

The Crocinae of southern Africa (Neuroptera: Nemopteridae). 3. The genus *Tjederia* Mansell, with keys to the southern African Crocinae

by

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An account is given of the genus *Tjederia* Mansell. A new species, *T. brevicornis*, and its egg and larva are described. Keys for identification of adults and larvae of southern African Crocinae are provided.

This is the last paper in a three-part series revising the systematics of the southern African Crocinae. The first and second publications treated the genera *Laurhervasia* Navás, *Thysanocroce* Withycombe and *Concroce* Tjeder (Mansell 1980, 1981). *Tjederia* is the fourth crocine genus known from southern Africa and it is dealt with in this paper. It comprises two species, *T. namaquensis* Mansell, the type-species, and *T. brevicornis* spec. nov., the eggs and larvae of which are also known.

This revisional series is concluded with a set of keys for the identification of adults and larvae of southern African Crocinae.

TJEDERIA Mansell

Tjederia Mansell, 1977: 195.

Type-species: *Tjederia namaquensis* Mansell, 1977 (by original designation and monotypy).

The morphological characters of the genus were described by Mansell (1977).

Tjederia namaquensis Mansell, fig. 1

Tjederia namaquensis Mansell, 1977: 197.

ADULTS, LARVA and EGG. As described by Mansell (1977: 197, 199, 200).

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DISTRIBUTION (fig. 1). This species is apparently endemic to the south-western Cape Province, Namaqualand and southern South West Africa.

ADDITIONAL MATERIAL EXAMINED. 17 adults and 36 larvae. SOUTH AFRICA: Cape Province; Versveld Pass, Piketberg ($32^{\circ} 52' S 18^{\circ} 45' E$), 3 ♂ 4 ♀ 12 larvae, 26.vii.1977; Piketberg ($32^{\circ} 54' S 18^{\circ} 45' E$), 4 ♂ 3 ♀, 15 larvae, 27.vii.1977; Heerenlogements Cave, Vanrhynsdorp District ($31^{\circ} 58' S 18^{\circ} 33' E$), 2 ♂ 7 larvae, 7.i.1978; Algeria Forestry Station, Cedarberg ($32^{\circ} 33' S 19^{\circ} 03' E$), 1 ♂ 2 larvae, 8.i.1978. All collected by M. W. Mansell. Adults were reared from the larvae.

***Tjederia brevicornis* spec. nov., figs 1-4**

ADULTS. Characterized by short antennae and narrow iridescent slightly opaque wings, with pale yellow venation. Sexes similar, but females with broader forewings and longer rostrum and antennae than males. Mean measurements in mm for 142 specimens, ranges in brackets; male and female measurements are given separately where they differ: length of body 6,8 (5,6-8,4); length of forewing 12,2 (10,5-14,5); length of hindwing 34,3 (28,0-40,0); antennae ♂ 2,4 (2,0-2,8); antennae ♀ 2,8 (2,6-3,0); rostrum ♂ 1,02 (0,90-1,12); rostrum ♀ 1,14 (0,96-1,30). Holotype ♂ 7,2; 12,5; 34,0; 2,4; 1,10.

Head creamy white, with two dark maculae above the antennal bases extending posteriorly over the vertex. These marks occasionally pale and diffuse. Mouthparts pale yellow, with clypeus pale proximally, brown distally, labrum brown, genae dark brown. Antennae with uniformly pale brown flagellum, thickening slightly towards the apex, densely clothed with short brown setae. Scape pale, pedicel pale with brown annulation distally.

Thorax pale brown, paler ventrally. Prothorax with a dark brown mark along each lateral margin and bearing long black setae along anterior and posterior margins, with shorter setae on dorsum. Mesothorax with sparsely arranged short black setae on dorsum and a thin black line above the wing bases. Metathorax with irregular brown markings and a row of setae across the metascutellum. Legs uniformly pale yellow, with brownish annulations on proximal ends of tibiae and densely clothed with short black setae. Tarsi five-segmented, with proximal tarsomere longer than combined length of other four. Paired tarsal claws pale brown. Forewings (fig. 2H) narrow in the males, broader in the females, with pale yellow venation but radial vein conspicuously darker than other veins. Brown setae occur on the veins, with a fringe of pale grey setae along the posterior margin of the wing. Wing membrane markedly iridescent, with a slight yellowish-brown tinge, imparting the appearance of a general wing. Two crossveins present between R and M before Rs, and 6 or 7 (occasionally 4, 5, 8 or 9) radial crossveins between R and Rs before the hypostigmatic cell. In the wings examined, the first branch of Rs arose between radial veins two and three in 52%, between three and four in 28%, between one and two in 17% and beyond four in 3% of the wings. Ten to thirteen costal veins usually present before the pterostigma, which is pale. Vein Cuz fused with 1A for almost its entire length. Hindwings narrow, pale yellowish brown proximally, white distally and densely covered with short white setae, bullae absent.

Abdomen pale brown, with diffuse dark marks on the tergites. Pleuriticavae

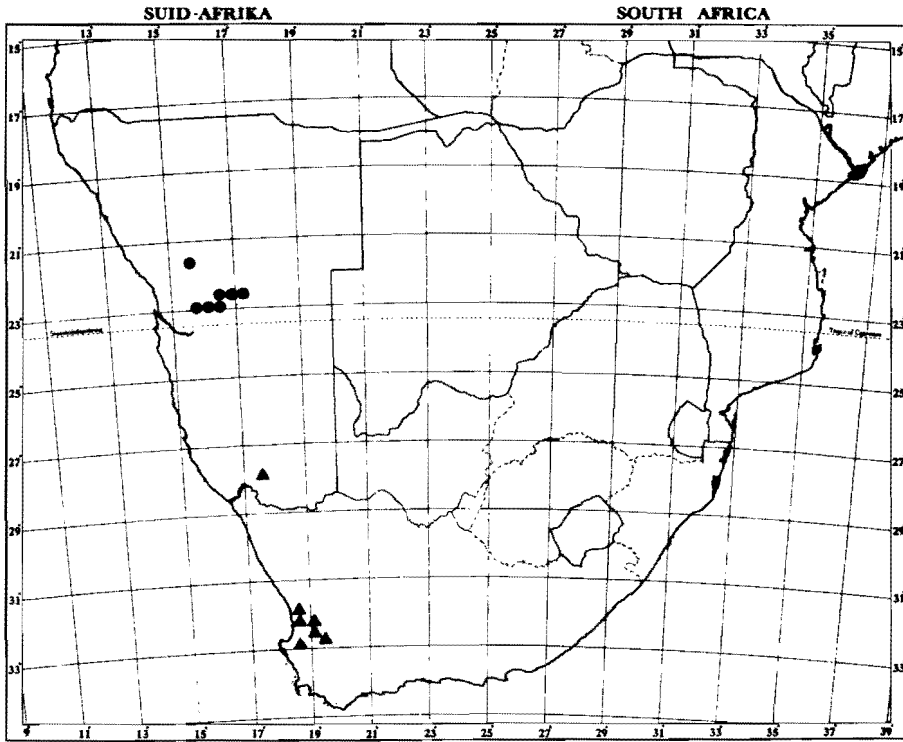


Fig. 1. The recorded distribution of *Tjederia namaquensis* Mansell (triangles) and *T. brevicornis* spec. nov. (circles).

absent. Male (figs 2A-F) with tergite 9 entire dorsally, narrowing to acute tips overlapping sternite 9, which is almost rectangular and lacks a posterior projection. Ectoprocts shaped as in fig. 2A, with posterior ventral margin projecting downwards. Callus cerci present, and long black setae occur along posterior margins of ectoprocts. Gonarcus arcuate, with short arcessus and delicate flange-like entoprocesses. Parameres slender, slightly curved, 1.02-1.12 mm long. Distal paramere lobes symmetrical, lacking a prominent ventrally directed projection but with distal ends of parameres curving downwards and inwards, each supporting a membranous sac. Proximal end of paramere with long slender projection and the flattened quadrate region orientated at right angles to the length of the paramere. Spinellae present, gonosetae absent. Female (fig. 2G) with tergite 9 divided dorsally, each half narrow, curving downwards and posteriorly, becoming closely adpressed to the dorsal margin of the lateral gonapophysis. Lateral plates of sternite 8 fused with the lateral gonapophyses, the line of fusion demarcated by a hairless zone. Genital opening situated between the posterior apices of the lateral gonapophyses, which are connected ventrally by a convoluted expansible membrane. Ectoprocts oval, with ventral margins flattened. Callus cerci well developed, lacking setae. Anal opening situated dorsally between ectoprocts.

Specimens occurring along the edge of the Namib Desert (Pro-Namib) are paler in colour than those from the central highlands around Windhoek and the Khomas Hochland, although the basic colour patterns are similar.

LARVA (fig. 3). Characterized by two colour forms; in the central highlands near Windhoek and the Khomas Hochland the larvae are dark and heavily mottled, but those from the Pro-Namib, whilst retaining traces of the general colour pattern, are very much paler. Measurements are given in Table 1.

Head triangular, wider than long, tapering towards the occipital region. Surface covered with raised dolichaster-bearing papillae interspersed with smaller papillae. Third-instar larvae have a characteristic triangular black mark, with a central light patch, on anterior dorsal surface of head. Remainder of head blackish in the highland larvae, but paler in the Pro-Namib forms, with two pale patches between tentorial pits and antennae. A third pale mark usually present on the centre of the head. These marks also discernible in first- and second-instar larvae, with dorsal Y-shaped epicranial sutures visible as well. Eyes each comprising seven stemmata, one ventral and six dorsolateral. Antennae each consisting of a stout black pedicel supporting a delicate eight-segmented flagellum. Proximal and distal flagellomeres long, intermediate six short, with distal segment bearing delicate apical bristles. Mandibles longer than head, uniformly yellowish-brown, devoid of teeth, curved near apices, with dolichasters along basal third. Maxillae each reduced to a single blade fitting into the ventral surface of the mandible to form the suctorial tubes. Cardo and

TABLE 1. Mean measurements (mm) of *T. brevicornis* larvae (ranges are shown below means).

	1st Instar	2nd Instar	3rd Instar
Number of larvae measured	19	68	219
Head width	0,32 0,32	0,53 0,48-0,56	0,88 0,76-0,96
Head length	0,31 0,28-0,32	0,49 0,44-0,52	0,81 0,68-0,88
Mandible length	0,41 0,36-0,44	0,66 0,60-0,72	1,12 0,96-1,28
Prothoracic length	0,50 0,48-0,56	1,07 0,96-1,20	2,20 1,72-2,44
Body width*	0,81 0,72-0,96	1,49 0,80-1,80	2,55 1,48-3,68
Body length*	2,44 2,08-2,84	4,46 3,20-5,00	7,20 5,68-8,96

*Variable, depending on feeding and state of maturity within the instar.

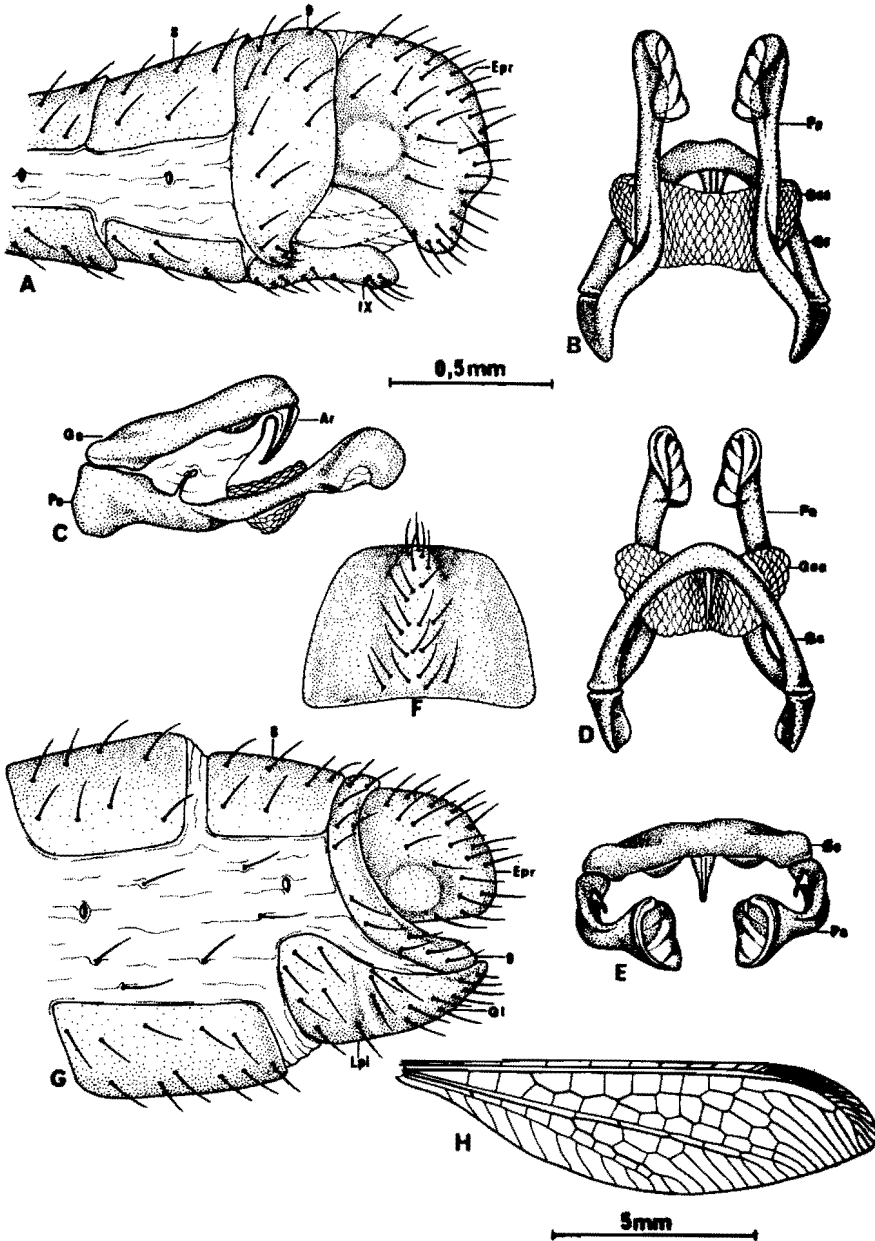


Fig. 2A-H. *Tjederia brevicornis* spec. nov. A. Apex of abdomen ♂. B. Gonarcus and parameres, ventral view. C. Gonarcus and parameres, lateral view. D. Gonarcus and parameres, dorsal view. E. Gonarcus and parameres, frontal view. F. Sternite 9. G. Apex of abdomen ♀. H. Wing. Ar - arcessus; Epr - ectoproct; Gl - lateral gonapophysis; Gs - gonarcus; Gsa - gonosaccus; Lpl - lateral plate of sternite 8; Pa - paramere; IX - sternite 9; 8 & 9 - tergites.

stipes distinct, but maxillary palps absent. Labium reduced to a single median plate bearing three-segmented labial palps on either side. Basal segment broad and flattened, with dolichasters along anterior margin, middle segment short, dilated apically, terminal segment fusiform, tapering to an acute tip and bearing an oval pit-like sense organ on its dorsal surface.

Prothorax long, approximately three times the head length, comprising three segments. Anterior segment elongated, dilated apically, bearing sensory setae at articulation with head. Two brown marks present on dilated area, with a wide brown band in the middle of the segment, divided by a pale narrow midline. Middle segment shorter, wider, divided into tergite and sternite and bearing the prothoracic legs. Dark markings cover most of this segment, with a prominent pair of spots usually present on anterior margin. Anterior and middle segments sclerotized, bearing sparsely arranged dolichasters. These segments uniformly brown in first-, but mottled brown in second-instar larvae, with well defined pale narrow midline. Posterior segment of prothorax short, unsclerotized, incorporated into the rest of the body and bearing lateral prothoracic spiracles. Cuticle of this segment of stellate conformation, with two pairs of brown marks on either side of dorsal midline. Mesothorax rectangular, pale buff, heavily overlain with brown maculae on the highland forms but pale in the larvae from the Pro-Namib. Metathorax similar to mesothorax but wider, with a distinct transverse fold. A prominent brown mark, divided by the pale midline, covers most of the metathorax (this mark very prominent in the pale Pro-Namib larvae), and spiracles occur dorsally but are difficult to discern. Legs uniformly brownish-yellow, long, slender, with faint brown annulations on either side of femoro-tibial joint. Rows of sparsely arranged setae present on legs, with sensory setae at articulations. Tarsi one-segmented, terminating in paired brown claws.

Abdomen ten-segmented, segments 1 to 7 all alike but becoming progressively smaller, with lateral spiracles. Segment 8 conical, bearing densely arranged dolichasters and setae. Segments 9 and 10 reduced, telescoped into segment 8, together forming the spinneret. Abdomen heavily overlain with brown marks, imparting a maculated appearance to the larvae. Two large brown marks occur on either side of the dorsal midline on abdominal segments 3 and 6. Segment 8 pale. Ventral surface of abdomen also with dark marks. Pro-Namib larvae pale, with only the larger marks prominent.

EGG (fig. 4). Oval, 0,62–0,68 mm long. Surface of chorion with bower-shaped aeropyles, each of which is surrounded by a hexagonal pallisade of waxy globules, regularly arranged over the surface of the egg (Withycombe (1925) suggested that patterns of this nature are generally due to the impressions of the ovarian follicle cells prior to oviposition). A sponge-like structure occurs over the micropyle at the cephalic end.

DISTRIBUTION (fig. 1). *Tjederia brevicornis* appears to be confined to a small area of South West Africa. It is abundant in the central highlands around Windhoek and the Khomas Hochland, which is the escarpment area between the highlands and the Namib desert. It has been collected as far north as the Erongo mountains and occurs in the arid transitional area between the Khomas Hochland and the Namib desert.

REMARKS. Adults of *T. brevicornis* are characterized by short antennae, and the species is named accordingly. It has been assigned to the genus *Tjederia* as the adults

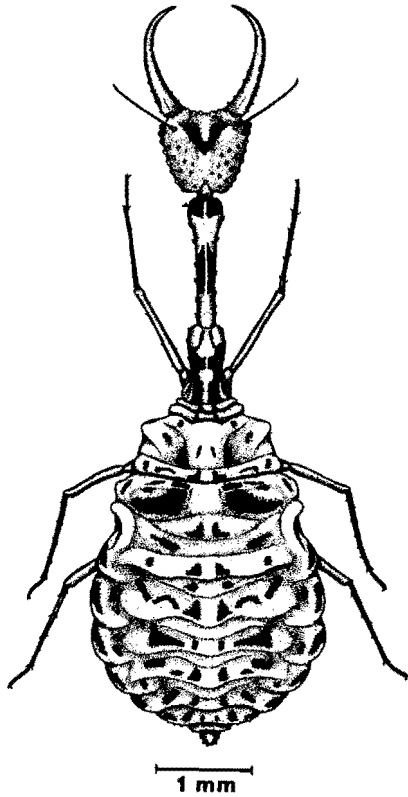


Fig. 3. Larva of *Tjederia brevicornis* spec. nov., dark form.

have several characters in common with *T. namaquensis*, the type-species. The parameres of the two species are similar in shape, with long proximal projections and distal paramere lobes which are relatively simple, lacking the ventral projections. In the males tergite 9 is undivided. Only two crossveins occur before Rs in the forewings of both species; the wings of the males are narrow and bullae are absent. Adults of the two species differ in the lengths of the antennae and rostrum, which are long in *T. namaquensis* but short in *T. brevicornis*. Morphological comparisons between *Tjederia* and the other southern African genera were given by Mansell (1977: 201).

The larvae of the two species exhibit slight morphological differences; in *T. namaquensis* the prothorax is very long, more than three times the head length; in *T. brevicornis* it is approximately three times as long as the head. The shape of the head also differs, being longer than wide and strongly tapered in *T. namaquensis* and wider than long in *T. brevicornis*. However, such variation also exists between species of *Laurhervasia*, which is a well-defined genus.

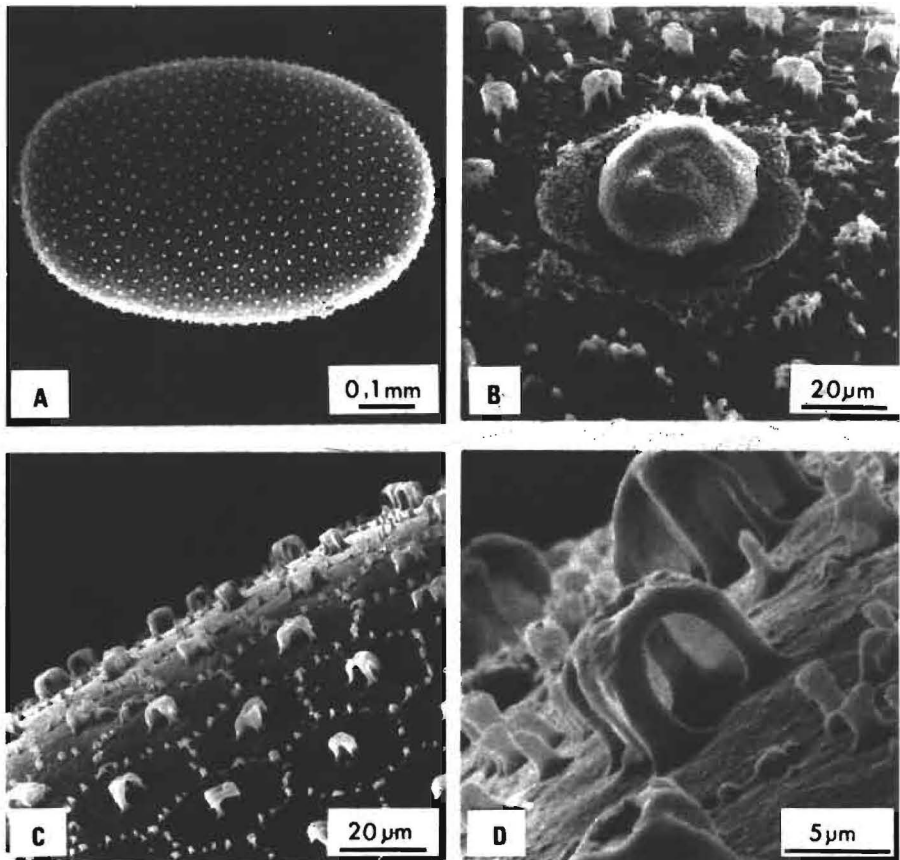


Fig. 4A-D. Egg of *Tjederia brevicornis* spec. nov. A. Whole egg, lateral view. B. Sponge-like structure covering the micropyle. C. Aeropyles on chorion. D. Detailed structure of aeropyles.

The eggs of the two species differ considerably in that aeropyles of *T. brevicornis* are more elaborate than those of *T. namaquensis*. However, differences between the larvae of the two species are not considered important enough to assign them to different genera, and there is insufficient information on the taxonomic importance of the egg to warrant their generic separation.

Larvae of *T. brevicornis* occur in two colour forms, a situation similar to that found in *Pterocroce capillaris* (Klug) (= *storeyi* Withycombe) from Egypt (Withycombe 1923). The darkly coloured highland larvae inhabit caves with dark substrates, whereas the Pro-Namib forms occur in caves where the substrates are composed of pale

granitic sand. The brown band across the metathorax of the pale larvae provides a disruptive colour pattern, effectively dividing the body into two smaller portions and thereby enhancing their camouflage. Adults from the Pro-Namib are also paler than their highland counterparts, and I initially regarded them as separate species. However, morphological and morphometric data contradicted this, and they were shown to be almost certainly the same species when adults of the two colour forms mated with each other and produced viable eggs.

The sex of the individual can be predicted in the larval stage of *T. brevicornis* on the basis of size. Although there is some overlap, statistical comparisons have shown that larvae of females are significantly larger, for four parameters measured, than their male counterparts. Larval measurements for 46 reared males and 38 females were compared statistically, and the results are in Table 2.

TABLE 2. Comparison of measurements (mm) of third-instar *T. brevicornis* larvae from which male and female adults were reared.

Character	Sex	N	Mean	Range	P*
Head width	♂	46	0,86	0,80-0,92	<0,001
	♀	38	0,92	0,88-0,96	
Head length	♂	46	0,78	0,68-0,84	<0,001
	♀	38	0,83	0,80-0,88	
Mandible length	♂	46	1,09	1,00-1,16	<0,001
	♀	38	1,16	1,12-1,28	
Prothoracic length	♂	46	2,11	1,92-2,28	<0,001
	♀	38	2,26	2,00-2,44	

*Significance of difference between male and female.

MATERIAL EXAMINED. Adults, ♂ holotype, 97 ♂ 44 ♀ paratypes and 306 larvae. SOUTH WEST AFRICA: Windhoek (22° 34' S 17° 07' E), 10 ♂ 5 ♀ paratypes, 20.vii.1976, ♂ holotype, 19 ♂ 8 ♀ paratypes and 56 larvae, 19.viii.1977; Klein Windhoek (22° 34' S 17° 09' E), 4 ♂ 8 ♀ paratypes and 29 larvae, 19.viii.1977; Mavis Siding (22° 33' S 17° 10' E), 16 ♂ 7 ♀ paratypes and 48 larvae, 25.viii.1977; 10 km N. Windhoek (22° 31' S 17° 06' E), 1 ♀ paratype and 3 larvae, 19.viii.1977; 34 km W. Windhoek (22° 36' S 16° 43' E), 8 ♂ 2 ♀ paratypes and 25 larvae, 20.viii.1977; Dirleen Farm, 46 km W. Windhoek (22° 40' S 16° 34' E), 6 ♂ 4 ♀ paratypes and 24 larvae, 20.viii.1977; von Francois Fort (22° 48' S 16° 26' E), 2 ♂ paratypes and 11 larvae, 20.viii.1977; Bergkrans Farm, 100 km W. Windhoek (22° 50' S 16° 12' E), 3 ♂ 3 ♀ paratypes and 18 larvae, 20.viii.1977; Komuanab Farm, Karibib District (22° 45' S 15° 48' E), 12 ♂ 4 ♀ paratypes and 38 larvae, 20.viii.1977; Ameib Farm, Usakos District (21° 48' S 15° 36' E), 17 ♂ 2 ♀ paratypes and 36 larvae, 21.viii.1977; 18 larvae reared from eggs laid in laboratory. All adults reared from larvae collected by M. W. Mansell and V. C. Moran; larval collection dates given. Holotype ♂, 70 ♂ and

30 ♀ paratypes deposited in National Collection of Insects, Plant Protection Research Institute, Pretoria (holotype No. 920). Paratypes: British Museum (Nat. Hist.), London, England; State Museum, Windhoek, South West Africa; Transvaal Museum, Pretoria; Albany Museum, Grahamstown.

Keys to the genera and species of adult and larval Crocinae from southern Africa

KEY TO THE GENERA
ADULTS

- 1 Thorax with longitudinal black stripe below wings; yellowish or blackish species *CONCROCE*
- Thorax without longitudinal black stripe below wings; brown species 2
- 2 Two crossveins between R and M before Rs in forewings (fig. 5A); bullae absent; parameres lacking ventral projections on distal lobe (fig. 5C) *TJEDERIA*
- Three crossveins between R and M before Rs in forewings (fig. 5B); bullae usually present; parameres with ventral projections on distal lobe (fig. 5D) 3
- 3 Head with two distinct parallel stripes on vertex; parameres without proximal projections. Recorded only from South West Africa and Angola *THYSANOCROCE*
- Head usually with diffuse marks or maculae on vertex; parameres with proximal projections (fig. 5D) *LAURHERVASIA*

LARVAE

- 1 Prothorax short, less than twice the head length; living in plant detritus in crevices and under rock overhangs 2
- Prothorax elongated, longer than twice the head length; living amongst dust and sand in small caves and rock overhangs 3
- 2 Larva heavily marked with black or brown (see Mansell 1981: figs 2 & 3); recorded only from the Cape Province *CONCROCE*
- Larva creamy-white, with three longitudinal rows of brown marks on body (see Mansell 1980: fig. 10); recorded only from South West Africa and Angola *THYSANOCROCE*
- 3 Prothorax very long, longer than 3 times the head length (see Mansell 1977: fig. 9) *TJEDERIA* (part)
- Prothorax about 3 times the head length or less 4
- 4 Clypeal region with a black triangular mark enclosing a pale patch (fig. 3); recorded only from South West Africa *TJEDERIA* (part)
- Pale marks on clypeal region not enclosed by black triangular mark (see Mansell 1980: figs 3, 4, 5, 9) *LAURHERVASIA*

KEY TO THE SPECIES; ADULTS

LAURHERVASIA

- 1 Body dark brown; vertex of head with a pair of shiny black maculae above antennal bases; bullae prominent, more than 2 mm long *rhodesiae* Tjeder, 1967
- body light brown, marks on head variable, but shiny black maculae not present 2
- 2 Small species, forewing about 12 mm, hindwing about 35 mm; bullae small, less than 1 mm or absent; recorded only from South West Africa *namibica* Mansell, 1980
- Large species, forewing about 14 mm, hindwing about 40 mm; bullae large, longer than 1 mm 3
- 3 Antennae long, about one-third of the forewing length; rostrum longer than 1.5 mm; recorded only from the northern Transvaal *transvaalensis* Mansell, 1980

- Antennae about one-quarter of the forewing length; rostrum usually less than 1,5 mm; recorded from the Cape Province and South West Africa **setacea** (Klug, 1836)

THYSANOCROCE

Only one species known, **damarae** (MacLachlan, 1898)

CONCROCE

- 1 Rostrum short, less than the interorbital distance across vertex (see Mansell, 1981: fig. 6H); parameres symmetrical (see Mansell, 1981: fig. 6B) **walkeri** Tjeder, 1967
- Rostrum longer than interorbital distance across vertex; parameres asymmetrical (see Mansell 1981: figs 1D & 8B) 2
- 2 Rostrum less than 1,5 times the interorbital distance; body coloration yellow; antennae shorter than prothoracic leg **parva** Mansell, 1981
- Rostrum longer than 1,5 times the interorbital distance; body colour blackish; antennae longer than prothoracic leg **capensis** Tjeder, 1967

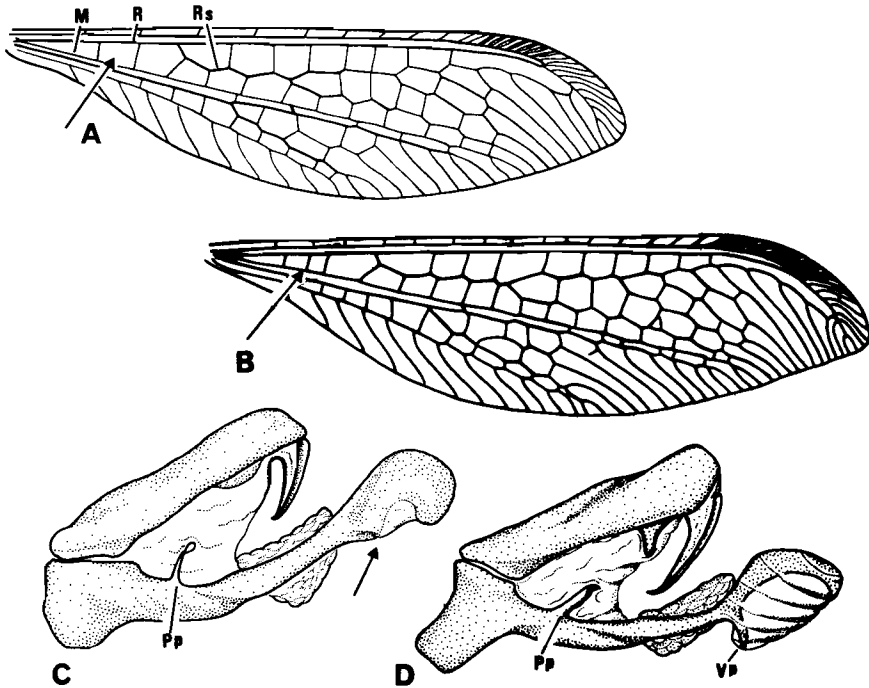


Fig. 5A-D. A. Wing of *Tjederia brevicornis* spec. nov. showing the two crossveins between R and M before Rs. B. Wing of *Laurhervasia transvaalensis* Mansell, showing the three crossveins between R and M before Rs. C. Gonarcus and paramere of *T. brevicornis* lacking the ventral projection on the distal lobe. D. Gonarcus and paramere of *L. transvaalensis* showing positions of ventral projection on the distal lobe and proximal projection. M - median vein; Pp - proximal projection on paramere; R - radius; Rs - radial sector; Vp - ventral projection on distal lobe of paramere.

TJEDERIA

- 1 Rostrum longer than twice the interorbital distance; a single black macula occurs on the frons above antennal bases; antenna longer than prothoracic leg **namaquensis** Mansell, 1977
- Rostrum length less than twice the interorbital distance; antenna shorter than prothoracic leg **brevicornis** spec. nov.

KEY TO THE SPECIES; LARVAE

LAURHERVASIA

- 1 Prothorax longer than 2,5 times the head length, but not more than 3 times 2
- Prothorax 2,5 times the head length or less 3
- 2 Head brown, with three pale marks, one across the dorsal midline and two adjacent to tentorial pits; recorded only from northern Transvaal **transvaalensis** Mansell, 1980
- Head dark brown, a distinct triangular mark usually present on dorsal surface **setacea** (Klug, 1836)
- 3 Head and body pale yellowish-white, with four prominent maculae on body (see Mansell 1980: fig. 9); recorded only from South West Africa **namibica** Mansell, 1980
- Head brown, with three pale marks on dorsum, body brown and mottled (see Mansell 1980: fig. 4); recorded from northern Transvaal, Zimbabwe, Botswana, Malawi. **rhodesiae** Tjeder, 1967

THYSANOCROCE

Only one species known, **damarae** (MacLachlan, 1898)

CONCROCE

- 1 Body marked with brown **walkeri** Tjeder, 1967
- Body marked with black 2
- 2 Mandible shorter than prothorax **parva** Mansell, 1981
- Mandible longer than prothorax **capensis** Tjeder, 1967

TJEDERIA

- 1 Prothorax longer than 3 times the head length; head strongly tapered **namaquensis** Mansell, 1977
- Prothorax less than 3 times the head length; head not strongly tapered **brevicornis** spec. nov.

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