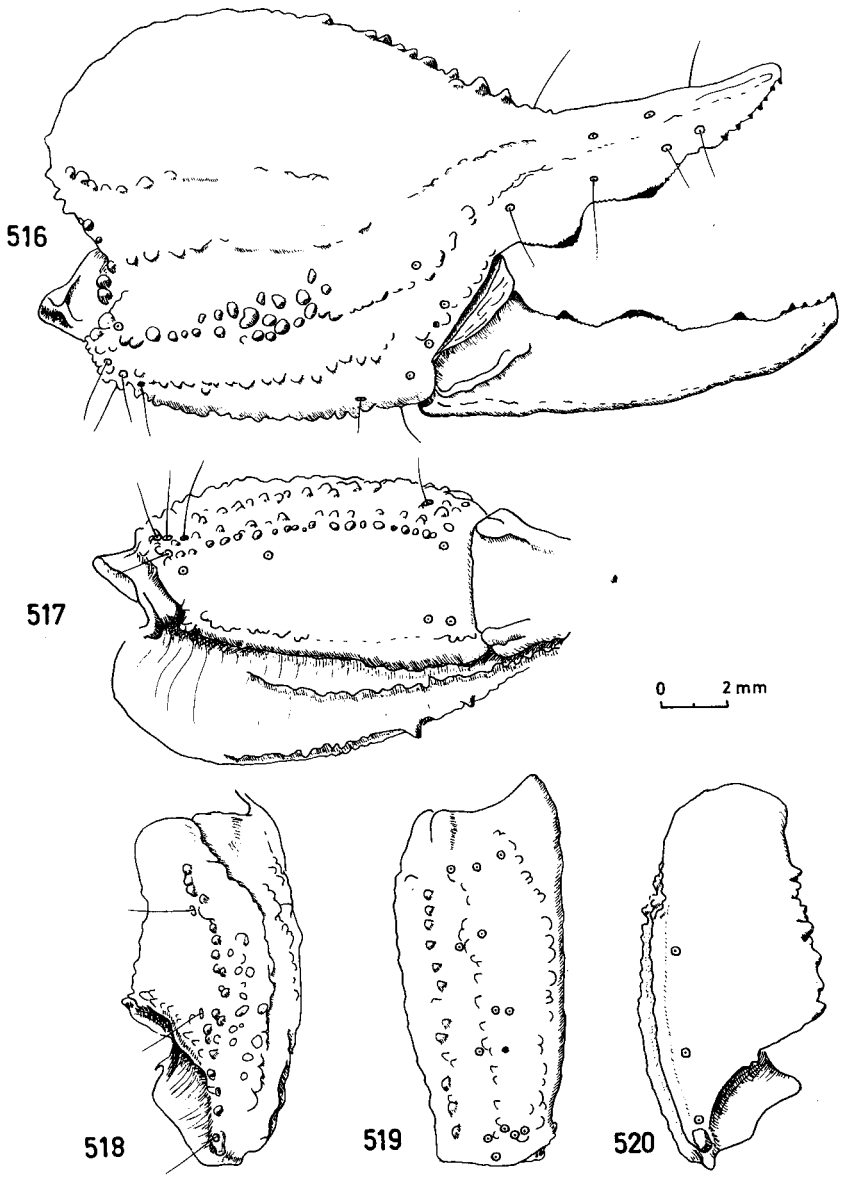
Variation: Sexual dimorphism: Adult males differ from females in the following characters: ♂ smaller but not proportionally more slender; ♂ cauda 1,5 times as long as trunk length, ♀ cauda 1,2 times as long while total body length is only slightly greater in ♂; upper surface of pedipalp handback nearly flat in ♂, shallowly convex in ♀; ♂ telson and pedipalp chela more pilose than ♀; see also differences in Table 8; ♂ with 19–23 and ♀ 13–19 teeth per pecten.

Intraspecific variation: In addition to characters listed in Table 8 the following are subject to clinal variation (character states of northern regions populations of the species range are given first, followed by those in the southern regions or opposite extremes of the clines): overall colour of ♀ and ♂ as dark as described above to much lighter; first proximal middle lamella of each pecten mesially rounded to angular in ♂.

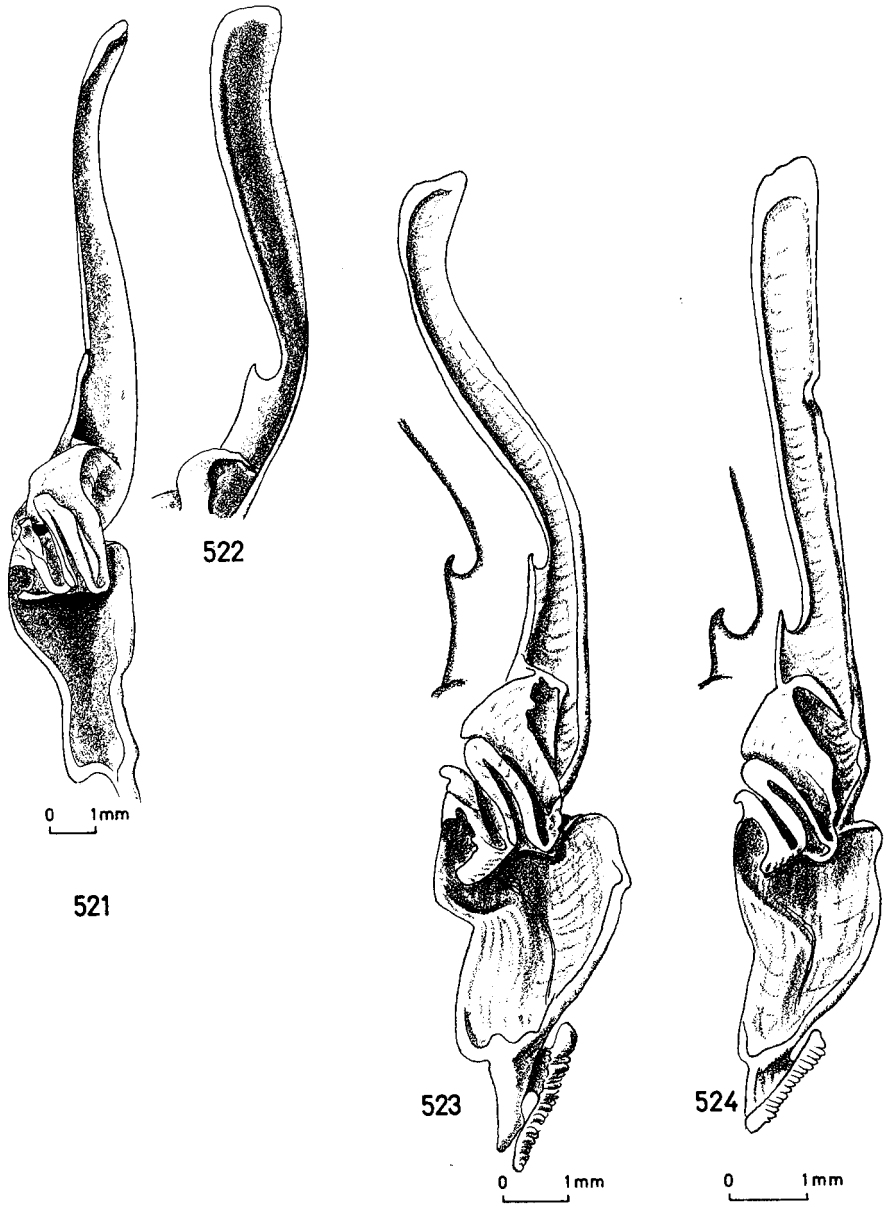
Measurements: See Table 8.

Type material: Simon's adult ♀ holotype is deposited in the collection of the Museum national d'Histoire naturelle, Paris (RS 0235) and was found to be in good condition, see Figs 512–513.

Material examined: ♀ holotype, Kalahari, Schinz (MNHP RS 0235, collection E. Simon 9621); *Opisthophthalmus scabrifrons* 2 ♂ syntypes, Narudas Süd and Quibis (TM 411, 412); *O. opinatus bradfieldi* 1 ♀ 1 ♂ (AM 6359), 1 ♀ (AM 6359), 1 ♂ (AM 6311) syntypes, Krantzberg, Namib Desert; 3 ♂, Kabiras, 2 Jan 1916, R. Tucker (SAM B1703–5); 1 ♀ Garries, 20 Dec 1915, R. Tucker (SAM B1720); 1 juv ♀, Nauchas, 3 Jan 1916, R. Tucker (SAM B1717); 1 ♀ Namsem, 22 Dec 1915, R. Tucker (SAM B1709); 1 ♂, Nomtsas, 23 Dec 1915, R. Tucker (SAM B1708); 1 juv ♂ 1 juv ♀, Areb, 4 Jan 1916, R. Tucker (SAM B1711); 1 ♂ 1 subad ♀, Nauchas, 3 Jan 1916, R. Tucker (SAM B1700–1); 1 ♂, Nauchas, 3 Jan 1916 (SAM B1716); 1 ♀, Aus, Dec 1926 (SAM B7002); 1 juv ♀; Swakopmund (AM 6421); 1 ♂, Kiries West (SAM B6987); 1 juv ♀, Erongo West, 5 Sep 1975, REG (SMN 566); 1 ♀, Hohenheim, 26 Mar 1961 (SMN 141); 1 ♂, Noachabeb, 7–12 Jan 1972 (SMN 327); 1 ♂ 3 ♀, Nauzerus, Dec–Jan 1973–1974, Kingsley (NM 10551–4); 1 juv ♂, Aar, 29 Feb 1976, B. Lamoral (NM 10789); 1 ♀, Plateau, 4 Feb 1973, B. Lamoral (NM 10590); 1 juv ♂ 1 juvenile ♀, Kamkas, 8 Mar 1976, B. Lamoral (NM 10794); 1 ♀ 4 subad ♀, Saffier, 5 Mar 1976, B. Lamoral (NM 10724); 1 ♂ 1 ♀, Vredenhof, 21 Feb 1976, B. Lamoral (NM 10727); 1 ♀, Saffier, 5 Mar 1976, B. Lamoral (NM 10801); 5 juv ♀ 2 juv ♂, Plateau, 29 Feb 1976, B. Lamoral (NM 10788); 4 juv ♀ 3 juv ♂ 2 juv, Rehoboth, 13 Mar 1976, B. Lamoral (NM 10814); 2 ♂ 1 ♀, Kubub, 2 Mar 1976, B. Lamoral (NM 10790); 2 ♀, Kam River, Dec 1937, H. Bell-Marley (NM 8329); 2 ♀ 1 ♂ 3 juv ♀ 4 juv ♂, Klein Aub, 11 Mar 1976, B. Lamoral (NM 10806); 1 ♂ 1 juv ♀, Narib, 10 Mar 1976, B. Lamoral (NM 10802); 1 ♂ 1 ♀, Noachabeb, 6 Feb 1973, B. Lamoral (NM 10711); 4 ♀ 2 subad ♂ 1 juv ♀ 1 juv ♂ Us, 6 Feb 1973, Lamoral (NM 10609); 2 ♂ 2 juv, Maltahöe, 12–14 Dec 1934, Dr Jordaan (BM 1934 4.25 21–23).



Figs 516–520. *Opisthophthalmus opinatus*, ♀ holotype (MNHP RS 0235). 516–517, right hand; 516, outer aspect; 517, ventral aspect; 518–520, right pedipalp tibia; 518, dorsal aspect; 519, outer aspect; 520, ventral aspect.



Figs 521–524. *Opisthophthalmus* species, right hemispermatophore; 521–522, *O. gigas* (SMN 196), 521, ventral aspect; 522, oblique aspect showing hook notch in lateral outline; 523, *O. opinatus* (SAM B1700) ventral aspect, with hook notch also shown in lateral outline; 524, *O. setifrons* (NM 11107) ventral aspect, with hook notch also shown in lateral outline.

Distribution: South of 21° of latitude in Namibia with the exclusion of the Namib and Kalahari sand systems.

Bionomics: O. opinatus burrows to depths of 15–25 cm in soils with surface hardness ranging from categories VIII to XIII (Table 2). Burrow entrances are usually situated in open ground in the northern regions of the species range and at the side of large stones or rocks in the southern regions while in intermediate regions both situations are encountered. *O. opinatus* was found to be sympatric with *coetzeei*, its most closely related species, at two localities in western central Namibia, namely farms Narib 4 and Klein Aub 350. At Narib 4, the entrances of burrows of *opinatus* were all in open ground and those of *coetzeei* at the side of rocks while at Klein Aub 350 this situation was reversed. This observation possibly indicates an ecological difference of burrow location in sympatric conditions but the low number of records available (see material examined) precludes a definite statement on the matter. The distribution range of *opinatus* encompasses vegetation types 4, 7, 8 and 9 (see Fig. 4). *O. opinatus* is nocturnal and hemiedaphic.

Opisthophthalmus penrithorum sp. n. Figs 526, 529–535

Derivation: Named in honour of Mary-Lou and Mike Penrith.

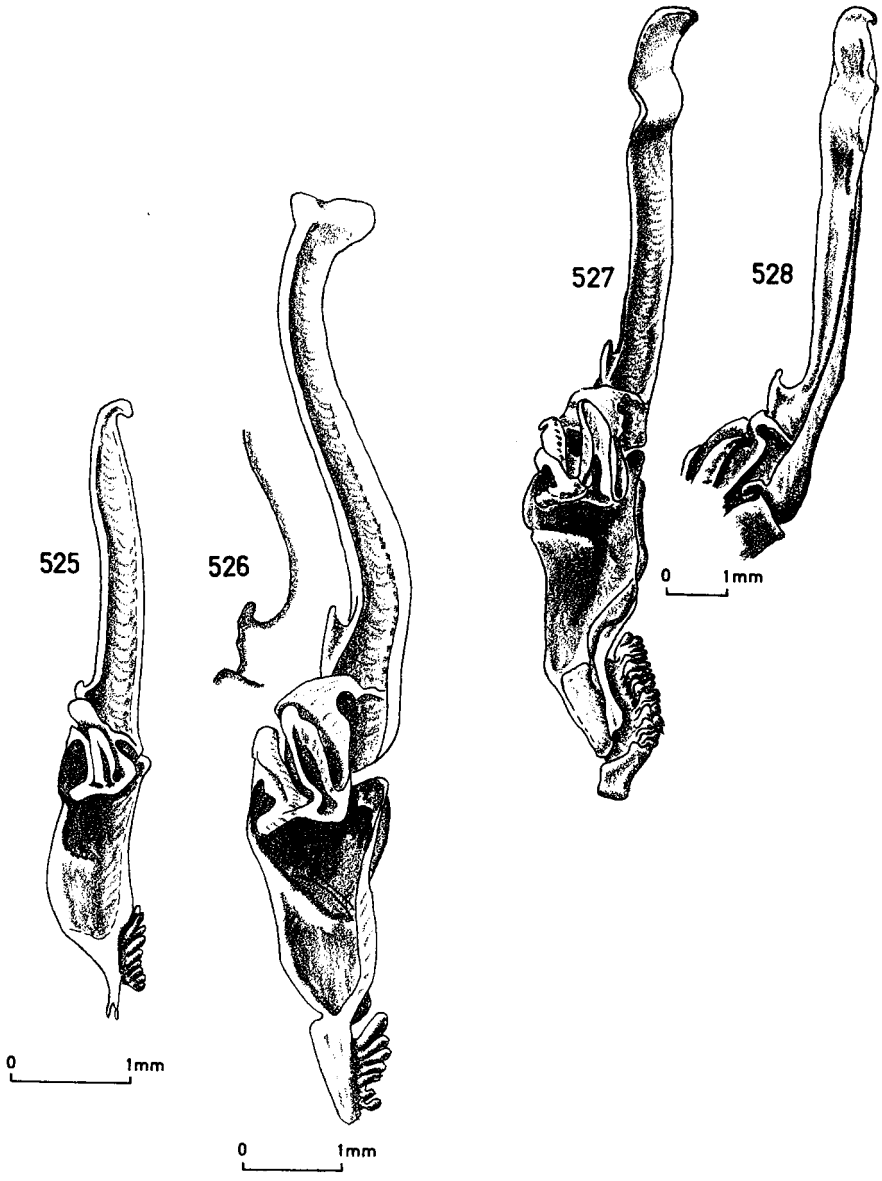
Diagnosis: O. penrithorum is most closely related to *O. flavescens* but can be separated from it and other species of the genus by the following combination of characters. Carapace: anterior median and median ocular furrows without sutures; lc/x ratio 1,75–1,80. Cauda: cauda V, ventro-lateral keels posteriorly divergent; cauda III and IV with ventral and ventro-lateral keels absent to obsolete; ventral surface of telson vesicle agranular.

Description: See also Table 6. The type series consists of an adult ♀ holotype, 2 subadult ♀, 4 adult ♂, 2 subadult ♂ paratypes. The following description is based on the ♀ holotype unless otherwise indicated.

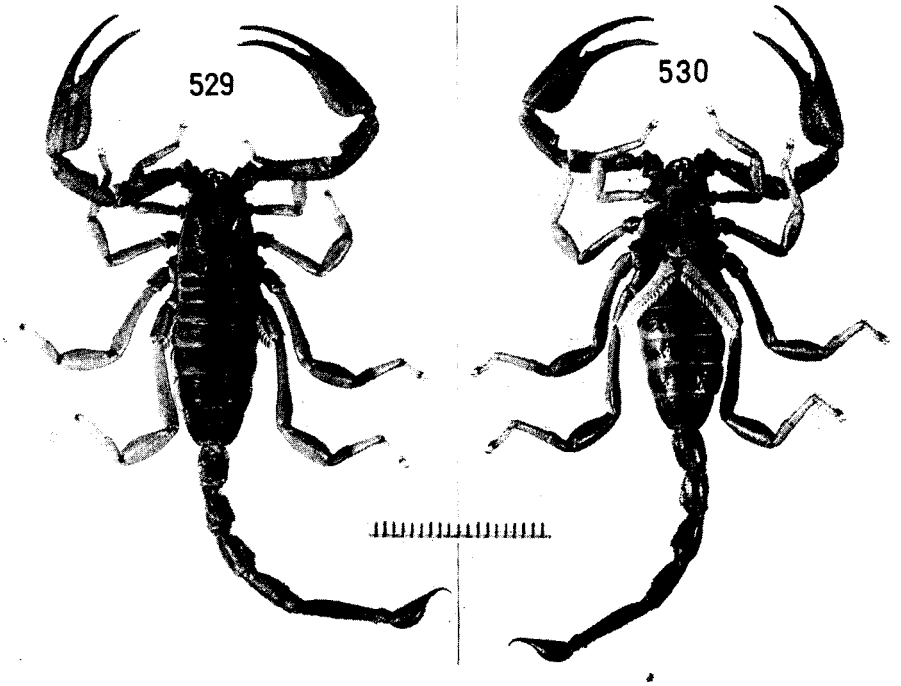
Granulation: Upper and outer surfaces of pedipalp handback and tibia and outer femur shiny and smooth to very shallowly reticulated in texture and occasionally with a few scattered granules; inner surfaces of handback, tibia and femur and dorsal femur with few scattered granules; carapace, interocular surface smooth and shiny, lateral and posterior surfaces lightly granular; tergite VII lateral surfaces lightly granular; ventral surface of cauda V lightly granular, ventral keel not very distinct, ventro-lateral keels granular to sub-spiniform, dorsal keels obsolete (partially present in ♂ paratypes); all other cuticular surfaces smooth and shiny.

Colour: Pedipalps, caudal segments and cheliceral fingers dark yellowish brown No. 78; cheliceral handback, carapace and tergites deep yellowish brown No. 75; legs I–IV dark orange yellow No. 72; sternite VII strong yellowish brown No. 74 and I–VI light orange yellow No. 70; pectines and genital operculum light yellow No. 86.

Pedipalps: Fig. 531. Handback finger keel shallowly costate, outer ventro-lateral keel shallowly granular; dentate margin of fixed and movable fingers of chelae with respectively 5 and 6 enlarged and prominent teeth in addition to the



Figs 525–528. *Opisthophthalmus* species, right hemispermatophore; 525, *O. jenseni* holotype (TM 9504) ventral aspect; 526, *O. penrithorum* sp. n. paratype (NM 10601) ventral aspect; 527–528, *O. wahlbergi* (NM 10356); 527, ventral aspect; 528, oblique aspect of distal half showing hook notch in lateral outline.

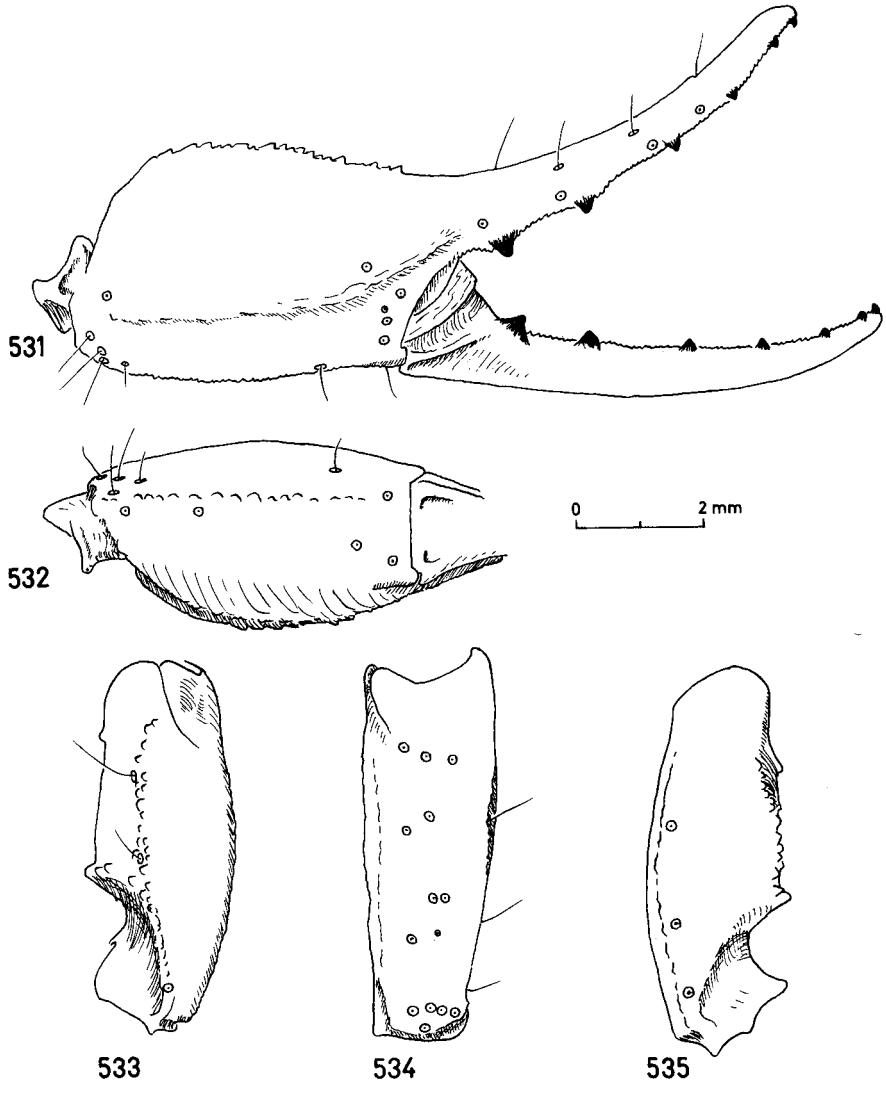


Figs 529–530. *Opisthophthalmus penrithorum* sp. n., ♂ paratype (NM 10601). Scale in mm.

terminal ones; fingers of ♂ and ♀ long, with length movable finger/handback length 1,58 (1,55–1,62); handback of ♂ and ♀ narrow with width handback/carapace length ratio 0,50 (0,48–0,52).
Legs: See Table 6.
Cauda: See Table 6.
Sternum: Subpentagonal in outline, width equal to length.
Setation: A moderately pilose species, see Figs 529, 530.
Trichobothria: As in Figs. 531–535. (+1) neobothriotaxic for group C with 14 external τ on tibia. Also see couplet 23 in key to species of *Opisthophthalmus*.
Hemispermatophore: As in Fig. 526. Differing diagnostically from that of *flavescens* in the shape, length and size of the hook notch, distal lamina, distal crest of distal lamina, basal portion and foot. Percentages of distances of hook apex to other structures in relation to various sets of distances are as follows for paratype NM 10601:

1. ha → w distance × 100/dcr → w distance = 30,4%
2. ha → bsh distance × 100/ha → w distance = 40,9%
3. ha → bsh distance × 100/dcr → bsh distance = 15,0%

Variation: Sexual dimorphism: Holotype and paratypes. Adult males differ from the only adult ♀ available in the following characters: ♂ trunk proportionally more slender with width sternite V/carapace length ratios 0,95 (0,93–0,98) for ♂ and 1,09 for ♀; ♂ cauda proportionally 25% longer than trunk length, ♀ cauda subequal to trunk in length; ♂ tergites and carapace finely granular, ♀ smooth and



Figs 531–535. *Opisthophthalmus penrithorum* sp. n., ♀ holotype (NM 9123). 531–532, right hand; 531, outer aspect; 532, ventral aspect; 533–535, right pedipalp tibia; 533, dorsal aspect; 534, outer aspect; 535, ventral aspect.

shiny; first proximal middle lamella of each pecten with mesial margin obtusely angular and bearing teeth along entire length of posterior margin of pecten in ♂, in ♀ shallowly convex and with proximal one-third of pectinal posterior margin devoid of teeth; ♂ pedipalps are more pilose than ♀; ♂ with 18–22 and ♀ 12–16 teeth per pecten.

Intraspecific variation: Only in colour. The ♀ holotype is darker in overall colour than any of the paratypes. ♂ are in addition lighter than ♀ in overall colour as described for *O. coetzeei*, a sympatric species.

Measurements: Greatest recorded body length of adult paratype ♂ 6,5 cm (carapace 9,2 mm) of adult ♀ holotype 6,5 cm (carapace 9,2 mm).

Type material: Holotype in Natal Museum (NM 9123). Paratypes in: Natal Museum; Transvaal Museum, Pretoria; State Museum, Windhoek.

Material examined: ♀ holotype, Ururas near Rooibank, Namib Desert Park, Aug 1966, F. Gaerdes (NM 9123). Paratypes: 1 subad ♀, Swartbank, Namib Desert Park, 19 Feb 1972, B. Lamoral (NM 10593); 1 subad ♀, Ganab, Namib Desert Park, 16 Sep 1971, P. Olivier (SMN 356); 1 subad ♂, Swartbank, 2 Feb 1972, B. Lamoral (NM 10537); 1 subad ♂, Rössing Mountains, Swakopmund district, 1 Mar 1974, M. Penrith (SMN 514); 1 ♂, (TM 8923); 1 ♂, 32 km north of Swakopmund, 11 May 1972, O. Prozesky (TM 10493); 1 ♂, Swartbank weather station, Namib Desert Park, 14 Feb 1972, W. Goussard (NM 10602); 1 ♂, Rooibank, Namib Desert Park, 2 Feb 1972, Dr Roer (NM 10601).

Distribution: Central Namib gravel plains.

Bionomics: All specimens collected were found in shallow scrapes under large stones on soils with surface hardness ranging from categories VII–X (Table 2). *O. penrithorum* is hemiedaphic and presumably nocturnal. No additional ecological data are available.

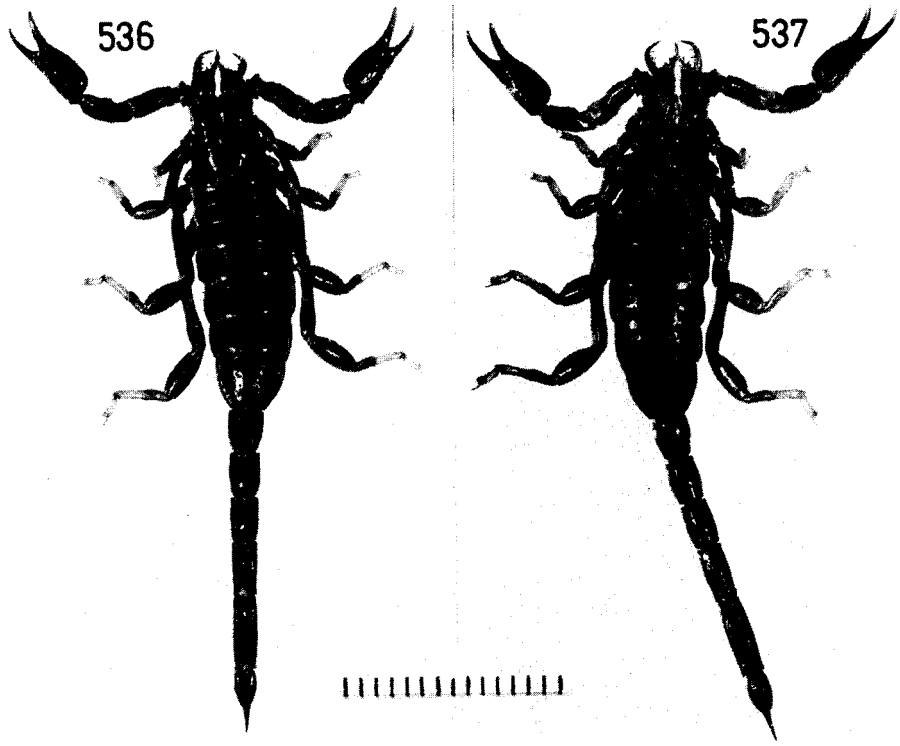
Opisthophthalmus pygmaeus sp. n. Figs 536–544

Derivation: Pygmaeus m. (L.) = dwarf.

Diagnosis: O. pygmaeus is closely related to *O. concinnus* but can be separated from it and other species of the genus on the following combination of characters. Carapace: anterior and median ocular furrows without sutures; lc/x ratio 2,10–2,25. Pedipalp chela with 4 *V* τ. Pedipalp tibia with 14 *e* τ and 3 *v* τ. Leg telotarsi with median dorsal lobe distinctly shorter than lateral lobes. It is the smallest species of *Opisthophthalmus* so far described, with a maximum total body length of 4,2 cm.

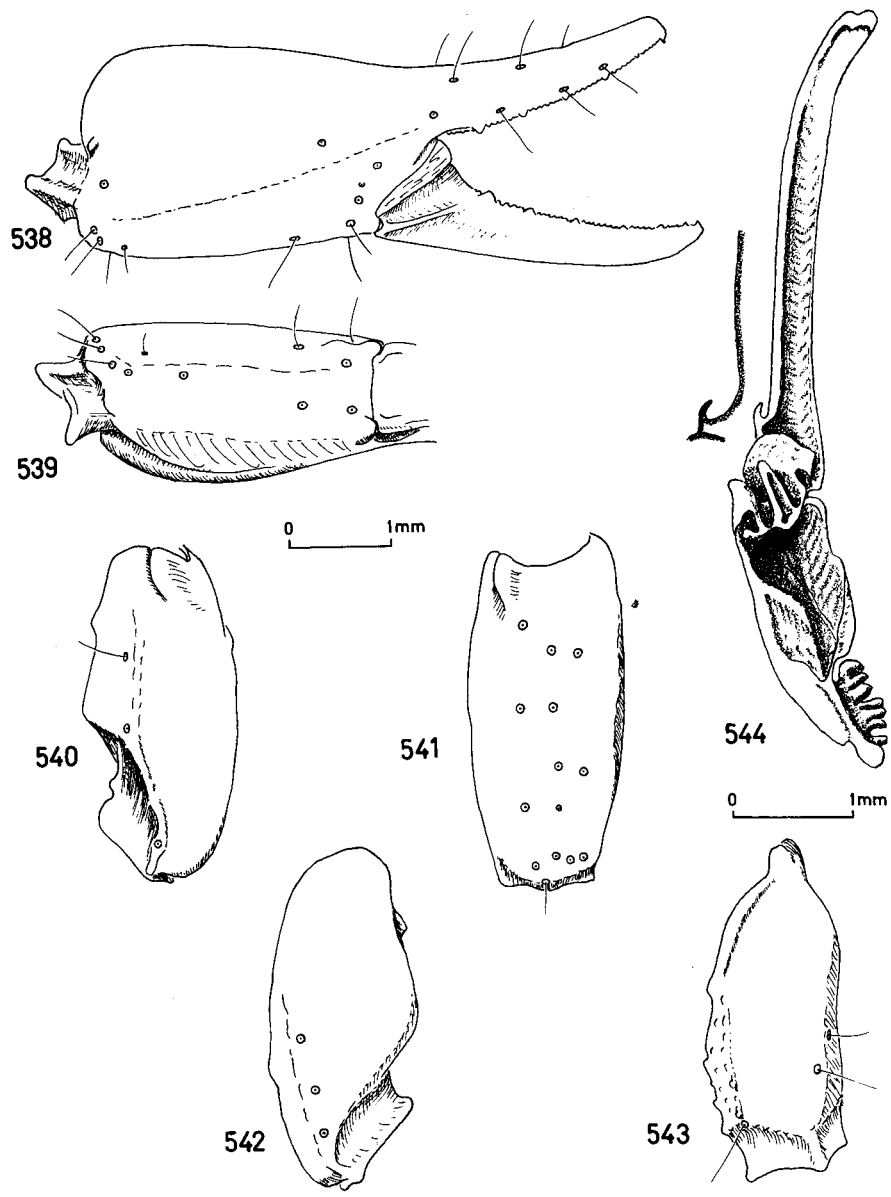
Description: See also Table 6. The type series consists of a ♀ holotype, 2 ♀ paratypes and 160 ♂ paratypes. The following description is based on the ♀ holotype, unless otherwise indicated, and supplements the above diagnosis and pertinent plates and figures.

Granulation: Upper and outer surfaces of pedipalp handback, tibia and femur smooth and shiny while sparsely and lightly reticulated in texture; ventral surface of cauda V densely and finely granular, ventral keels absent, ventrolateral keels obsolete; proximal ventral surface of telson vesicle lightly granular; ventral surface of cauda IV sparsely and shallowly punctate; all other cuticular



Figs 536–537. *Opisthophthalmus pygmaeus* sp. n., ♀ holotype (NM 11104). Scale in mm.

surfaces smooth and shiny except those described under sexual dimorphism.
Colour: Pedipalps, carapace and cauda I–V strong brown No. 55; telson and legs I–IV brownish orange No. 54; tergites and sternites deep yellowish brown No. 75; posterior margins of carapace, tergites I–VI and sternites III–VI dark orange yellow No. 72; pectines light orange yellow No. 70.
Chelicerae: Large with length of chela equal to 60% of carapace length; chela fingers longer than handback and with movable fingers distally strongly curved.
Pedipalps: Finger keel almost obsolete while in ♂ paratypes the finger keel is strongly costate. Outer ventro-lateral keel of handback shallowly costate but distinctly costate in ♂ paratypes. Length movable finger/length handback ratio 1,06 and width handback/carapace length ratio 0,39; these ratios are approximately the same in ♂ paratypes.
Carapace: lc/x ratio 2,21 with median eyes distinctly antero-median in position.
Legs: Legs I and II: telotarsi, basitarsi and tibia posterior and anterior margins with a single comb-like row of long setae.
Cauda: All caudal segments devoid of any keels except ventro-lateral of V which are obsolete; in ♂ paratypes a few small granules are present distally in the region of the dorsal keels in cauda I–IV, otherwise as for ♀ holotype.
Pectines: 2 teeth per pecten. Also see Fig. 537.
Sternum: Subpentagonal in outline, width subequal to length.



Figs 538–544. *Opisthophthalmus pygmaeus* sp. n. 538–543, ♀ paratype (NM 11105); 538–539, right hand; 538, outer aspect; 539, ventral aspect; 540–542, right pedipalp tibia; 540, dorsal aspect; 541, outer aspect; 542, ventral aspect; 543, right pedipalp femur, dorsal aspect; 544, ♂ paratype (NM 10684), right hemispermatophore, ventral aspect, with hook notch also shown in lateral outline. *Scales:* 538–543, middle; 544, lower right.

Setation: A lightly pilose species with setation as for *O. concinnus*.
Trichobothria: As in Figs 538–543 for paratype ♀ (NM 11105). (+1) neobothriotaxic for group C with 14 external τ on tibia. Pedipalp femur, with $\tau\, d$ distinctly distal to *i*.
Hemispermatophore: As in Fig. 544. Differing diagnostically from that of *O. concinnus* in the shape, length and size of the hook notch, distal lamina and distal crest of median lobe. Percentages of distances of hook apex to other structures in relation to various sets of distances are as follows for paratype NM 10684.

1. ha → w distance × 100/dcr → w distance = 20,1%
2. ha → bsh distance × 100/ha → w distance = 34,8%
3. ha → bsh distance × 100/dcr → bsh distance = 7,8%

Variation: Sexual dimorhpism: Holotype and paratypes. Adult males differ from the two females that are adults out of the three available, in the following characters: ♂ smaller than ♀; ♂ trunk proportionately more slender with width sternite V/carapace length ratios 0,80 (0,77–0,83) for ♂ and 0,93–0,95 for ♀; ♂ tergites and carapace finely granular, ♀ smooth and shiny; ♂ sternites III–VII and ventral surfaces cauda I–III densely and uniformly shallowly punctate, in ♀ these surfaces very sparsely and shallowly punctate and smooth; ♂ with 9–13 and ♀ 1–3 teeth per pecten.
Intraspecific variation: Only in colour. Specimens from Belda farm 361, with the following surfaces having light to dark reticulated infuscations: dorsal and posterior pedipalp tibia and femur; carapace and tergites; distal half of prefemur and anterior and posterior femur of legs I–IV.

Measurements: Maximum recorded body lengths of adult paratype ♂ 3,8 cm (carapace 5 mm) of holotype ♀ 4,2 cm (carapace 6,2 mm).

Type material: Holotype in Natal Museum. Paratypes in: Natal Museum; Transvaal Museum; State Museum; Museum national d'Histoire naturelle; British Museum (Natural History); American Museum of Natural History and California Academy of Sciences.

Material examined: Holotype ♀, Louwshoop, 3 Feb 1973, B. Lamoral (NM 11104). Paratypes: 1 ♀, Belda, 1 Feb 1973, B. Lamoral (NM 11105); 55 ♂, Belda, 1 Feb 1973, B. Lamoral (NM 10687); 4 ♂, Belda, 28 Feb 1973, B. Lamoral (NM 10684); 102 ♂, Louwshoop, 3 Feb 1973, B. Lamoral (NM 10684 and other museums); 1 ♀, Ortmansbaum, 18–21 Oct 1971 (SMN 308).

Distribution: South central region of Namibia.

Bionomics: As for *O. lornae* with which *O. pygmaeus* is sympatric. At this stage no definite ecological differences between the two species are evident.

Opisthophthalmus schultzei Kraepelin, 1908. Figs 353, 545–557

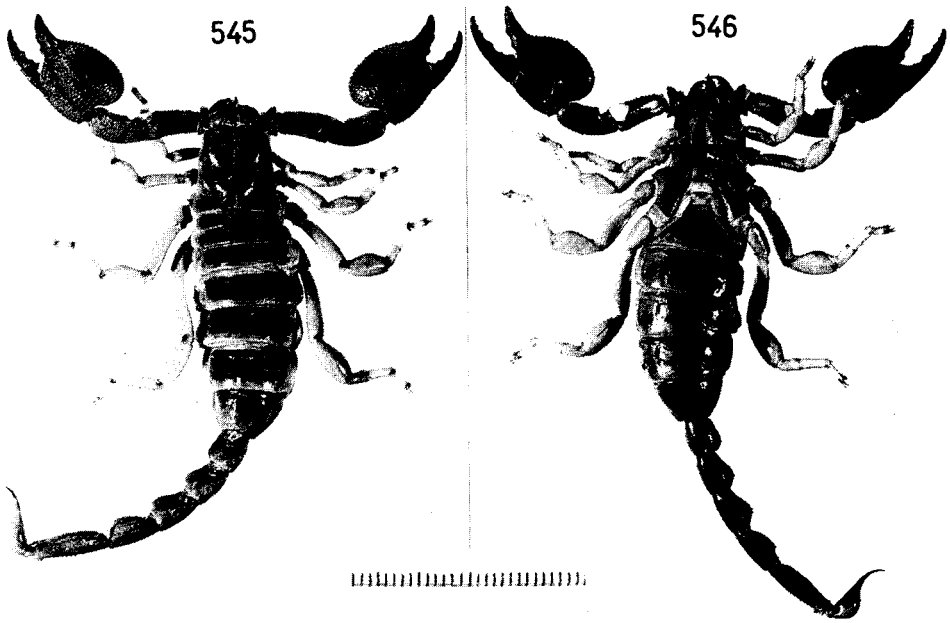
Opisthophthalmus schultzei Kraepelin, 1908: 262–263.
Opisthophthalmus laevicauda Roewer, 1943: 230–232, Pl. 5, Fig. 9a-d. **Syn. n.**
Opisthophthalmus undulatus Kraepelin, 1908: 263–264. **Syn. n.**

Diagnosis: O. schultzei is most closely related to *O. adustus* but can be separated from it and other species of the genus by the following combination of

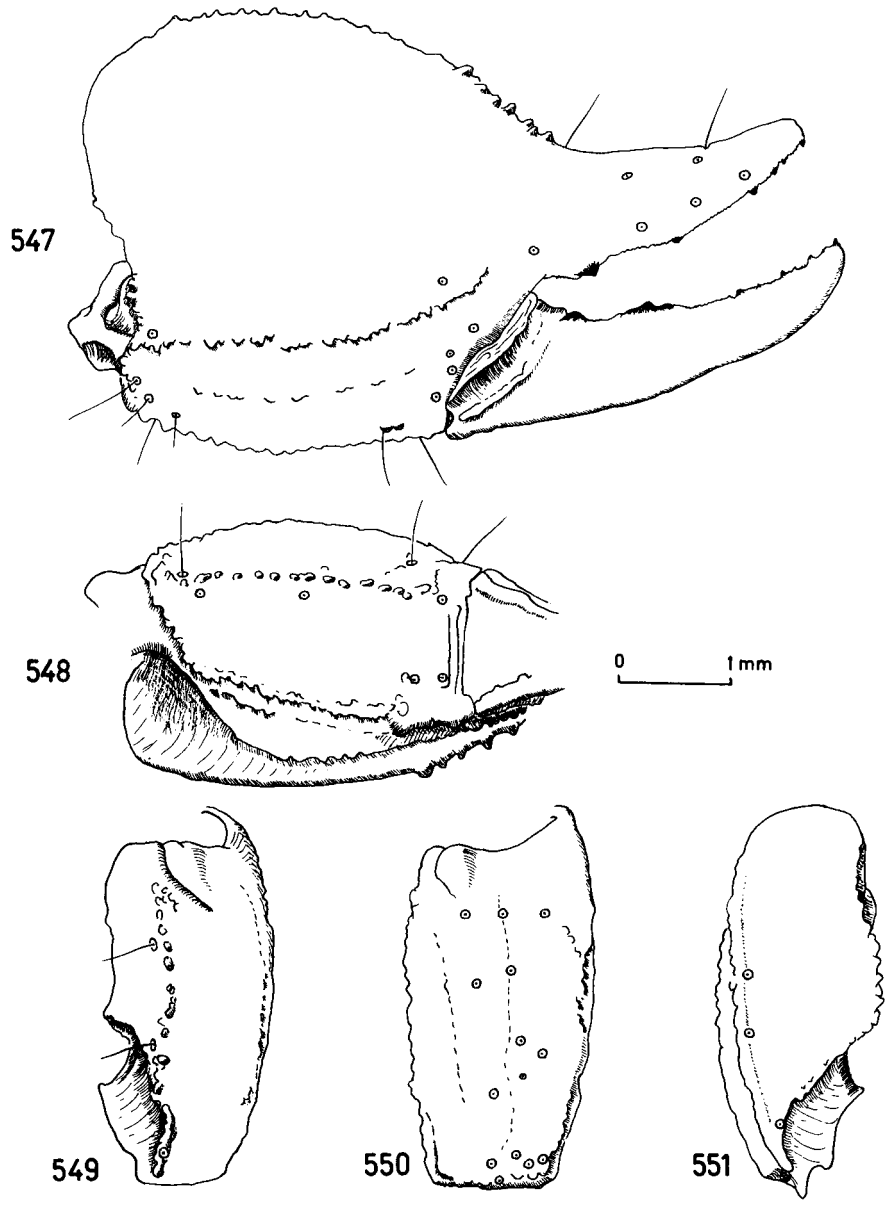
characters. Carapace Fig. 353: anterior median furrow with distinct longitudinal and anterior bifurcating sutures; median ocular furrow with longitudinal suture indistinct. Caudal segments II–IV with distal spines; dorsal keels only slightly larger than preceding ones. Ventral surface of telson vesicle lightly granular, telson not infuscated. Basitarsi I and II with a row of 3 spine-like setae on posterior surface. Lateral claws of equal length within each pair, short and strongly curved.

Description: The following account supplements Kraepelin's (1908: 262–263) original description, his original description (1908: 263–264) of *O. undulatus* a new synonym of *O. schultzei*, Roewer's (1943: 230–232) original description of *O. laevicauda* also a new synonym and Table 6. Kraepelin's description of *schultzei* was based on a subadult ♀ and a juvenile ♂ and that of *undulatus* on adult males. The character states listed in Table 6 for *schultzei* were compared with those found in the ♂ types of *undulatus* and no diagnostic differences, besides ones normally associated with sexual dimorphism, could be established. Roewer's holotype of *laevicauda* was found to be a ♀ and not a ♂ and, similarly, conspecific with *schultzei*.

Granulation: Upper and outer surfaces of handback evenly granular in ♀, but more shallowly so in ♂; finger keel costate granular anteriorly, granular posteriorly in ♀, in ♂ costate anteriorly, costate granular posteriorly; accessory keel of outer surface obsolete. Outer, dorsal and inner surfaces of pedipalp tibia and upper surface of femur lightly granular. Carapace: interocular surface smooth, lateral surfaces lightly granular, posterior median surface agranular in ♀, very



Figs 545–546. *Opisthophthalmus schultzei*, ♀ homotype (NM 10720). Scale in mm.



Figs 547–551. *Opisthophthalmus schultzei*, ♀ lectotype (ZMB 14988). 547–548, right hand; 547, outer aspect; 548, ventral aspect; 549–551, right pedipalp tibia; 549, dorsal aspect; 550, outer aspect; 551, ventral aspect.

lightly granular in ♂. Proximal ventral surface of telson vesicle lightly granular in both sexes.

Colour: Pedipalps and carapace, strong brown No. 55; cauda I–V, deep yellowish brown No. 75; sternites, dark orange yellow No. 72; legs I–IV, moderate orange yellow No. 71, pectines, light orange yellow No. 70; tergites, anterior three-quarters brown black No. 65, lateral margins and posterior one quarter with a light orange yellow No. 70 border. Chelicerae: fixed and movable fingers brown black No. 65; anterior one-third of handback brown black No. 65 to darkly reticular, posterior two-thirds strong yellowish brown No. 74.

Pedipalps: Outer ventro-lateral keel of handback granular, inner ventro-lateral keel moderately costate.

Carapace: lc/x ratio 1,73 (1,71–1,75). See also Table 6.

Legs: As in Table 6.

Cauda: As in Table 6 and diagnosis.

Pectines: ♂ with 16–20 and ♀ 12–13 teeth per pecten.

Setation: Pedipalps, legs, lateral and posterior margins of sternites III–VII and caudal segments, moderately pilose in ♀, these distinctly more pilose in ♂.

Trichobothria: As in Figs 547–551 and 552–556 for ♀ and ♂ respectively. (+1) neobothriotaxic for group C with 14 external τ on tibia. Differing diagnostically from *O. adustus* in the following distribution: pedipalp chela, distance between τ *est* and *esb* approximately equal to half that between *esb* and *eb*.

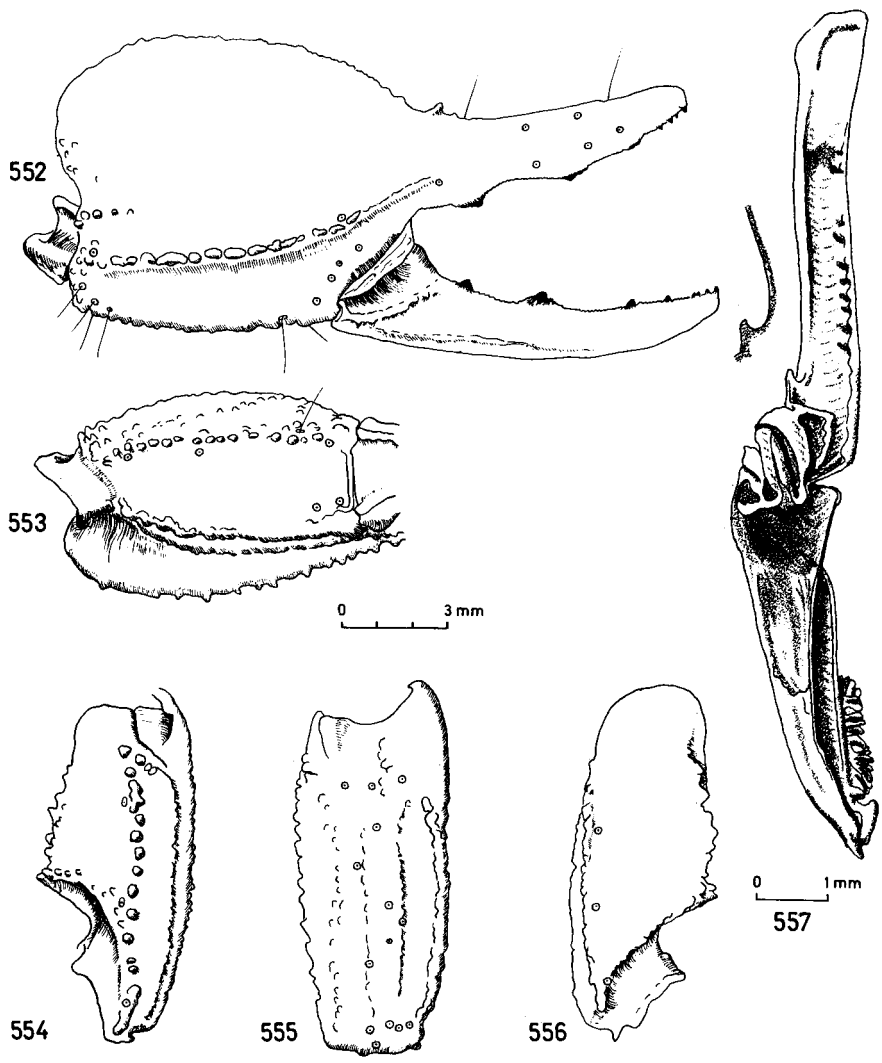
Hemispermatophore: As in Fig. 557. Differing diagnostically from that of *O. adustus* (Fig. 388) in the shape and length or size of the hook notch, distal lamina, basal portion and foot. Percentages of distances of hook apex to other structures in relation to various sets of distances as following:

1. ha → w distance × 100/dcr → w distance = 24,4%
2. ha → bsh distance × 100/ha → w distance = 30,6%
3. ha → bsh distance × 100/dcr → bsh distance = 9,1%

Variation: Sexual dimorphism: No adult ♀ is available but the following differences between adult ♂ and subadult ♀ are distinct. ♂ trunk proportionally more slender with width sternite V/carapace length ratios 0,88 (0,85–0,91) for ♂ and 1,05 for the largest ♀; pedipalp handback of ♂ narrower and fingers longer than in ♀ with width handback/carapace length ratios 0,70 (0,69–0,71) in ♂ and 0,83 in the largest ♀ and length movable finger/handback length ratios 1,52 (1,50–1,54) in ♂ and 1,30 in the largest ♀; ♂ tergites finely shagreened, ♀ smooth and shiny; sternites IV–VII and ventral surfaces of cauda I–III and, to a variable extent, of cauda IV finely and transversely rippled in ♂, these smooth and shiny in ♀; first proximal middle lamella of each pecten with mesial margin obtusely angular and with proximal one-sixth of posterior margin of pecten devoid of teeth in ♂, in ♀ almost sublinear and with proximal one-third of pectinal posterior margin devoid of teeth; ♂ with 16–20 and ♀ 12–13 teeth per pecten.

Intraspecific variation: No variations in the available material except for the lighter overall colour of the 2 ♂ from the Erongo mountains (NM 11071 & SMN 174).

Measurements: Maximum recorded body lengths of adult ♂ 9,3 cm (carapace 13 mm) of largest subadult ♀ 7,7 cm (carapace 10,6 mm).



Figs 552–557. *Opisthophthalmus schultzei*, ♂ (ZMB 14993—type of *O. undulatus*). 552–553, right hand; 552, outer aspect; 553, ventral aspect; 554–556, right pedipalp tibia; 554, dorsal aspect; 555, outer aspect; 556, ventral aspect; 557, right hemispermatophore, ventral aspect, with hook notch also shown in lateral outline. *Scales*: 552–556, middle; 557, lower right.

Type material: The type series examined consists of a subadult ♀ and a juvenile ♂ syntypes, (ZMB 14988). The ♀ is hereby selected as lectotype of *Opisthophthalmus schultzei* and the ♂ as paralectotype. These are deposited in the collection of the Zoologisches Museum Berlin.
Homotypes: I have selected a ♀ and ♂ homotype which are deposited in the Natal Museum collection (NM 10720).

Material examined: ♀ lectotype ♂ paralectotype, Kubub, gr. Namaland, L. Schultze (ZMB 14993); *Opisthophthalmus laevicauda* ♀ holotype (not ♂), Lüderitzbucht (NMS 6741/148); *O. undulatus* 2 ♂ syntypes, Kubub, gr. Namaland (ZMB 14993); 1 ♀ and 1 ♂ subad (homotypes) farm Kubub 15, 1 Mar 1976, B. Lamoral (NM 10720). 1 ♂, Erongo mountains, 3 Aug 1961, P. Buys (NM 11071); 1 ♂, Erongo mountains, 3 Aug 1961, P. Buys (SMN 174); 1 juv ♂, Aus, 29 Nov 1912, G.S.M.A. (TM 406).

Distribution: All available localities are within a radius of 15 km of Aus in the Lüderitz district, with the exception of the 2 ♂ from the Erongo mountains in the Omaruru district. The Erongo mountains are situated approximately 525 km north of Aus and provided there has not been an error in the locality recording for these 2 ♂, this considerably extends the species range of *O. schultzei*.

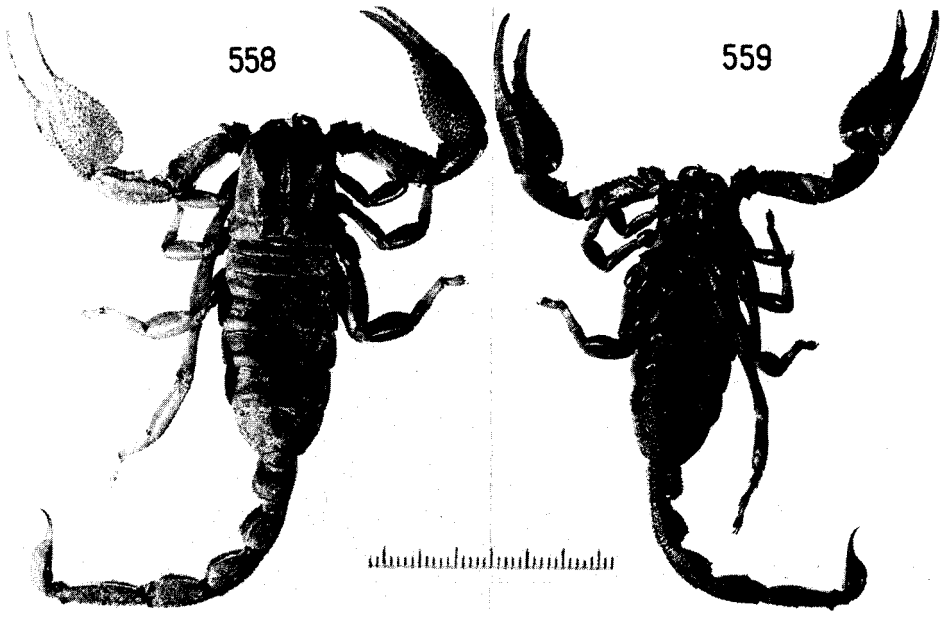
Bionomics: The only specimens personally collected (♀ and ♂ homotypes) were dug out of burrows 15–20 cm deep in very hard, stony ground with surface hardness falling within categories XX–XXI (Table 2), Burrow entrances were situated at the side of large stones. The distribution range of *O. schultzei* falls within a region of vegetation type 3A (Fig. 4) in the south and 7 in the northern limit (Erongo mountains). *O. schultzei* is nocturnal and hemiedaphic.

Opisthophthalmus setifrons Lawrence, 1961. Figs 357, 524, 558–565

Opisthophthalmus setifrons Lawrence, 1961: 151–152.
Opisthophthalmus pictus nigrocarinatus Lawrence, 1969: 113–115. **Syn. n.**
Opisthophthalmus vivianus Lawrence, 1969: 112–113. **Syn. n.**

Diagnosis: Because of the uncertainty surrounding the validity of the present status of *O. setifrons* (see remarks) no direct affinity to a sister species can be allocated at this stage. The following combination of characters is, however, diagnostic of the species. Carapace, Fig 357: anterior median furrow with distinct longitudinal and anterior bifurcating sutures, the latter long and occupying almost one-quarter of the total carapace length. Sternite VII and ventral surface of cauda I rasp-like, covered with large, non-anastomosing crescent-shaped granules which are usually individually infuscated.

Description: The following account supplements Lawrence's (1961: 151–152) original description, his original descriptions (1969: 112–115) of *O. vivianus* and *O. pictus nigrocarinatus*, both new synonyms of *setifrons*, and Table 6.
Granulation: As for *O. pictus*. See also this diagnosis and Lawrence's description of *O. vivianus* and *O. pictus nigrocarinatus* (1969: 112–115) and Figs 558–559.
Pedipalps: Upper and outer surfaces of handback evenly and distinctly granulated with flattened granules; finger keels granular, upper accessory and outer accessory keels granular and distinct in ♂ and ♀.

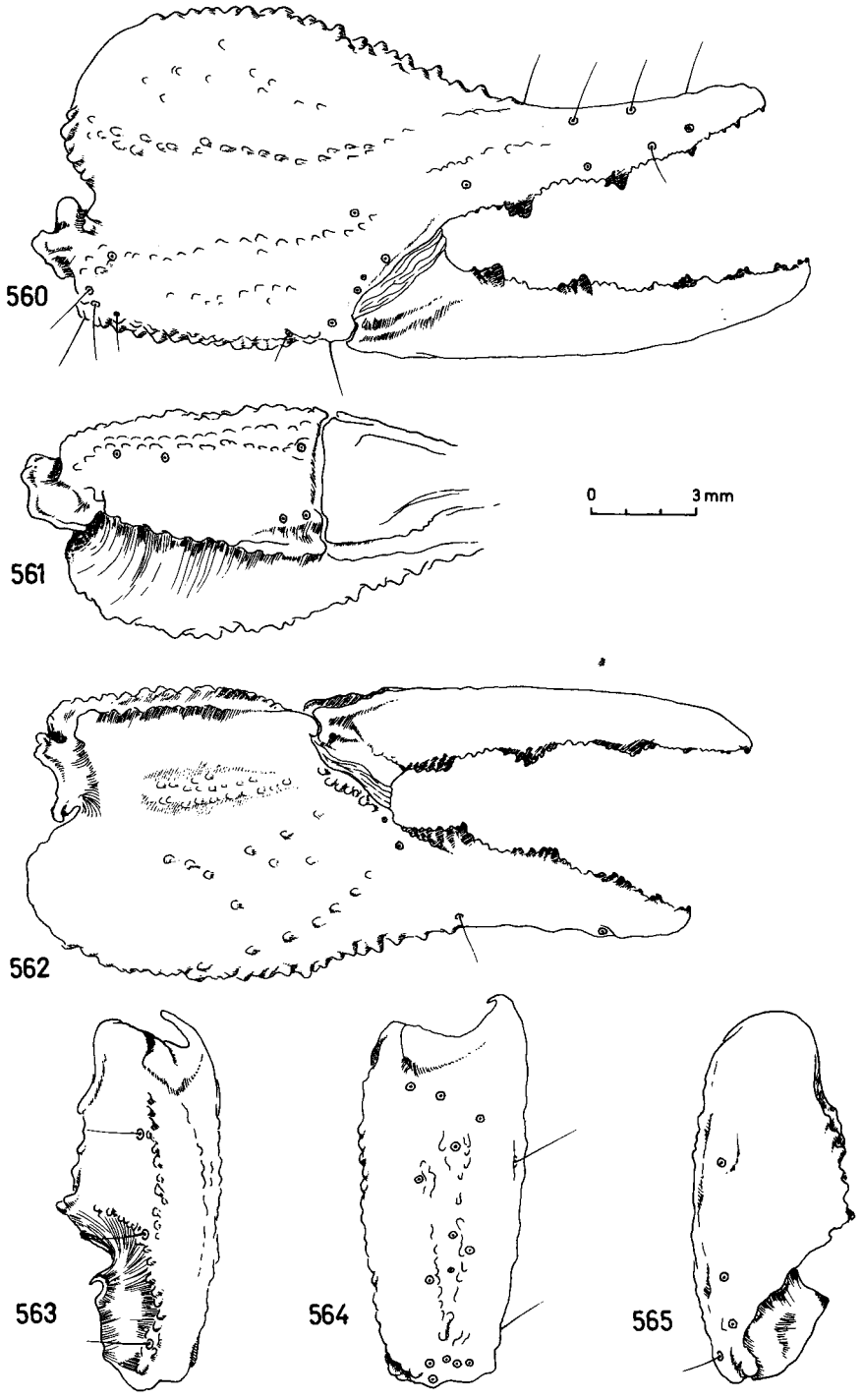


Figs 558–559. *Opisthophthalmus setifrons*, ♂ holotype (NM 8330). Scale in mm.

Colour: As described by Lawrence for *O. vivianus* and *O. pictus nigrocarinatus* (1969: 112–115).
Carapace: lc/x ratios 1,63 (1,61–1,65) for ♀ and ♂. Interocular surfaces of ♀ and ♂ smooth excepting lateral margins of anterior median furrow and anterior bifurcation which are lined with a single row of small granules.
Pectines: First proximal middle lamella of each pecten with mesial margin shallowly curved while proximal one-third of posterior margin of pecten is devoid of teeth in ♀ and ♂. ♂ with 11–15 and ♀ 10–13 teeth per pecten.
Trichobothria: As in Figs 560–565. (+1) neobothriotaxic for group C with 14 external τ on tibia.
Hemispermatophore: As in Fig. 524. Percentages of distances of hook apex to other structures in relation to various sets of distances, as following for one hemispermatophore dissected.

1. ha → w distance × 100/dcr → w distance = 24,4%
2. ha → bsh distance × 100/ha → w distance = 30,6%
3. ha → bsh distance × 100/dcr → bsh distance = 9,1%

Variation: Sexual dimorphism: In adults, males differ from females in the following characters: ♂ trunk proportionally more slender with width sternite V/carapace length ratios 0,90 (0,86–0,93) for ♂ and 1,06 (1,04–1,09); ♂ cauda approximately 15% longer than trunk length, in ♀ approximately equal while total body length is approximately the same in both sexes; pedipalp handback of ♂ narrower and fingers longer than ♀ with width handback/carapace length ratios 0,70 (0,67–0,73) in ♂ and 0,86 (0,82–0,90) in ♀ and length movable finger/handback



Figs 560–565. *Opisthophthalmus setifrons*, ♂ holotype (NM 8330). 560–562, right hand; 560, outer aspect; 561, ventral aspect; 562, inner aspect; 563–565, right pedipalp tibia; 563, dorsal aspect; 564, outer aspect; 565, ventral aspect.

length ratios 1,71 (1,66–1,76) in ♂ and 1,42 (1,38–1,43) in ♀; ♂ pedipalps and cauda more pilose than ♀. Tergites of ♂ lightly shagreened of ♀ smooth and shiny.
Intraspecific variation: Little except in overall colour and amount of infuscation of the crescent-shaped granules on the sternites and ventral surfaces of caudal segments, within samples of the same population.

Measurements: Maximum recorded body lengths of adult ♂ 8,5 cm (carapace 13,6 mm) of ♀ 8,2 cm (carapace 13,3 mm).

Type material: Lawrence's ♂ holotype is in good condition and is deposited in the Natal Museum (NM 8330).

Material examined: Holotype ♂, Kam River, Oct–Dec 1937, H. Bell-Marley (NM 8330); *Opisthophthalmus vivianus* ♂ holotype (not ♀), Rehoboth area (TM 8225); *O. pictus nigrocarinatus* ♂ holotype (not ♀), 30 miles south of Ohopoho, Kaokoveld (AM). 1 ♀, Isabis, Dec 1974 (SMN 596); 4 ♀, Keilberg, 10 Mar 1969, B. Lamoral (NM 10072); 2 ♂ Swartbooisdrift, Kaokoveld Expedition (SMN 115); 7 ♀ 10 subad ♂, De Waal, 16 Mar 1969, B. Lamoral (NM 10544); 1 ♂, Swartbooisdrift, Kaokoveld Expedition (NM 11107).

Distribution: Available material comes from the following regions: Kaokoland, Otavi Highlands and Rehoboth, Windhoek and Gobabis districts.

Bionomics: The only specimens personally collected were dug out of burrows with entrances in open ground (no entrances were found at the side of large stones). The burrows extended to a depth of 15–20 cm below surface in soils with surface hardness falling within categories XV–XVII (Table 2). Available distributions fall within regions with vegetation types 5, 6, 8 and 12 (Fig. 4). *O. setifrons* is nocturnal and hemiedaphic.

Remarks: It is probable that *O. setifrons* is a synonym of *O. pictus* Kraepelin, 1894 of which the type locality is Reddersburg in the Orange Free State, South Africa. This possible synonymy could not be verified by examining Kraepelin's types. It is based on the conclusion that all the material identified as *O. setifrons* in this revision was found to be conspecific with specimens of *O. pictus* from many localities (as far south-east as Graaff-Reinet) in the Cape Province of South Africa.

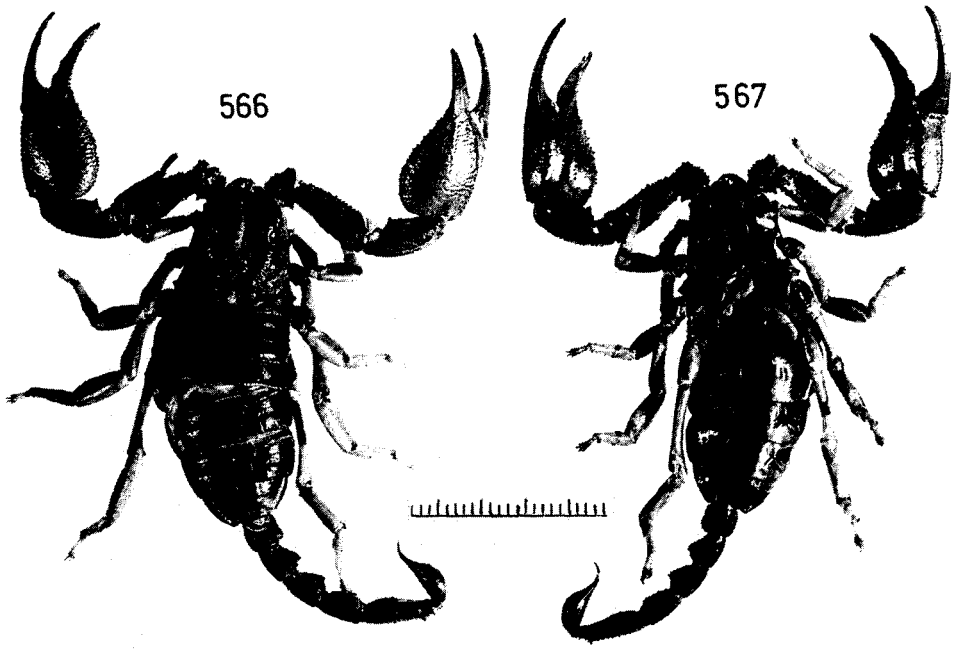
Opisthophthalmus ugabensis Hewitt, 1934, **stat. n.** Figs 342, 375–380, 566–574

Opisthophthalmus undulatus ugabensis Hewitt, 1934: 408–410.
Opisthophthalmus luciranus Lawrence, 1959: 384–385. **Syn. n.**

Diagnosis: O. ugabensis is a sibling species of *O. brevicauda* but can be separated from the latter by the following combination of morphological characters. Pedipalp tibia, Figs 571–573 & 375–380: $\tau\ esb_2$ without an accessory τ; $\tau\ v_1$ without an outer accessory τ: distance between $\tau\ i$ and d_1 two and a half times that between i and d_2.

Description: The following account supplements Hewitt's (1934: 408–410) original description, Lawrence's (1959: 384–385) description of *O. luciranus* and Table 6.

Colour: As for *O. brevicauda* but with melanic surfaces of caudal segments, telson, tergites I–VII, sternite VII and dorsal and lateral surfaces of pedipalp



Figs 566–567. *Opisthophthalmus ugabensis*, ♀ (TM 8939—type of *O. luciranus*). Scale in mm.

trochanter, femur and tibia, much lighter to absent in specimens from southern Angola.

Carapace: With sutures as in Fig. 342.

Trichobothria: As in Figs 568–573 and 375–380; external τ of tibia varying from 14 (Fig. 376) to 20 (Fig. 379); no accessory τ to *esb* series or V_1 of tibia as in specimens of *O. brevicauda*.

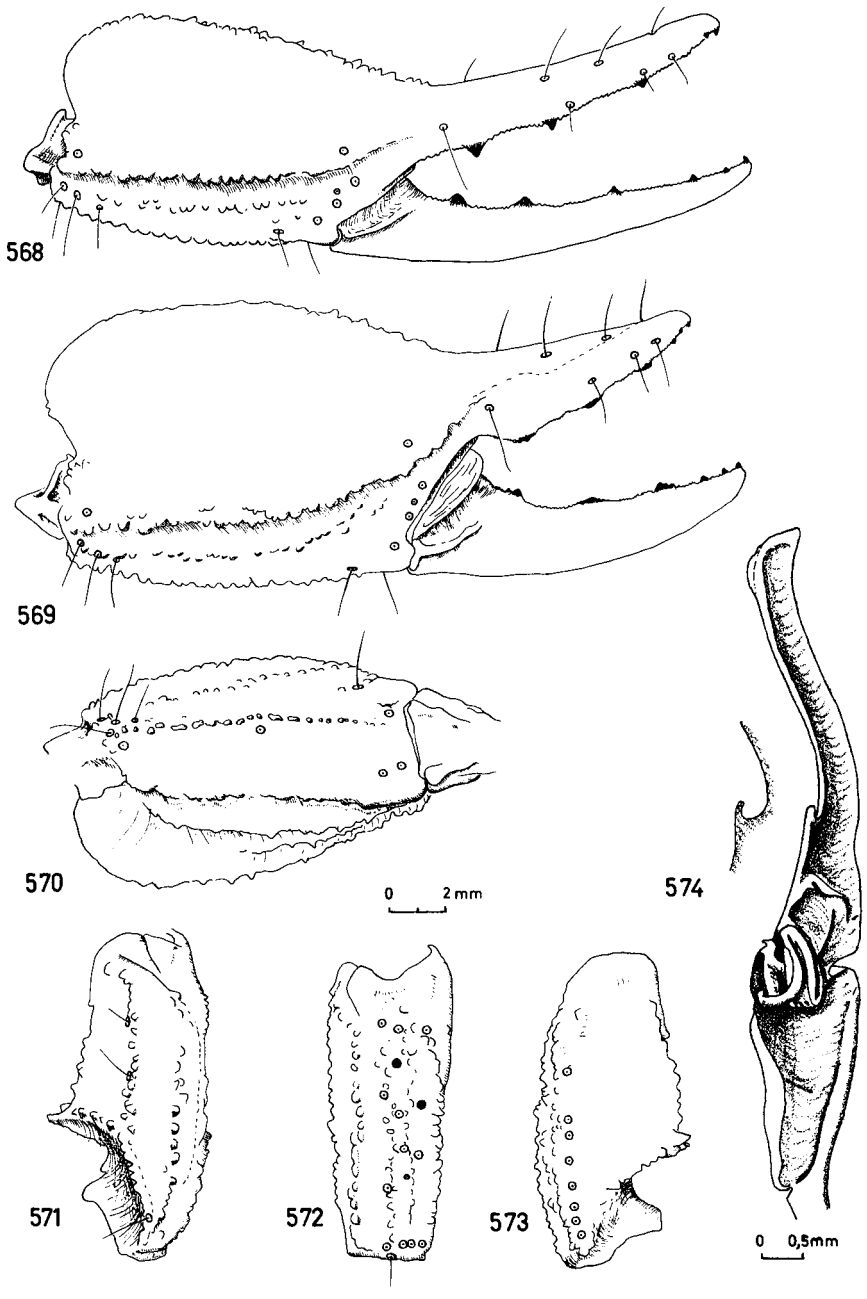
Setation: As in *O. brevicauda*.

Hemispermatophore: As in Fig. 574. Hook notch deeply excavated; percentage ha → bsh distance of ha → w distance 41% (40–42%); position of hook apex distinctly proximal on total distal lamina length, percentage ha → w distance of dcr → w distance 35% (33–37%).

Variation: Sexual dimorphism: As for *O. brevicauda*.

Intraspecific variation: Colour as reported above. Specimens from Angola and south of the Cunene in northern Kaokoland have 14 external τ on tibia as in Fig. 376, 2 ♂ from Khumib River mouth (SMN 216 and 217) have 20 external τ distributed as in Fig. 379 and all specimens from the Brandberg mountains and the lectotype ♀ from Ugab have 16 external τ distributed as in Fig. 572. In all these, *v* τ of tibia number 7–13.

Type material: Hewitt's ♀ and ♂ syntypes (AM 6574) are deposited in the collection of the Albany Museum. The ♂, however, is conspecific with *O. cavimanus* Lawrence while the ♀ is selected as lectotype of *Opisthophthalmus ugabensis*.



Figs 568–574. *Opisthophthalmus ugabensis*. 568, ♂ (Ang. 4038) right hand, outer aspect; 569–573, ♀ (SMN 91); 569–570, right hand, 569, outer aspect; 570, ventral aspect; 571–573, right pedipalp tibia; 571, dorsal aspect; 572, outer aspect; 573, ventral aspect; 574, ♂ (Ang. 4038) right hemispermatophore, ventral aspect with hook notch also shown in lateral outline. *Scales:* 568–573, lower middle; 574, lower right. *Note:* black dots indicate position of accessory trichobothria.

Material examined: ♀ lectotype, Ugab River, R. Bradfield (AM 6574); *Opisthophthalmus luciranus* subad ♀ holotype and 2 juv ♂ paratypes, Lucira, southern Angola (TM 8939). 2 juv ♂, Brandberg mts, 20 Feb 1969, B. Lamoral (NM 10038); 3 juv ♂ 1 juv ♀, Numaskloof, 5 Aug 1969, P. Buys (SMN 100); 2 juv ♀, Numasplato, 9 Aug 1969, P. Buys (SMN 95); 1 ♀ 2 subad ♂, Brandberg, 16 Aug 1969, P. Buys (SMN 101); 1 ♀, Brandberg Wes Myn, 20 Apr 1966, Bestuurder van myn (SMN 91); 1 ♂ 1 subad ♂, Khumib River Mouth, 12 June 1969, C. G. C. (SMN 216–7); 1 juv ♂, New Catengue, south-west Angola, 20 Oct 1970, I. Connell (TM 10033); 3 ♀ 3 ♂ 2 juv ♀, Moçamedes, 22 Oct 1949, Angola, (ANG 4038); 1 ♂ 1 ♀, Kaokoveld (NM 11073); 2 subad ♀, Kunene River, 16 Aug 1956, G. Rudebeck Brincus material (NM 11074); 1 subad ♀ 2 juv ♀, Curocua Road and Iona junction, Angola, 19–21 Oct 1969, C. Coetzee (SMN 162).

Distribution: Western Damaraland, western and northern Kaokoland in Namibia and southern Angola.

Bionomics: No data available.

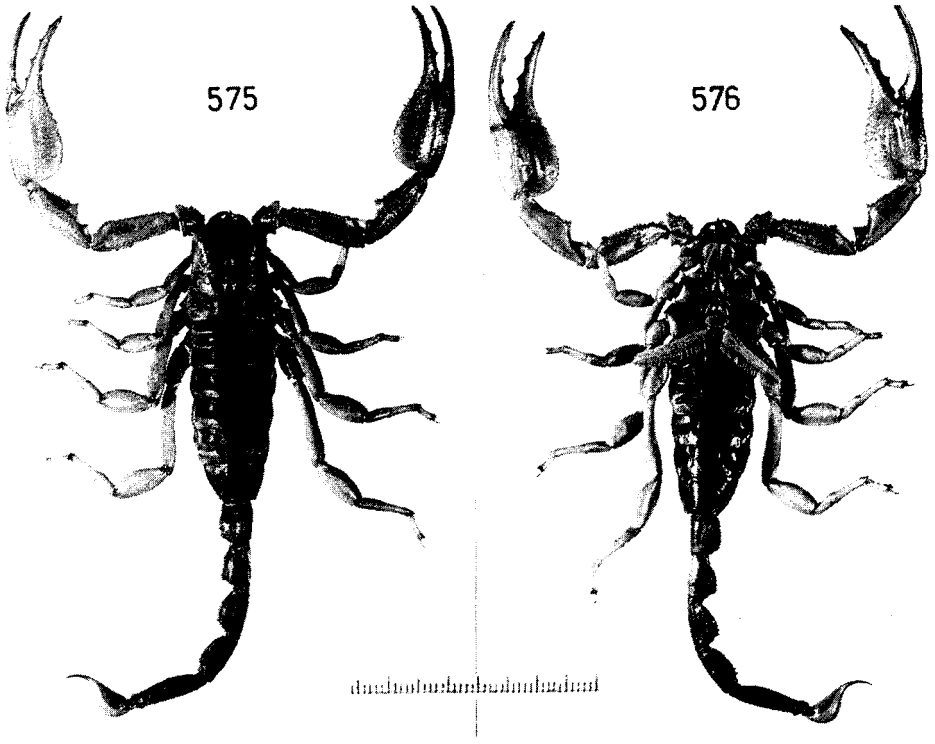
Opisthophthalmus wahlbergi (Thorell, 1876). Figs 527, 575–587

Miaephonus wahlbergi Thorell, 1876: 13.
Opisthophthalmus wahlbergi gariepensis Purcell, 1901: 194–195. **Syn n.**
Opisthophthalmus wahlbergi nigrovescicalis Purcell, 1901: 195. **Syn. n.**

Diagnosis: Adult ♂ and ♀ are subject to extensive colour pattern variations as well as a few other less extensive character state variations which are listed in the section on variation. Notwithstanding these, the following combination of characters separates *O. wahlbergi* from its most closely related species, *O. chrysites*, and other species of the genus. Carapace: anterior median and median ocular furrows without any sutures; lc/x ratio 1,70 (1,65–1,75). Cauda: cauda V, ventro-lateral keels posteriorly subparallel to each other; cauda III, ventral and ventro-lateral keels costate; cauda IV, ventral keels granular, ventro-laterals costate granular; ventral surface of telson vesicle granular.

Description: The following account supplements Thorell's (1876: 13) very brief original description, Thorell's (1877: 222–225) extensive supplement, Purcell's (1899: 139–141 & 1901: 194–195) supplements, the original descriptions of the species synonymised above and Table 6. Material available for this revision and examination of the types of *O. wahlbergi gariepensis* and *O. wahlbergi nigrovescicalis* have led to the conclusion that the diagnostic morphological characters selected by Purcell are so variable as to bridge the character sets proposed by him to separate these species. These variations are the result of hitherto unsuspected clinal differences in what were thought to be diagnostic ones, particularly in the presence or absence of infuscated patterns. In addition Purcell (1901: 195) described the above two subspecies from the same locality, namely Naroep, while recording (1899: 139) *O. wahlbergi wahlbergi* from Zandhoogte, a nearby locality! Habitus extremes are illustrated in Figs 575–578.

Colour: As for population samples from regions within the Kalahari sand system south of the 20° of latitude (see Fig. 20) in Namibia. Females: pedipalps, carapace, cauda I–VI and sternites varying from brownish orange No. 54 to deep brown No. 56; cauda IV and V is quite often lightly to moderately infuscated in



Figs 575–576. *Opisthophthalmus wahlbergi*, ♂ (NM 10540) from south eastern region. Scale in mm.

some populations; telson varying from dark orange yellow No. 72 to strong yellowish brown No. 74; legs varying from brownish orange No. 54 to strong yellowish brown No. 74; tergites I–VII deeply infuscated but with a broad strong yellowish brown No. 74 band along lateral and posterior margins; chelicerae, posterior half of handback varying from deep brown No. 56 to strong brown No. 55 while anterior half and fingers vary from moderately to deeply infuscated; pectines and genital operculum light orange yellow No. 70. Males: as for ♀ but generally lighter in overall colour. Samples from other regions exhibit colour pattern variations which are listed under the section on variation.

Pedipalps: Handback finger keel shallowly costate to obsolete in ♀, costate and distinct in ♂; upper surface of handback smooth to very shallowly reticulate in texture in ♀ and ♂, occasionally with a few scattered small granules in ♂.

Carapace: Interocular surface smooth and shiny, lateral and posterior surfaces lightly granular.

Trichobothria: As in Figs 579–586. (+1) neobothriotaxic for group C with 14 external τ on tibia. Also see couplet 23 in key to species of *Opisthophthalmus*.

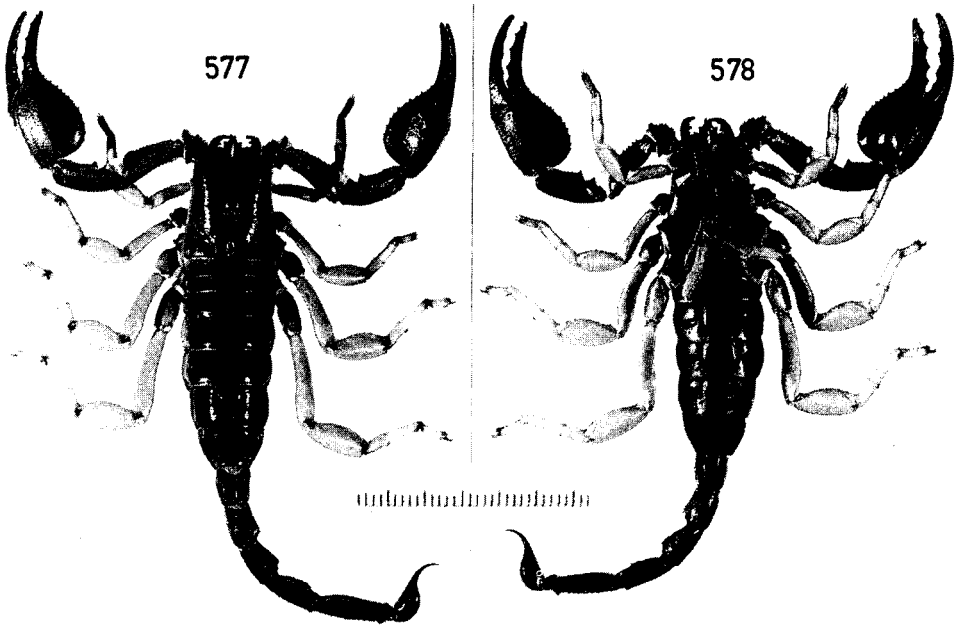
Hemispermatophore: As in Figs 527–528. The distal transverse undulation of the distal lamina shown in these figures is not present in most of the other hemispermatophores dissected. The hemispermatophore of *O. wahlbergi* differs diagnostically from that of its most closely related species, *O. chrysites*, in the shape,

length and size of the hook notch, distal lamina, distal crest of distal lamina, basal portion and foot. Percentages of distances of hook apex to other structures in relation to various sets of distances are as following:

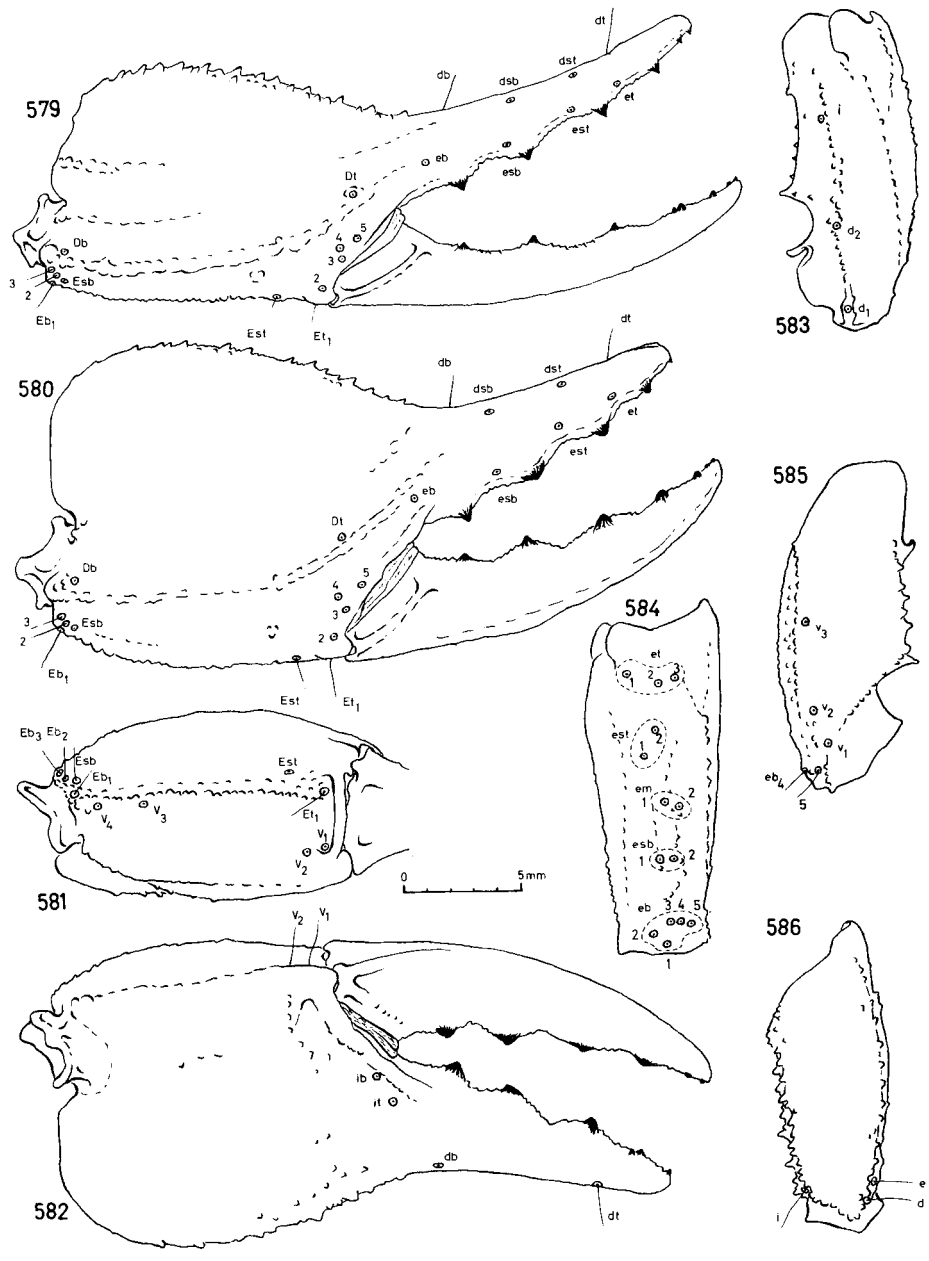
1. ha → w distance × 100/dcr → w distance = 25,5% (24,0%–27,0%)
2. ha → bsh distance × 100/ha → w distance = 39,0% (37,0%–41,0%)
3. ha → bsh distance × 100/dcr → bsh distance = 11,0% (10,0%–12,0%)

Variation: Sexual dimorphism: Adult males differ from adult females in the following characters: ♂ trunk is more slender with width sternite V/carapace length ratios 0,80 (0,76–0,84) for ♂ and 1,00 (0,95–1,05) for ♀; ♂ cauda is proportionally 20% longer than trunk length, ♀ cauda is equal or subequal to trunk in length; ♂ tergites and carapace finely granular, ♀ smooth and shiny; in some populations sternite VII and ventral surface of cauda I are transversely shallowly wrinkled while these surfaces are smooth in ♀; first proximal middle lamella of each pecten with mesial margin obtusely angular and bearing teeth along entire length of posterior margin of pecten in ♂, in ♀ shallowly convex and with proximal one-third of pectinal posterior margin devoid of teeth; ♂ pedipalps are more pilose than ♀; ♂ with 23–30 and ♀ with 16–23 teeth per pecten.
Intraspecific variation: Fig. 587 shows the distribution range of *O. wahlbergi*. Population samples from the ensuing sub-regions of this range exhibit the following variations.

(i) West of Warmbad and south of the 27° of latitude: as in Figs 577–578; ventral surface of cauda III, entire cauda IV, V and telson, deeply infuscated; anterior portion of and occasionally entire carapace deeply infuscated; tergites I–VI



Figs 577–578, *Opisthophthalmus wahlbergi*, ♀ (NM 10645) from east of Ai-Ais. Scale in mm.



Figs 579–586. *Opisthophthalmus wahlbergi*. 579, ♂ (NM 10356) right hand, outer aspect; 580–586, ♀ (NM 10042); 580–582, right hand; 580, outer aspect; 581, ventral aspect; 582, inner aspect; 583–585, right pedipalp tibia; 583, dorsal aspect; 584, outer aspect; 585, ventral aspect; 586, right pedipalp femur, dorsal aspect.

occasionally entirely deeply infuscated and without a yellowish band along posterior and lateral margins of each tergite; anterior upper, outer and inner surface of chelicerae handback and fingers deeply infuscated; in some specimens from the same locality the telson (e.g. NM 10624 from Louwshoop farm) is yellowish and not or only faintly infuscated.

(ii) North and north-east, namely populations from north of the 20° of latitude in the east and from Ovamboland and Etosha Game Park: much lighter in overall colour and with the infuscation patterns described for typical Kalahari populations distinctly attenuated or absent; in typical samples from this sub-region only the following surfaces are lightly to moderately infuscated, ventral and lateral surfaces of cauda III–V, anterior one-quarter of chelicerae handback and fingers, and pedipalp chela fingers.

(iii) Western, namely populations from Damaraland down to the Namib Desert Park: overall colour as for typical Kalahari populations but without any infuscations (including the chelicerae) except occasionally on ventral surface of cauda

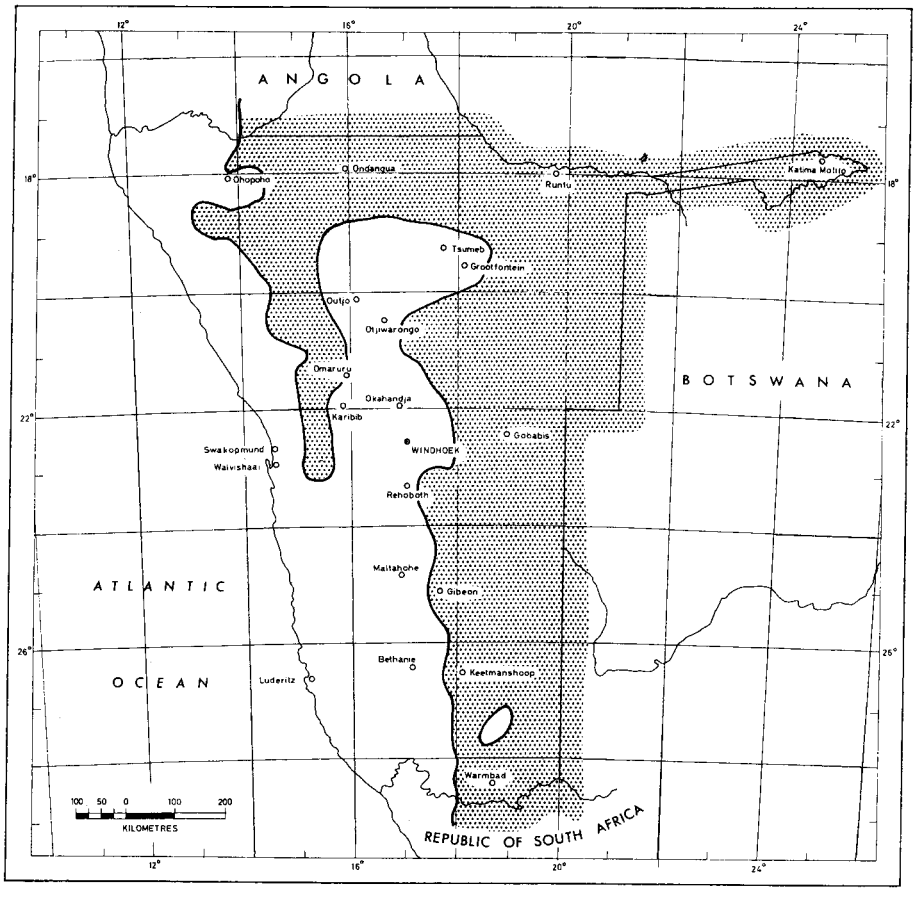


Fig. 587. Distribution range of *Opisthophthalmus wahlbergi* (stippled) in Namibia.

V; carapace anterior margin with a broad U-shaped notch instead of a shallow V-shaped one; ventral surfaces of cauda V and telson more lightly granular.
(iv) South of the Orange River in the northern Cape Province of South Africa: ranging in infuscation patterns from those found in typical Kalahari populations to those described by Purcell for *nigrovescicalis*.

Measurements: Greatest recorded body length of adult ♂ 11,0 cm (carapace 16,3 mm) of adult ♀ 11,6 cm (carapace 19,0 mm).

Type material: Thorell's ♀ holotype is deposited in the Entomological Section of the Naturhistoriska Riksmuseet in Stockholm (NRS, collection T. Thorell no. 48). It was examined and found to be in fairly good condition though very darkened.

Material examined: ♀ holotype, Caffraria 1840–1845, J. Wahlberg (NRS no. 48); *Opisthophthalmus wahlbergi gariepensis* many syntypes, Naroep, northern Cape Province, South Africa (SAM 2178, 2184); *O. wahlbergi nigrovescicalis* many syntypes, Naroep, northern Cape Province, South Africa (SAM 2202, 2232, 2235, 2971). The roman numerals used for the subheadings of the different sub-regions listed hereafter refer to populations with variations of colour patterns listed in the section on variation.

Material from (i) and (iv)

3 ♀ 2 ♂ 1 subad ♀, Augrabies falls, 7 Apr 1970, B. Lamoral (NM 10607); 1 subad ♂, Fish River Canyon, 11 Mar 1969. W. Haacke (NM 10617); 2 ♀ 1 ♂, Louwshoop farm, 4 Feb 1973, B. Lamoral (NM 10624); 1 ♀, Ai-Ais, 5 Feb 1973, B. Lamoral (NM 10645); 3 juv ♀, 3 Feb 1973, B. Lamoral (NM 10643); 1 ♂ 1 ♀, Namies, W. Purcell (NM 9119–20); 1 juv ♂, Goodhouse 29–31 Jan 1973, B. Lamoral (NM 10591); 2 ♂ 3 ♀, Pella Mission, 5–6 Apr 1970, B. Lamoral (NM 10622); 1 ♀, Pella Mission, 6 Apr 1970, B. Lamoral (NM 10632).

Material from (ii) East and North of (i) and South of (ii)

2 ♀ 3 juv ♀ 1 juv ♂, Okawao, 5 Mar 1969, B. Lamoral (NM 10078); 1 ♀ 2 ♂ 2 juv ♀ 2 juv ♂, Waltersdorf farm, 11–12 Mar 1969, B. Lamoral (NM 10037); 4 ♀ 1 ♂ 3 juv ♀ 2 subad ♂ 3 juv ♂, Sukses Dam, 2 Mar 1969, B. Lamoral (NM 10034); 6 ♀ 6 ♂, De Waal farm, 17 Mar 1969, B. Lamoral (NM 10040); 1 ♂, Aus, Etosha, 2–6 Mar 1969, B. Lamoral (NM 10036); 3 ♀, Sterkstroom farm, 19–20 Mar 1969, B. Lamoral (NM 10944); 2 ♂ 3 ♀ 5 juv 1 subad, Mata Mata, 27 Apr 1970, B. Lamoral (NM 10657); 2 ♂ 2 ♀ 1 juv, Twee Rivieren, 16 Apr 1970, B. Lamoral (NM 10648); 1 ♂ 5 ♀ 2 juv, Jansdraai, 19 Apr 1970, B. Lamoral (NM 10616); 2 ♀ 1 ♂ 1 juv, Moravet, 24 Apr 1970, B. Lamoral (NM 10642); 3 ♂ 1 ♀, Klein Skrypan, 17 Apr 1970, B. Lamoral (NM 10635); 4 ♀ 1 ♂ 3 juv, confluence of Auob and Nossob rivers, 18 Apr 1970, B. Lamoral (NM 10610); 3 ♀ 1 ♂, Bayip Pan, 23 Apr 1970, B. Lamoral (NM 10608); 2 juv, Ghaub 47, 19–30 Nov 1972, H. Strauss (SMN 414); 1 juv ♂ 1 juv ♀, Noachabeb 97, 7–12 Jan 1972 (SMN 326); 1 ♂, Noachabeb farm, 6 Feb 1973, B. Lamoral (NM 10541), 1 ♂ 2 ♀, Seven Pan, 29 Apr 1970, B. Lamoral (NM 10615); 2 subad ♂, Kameelsleep, 3 May 1970, B. Lamoral (NM 10612); 1 ♀,

Mata Mata, 21 Mar 1969, B. Lamoral (NM 10033); 1 ♀, Twee Rivieren, 18 Nov 1970 (NM 10605); 3 ♀, Nossob kamp, 29 Apr 1970, B. Lamoral (NM 10626); 1 ♂, Noachabeb 97, 7–12 Jan 1972 (SMN 328); 1 ♂, Twee Rivieren, 1960–1970, le Riche family and staff (NM 10630); 3 ♀, Katima Molilo, Oct 1970, W. Haacke (TM 9973–5); 1 subad 2 juv, Twee Rivieren, 20 Apr 1970, B. Lamoral (NM 10633); 1 ♀, Mata Mata, 27 Apr 1970, B. Lamoral (NM 10620); 3 ♂ 2 ♀, De Waal farm, 17–18 Mar 1969, B. Lamoral (NM 10041); 1 ♀ 3 ♂, Mata Mata, 10 Jan 1972, Eastwood (NM 10356); 5 ♂ 1 subad ♂ 4 ♀ 4 subad ♀ 1 juv, Swartmodder farm, 25–26 Feb 1973, B. Lamoral (NM 10540); 1 ♂ 1 ♀, Auob River, 5 Apr 1970, B. Lamoral (NM 10663); 2 ♀ 2 ♂, Pollentswa River, 2 May 1970, B. Lamoral (NM 10634); 2 ♂, Kapako, 27 June 1969, P. Olivier (SMN 210–11); 1 juv ♂ 3 juv ♀, Kapako, June 1969, P. van Niekerk (SMN 151); 1 ♀, Epukiro Reserve, 28 Sep 1964, F. Botes (SMN 84); 1 ♂ 1 subad ♀, Katima Molilo, 24 Oct 1970, H. Brown (TM 10195–6).

Material from (iii)

1 ♂, Ganab, 27 Jan 1972, B. Lamoral (NM 10413); 3 subad ♀ 3 subad ♂ 1 ♀, Amichab Mountain, 27 Jan 1972, B. Lamoral (NM 10662); 1 ♀, Bloedkoppie, 9 Feb 1972, B. Lamoral (NM 10539); 2 ♀ 2 subad ♀ 2 subad ♂, Vrede, 31 Mar 1976, B. Lamoral (NM 10829); 1 ♀, Ganab, 27 Jan 1972, B. Lamoral (NM 10638); 2 subad ♀ 1 subad ♂ 1 juv ♂, Ombu, 6 Apr 1976, B. Lamoral (NM 10838); 1 ♂ 1 ♀, Tinkas mountains. Feb 1972, B. Lamoral (NM 10682); 1 ♀, Erongo mountains, 6 Apr 1976, B. Lamoral (NM 10753); 1 ♀, Brandberg, 5 Aug 1969, P. Buys (SMN 97); 2 ♀, Bloedkoppie, 1–10 July 1970, P. Olivier (SMN 211); 1 juv ♂, Bloedkoppie, 9 Jan 1972, B. Lamoral (NM 10665); 3 ♀ 1 subad ♀ 2 subad ♂, Makalani, 27 Feb 1969, B. Lamoral (NM 1112).

Distribution: As in Fig. 587 for Namibia. *O. wahlbergi* has also been recorded from southern Angola, western and northern Botswana, western Zimbabwe, south-western Zambia and the northern regions of the Cape Province in South Africa.

Bionomics: The burrowing activities and soil predilections of *O. wahlbergi* are treated extensively in Lamoral (1978). Burrow entrances are usually situated in open ground and only very rarely at the sides of rocks or dead vegetation on consolidated sand (soils of hardness categories IV–VI, Table 2). *O. wahlbergi* is nocturnal and hemiedaphic.

Dubious species

Opisthophthalmus werneri Lamoral & Reynders, 1975

Opisthophthalmus werneri Lamoral & Reynders, 1975: 563.
Opisthophthalmus pilosus Werner, 1936: 187–189; preoccupied by *O. pilosus* C. L. Koch, 1838; in Lamoral & Reynders, 1975: 563.

Werner's type material of this species was in the Zoologische Museum Hamburg but was destroyed in an air disaster while on its way on loan to the Natal Museum for study. The type series consisted of either 2 ♀ syntypes or 1 ♀ and 1 ♂ syntypes. The uncertainty regarding the sexes of the types stems from

Werner's ambiguous original description in which he listed 2 ♀ for material examined but proceeded to describe a ♀ and ♂.

The following aspects are difficult to reconcile with Werner's original description of this species:

— Werner states that his species does not have a forked suture anteriorly but cites *O. peringueyi*, which has a distinct fork anteriorly, as the most closely related species.

— None of the species treated in this study fit Werner's description. This could indicate that *O. werneri* is in fact a valid species which may turn out to be related to either *O. adustus* or *O. flavescens*, depending on the presence or absence of a medial suture on the carapace.

For the above reasons, it is advisable at this stage to maintain the present status of this species on the assumption that material conspecific with Werner's species may yet be collected. Werner's original description was in German. A complete translation thereof follows.

O. pilosus n. sp. (Fig. 5, page 188).
♀ South West Africa, Lüderitz Bay, 30–40 km in surrounding dunes, Eberlans leg. ded. Eing. No. 44, 1929.
♀ German South West Africa. Prof. Dr Griess leg. Eing. No. 18, 1926.
Among the numerous specimens of *O. carinatus* which Prof. Griess had collected was also a single not fully-grown ♀ of a species which appears closely related to *O. peringueyi*. Thereto belongs in all probability the abovementioned fully-grown ♂, which I initially regarded as a separate species, but had to regard as belonging together after comparing descriptions and finally the animals themselves. Pectinal teeth 23–21 (♂) 21–21 (♀). ♂ colour red-brown. Hand yellow-brown, finger, outer and inner rim and finger keel black, legs and telson vesicle yellow. Carapace: in front deeply incised, without an actual fork; interocular area in the front portion clearly falling off obliquely downwards, very finely and sparsely granular, coarsely granular on the sides, anterior margin coarsely granular, similarly also inwards from the side eyes. Middle eye closer to posterior margin of carapace than the anterior one. Median furrow deeply encompassed by indistinct granules. Supraciliar ridge smooth—abdominal tergites matt with median keel, last tergal plate distinctly granular; all sternites completely smooth. Dorsal keel of the cauda all granular, 2nd to 4th segment with a very distinct distal spine, while all upper lateral keels are granular. Lower lateral keel smooth, blunt in 1st–3rd segment, with the 1st hardly distinguishable; on the 4th and 5th segments of the keels are distinctly serrated, on the 5th there is an irregular row of grains between the lower median and lateral keels. Dorsal surface of the cauda with scattered granules.
Dimension of 1st caudal segment ♂ 7 × 6, ♀ 4 × 4 mm
Dimension of 5th caudal segment ♂15 × 5, ♀ 9 × 3 mm
Pedipalp hand with very flat tubercules on the inner area, coarsely granular on the outer; finger keel proximally granular, distally costate. Outer secondary keel granular, outer marginal keel granular, inner marginal keel fairly sharp-edged, set with sharp granules, inner secondary keel indistinct. Both pedipalp fingers with strong teeth on the inner edge. Surface of femur and posterior surface of tibia coarsely granular as well as all its keels—Telson vesicle with rows of granules. Pedipalps, telson vesicle as well as other limbs covered with long fairly dense hairs.
The ♀ is distinguishable from the ♂ by the uniform red-brown colouring, the smooth finely pitted, abdominal tergite, a hand with a completely coarsely granular upper surface, the shorter pedipalp chela fingers with weaker inner teeth and entirely granular finger keel—The spines on the outer ventral and inner ventral surface of telotarsi of the 4th legs in both sexes, basitarsi without spines but with long bristles.

Dimensions:

	♂	♀
Total length	100 mm	84 mm
Trunk	40 mm	50 mm
Hand length	24 mm	18 mm
Movable fingers	15 mm	10 mm
Hand width	11 mm	9 mm