

Description of the male of *Crozetulus rhodesiensis* Brignoli, 1981 (Araneae, Anapidae)

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Summary

The hitherto unknown male of *Crozetulus rhodesiensis* Brignoli, 1981 (Araneae, Anapidae) is described and Brignoli's provisional placement of this species in the genus is now confirmed on the basis of the structure of the male palp. Some additional observations on female morphology are provided. This spider species seems to be distributed in the whole of southern Africa and occurs in the litter of reed belts. Certain characters are discussed with regard to the supposed autapomorphies of the Anapidae.

Introduction

The genus *Crozetulus* was established by Hickman (1939) for an anapid spider from the Crozet Archipelago in the Southern Indian Ocean. The three other known species were all found in tropical Africa, of which the cave-dwelling *Crozetulus scutatus* (Lawrence) was described from both sexes but the other two were known as single females only. A description of the male of *C. rhodesiensis* Brignoli is presented. Specimens of both sexes are deposited in the South African Collection of Arachnida (NCA), Pretoria and in the Zoologisches Museum Berlin (ZMB).

Forster & Platnick (1977) relimited the enlarged Symphytognathidae of Forster (1959) and as part of this revalidated the taxon Anapidae. The only known character that seems suitable to support the monophyly of the family is an anteriorly directed protrusion ("spur") on the labrum. These and other suggested apomorphies are discussed with regard to the morphology of *C. rhodesiensis*.

This spider was erroneously named *?Dippenaaria* sp. in Schütt (2000).

Material and methods

All material was collected by Dr Manfred Uhlig, Berlin. He kindly let me have the supplementary collection material from his field trips, which took place in the years 1993 to 2000. For details of collection sites and methods see Table 1.

The spiders were examined with stereoscopic, compound and scanning electron microscopes. For SEM the specimens were critical-point dried and sputter-coated with gold. All measurements are in mm.

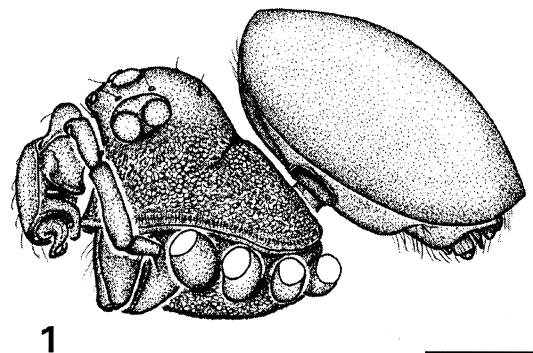
Taxonomy

Crozetulus rhodesiensis Brignoli, 1981 (Figs. 1–15)

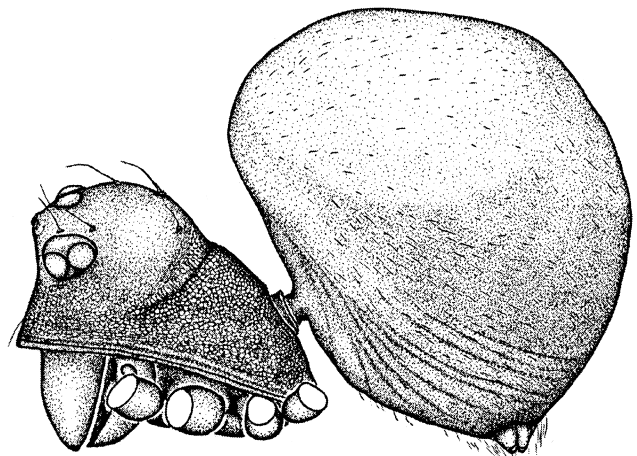
Crozetulus rhodesiensis Brignoli, 1981: 121, fig. 9 (♀).

Material examined: The localities, dates and collecting methods are given in Table 1. The descriptions refer to specimens collected in the De Hoop Nature Reserve.

Description: *Male* (Figs. 1, 3, 5–7, 9–11): Total length 0.78. Carapace length 0.40, height 0.28. Opisthosoma length 0.56 (measured vertical to petiolus). Carapace orange-brown, sternum chestnut-brown with darker margins, legs orange, opisthosomal scute and plate orange, weaker parts pale yellow in front, grey-green around spinnerets. *Prosoma:* Carapace with elevated pars cephalica, separated by distinct thoracic groove, clypeus very high and concave, surface of carapace granulated except for smooth ocular region, with a few short setae, pore-bearing depression lacking (Figs. 1, 3); eight eyes, anterior medians considerably smaller than others, laterals almost touching and sharing a common elevation; from above, eyes arranged in two slightly recurved rows (Fig. 5); sternum convex, granulated (Fig. 1), posterior margin broadly truncate (Fig. 6). *Chelicerae:* Condyle absent, furrow with four teeth on anterior margin, three outer ones sharing a common elevation (Fig. 7), basal tooth prominent and bearing a gland mound on its posterior side (Fig. 11), posterior margin with only a denticle plate but no teeth. *Mouthparts:* Labrum bearing a "labral spur", clearly visible when chelicerae removed (Fig. 12); labium wider than long, articulated against sternum (Fig. 6); gnathocoxae (endites) converging, with well developed serrulae (Figs. 6, 8). *Legs:* Leg formula 1243, tarsi considerably longer than metatarsi, no leg modifications, no spines, tarsal organ present, middle claw of tarsi III and IV elongated and curved (Fig. 13). Measurements:



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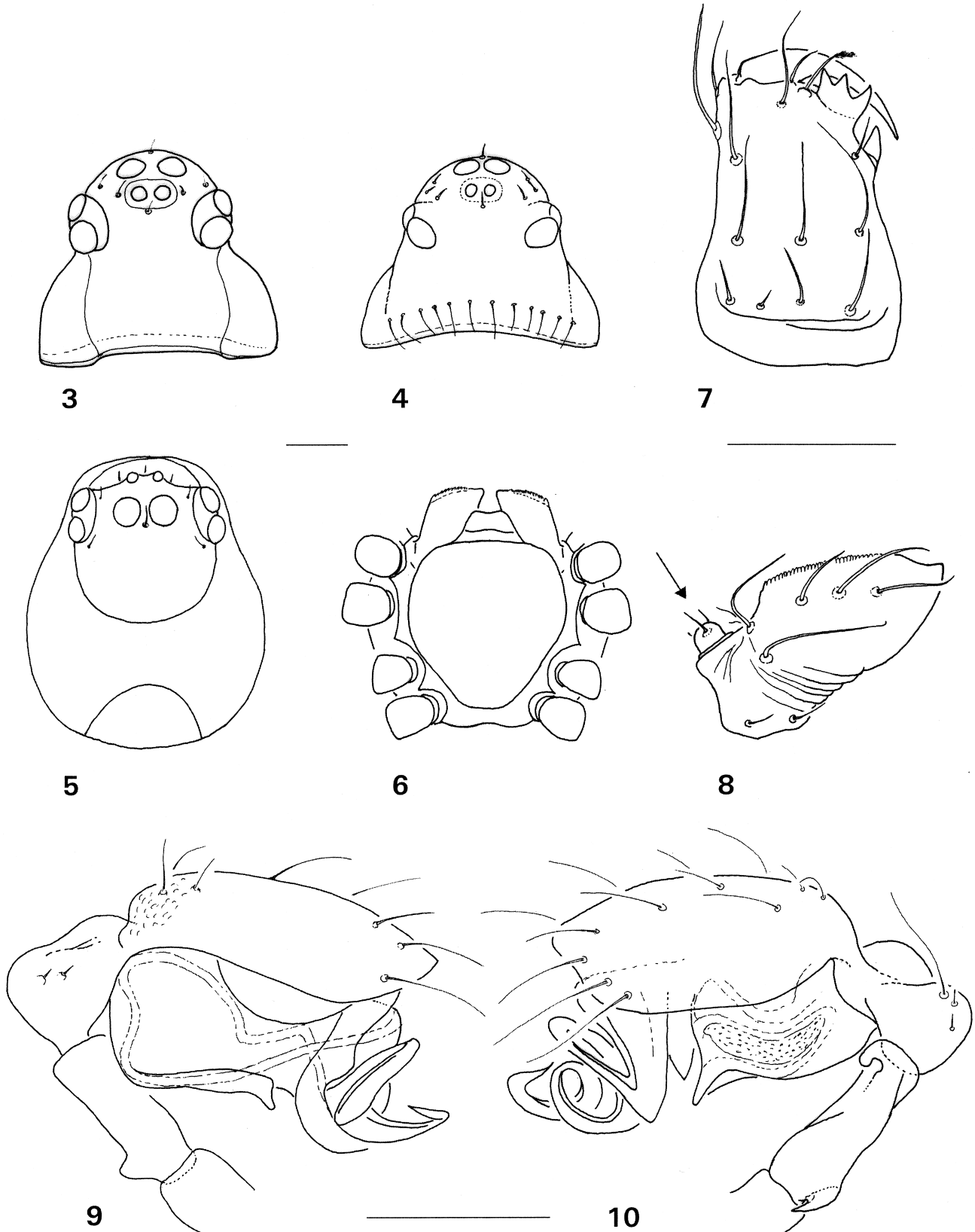


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Figs. 1–2: *Crozetulus rhodesiensis*, lateral view of body, legs omitted. 1 Male; 2 Female. Scale line=0.2 mm.

	Fe	Pa	Ti	Mt	Ta
I	0.38	0.14	0.32	0.16	0.28
II	0.36	0.11	0.25	0.14	0.26
III	0.21	0.10	0.16	0.11	0.23
IV	0.31	0.09	0.22	0.14	0.25

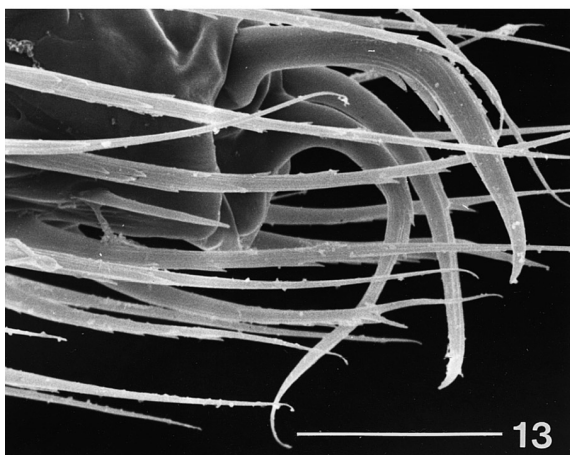
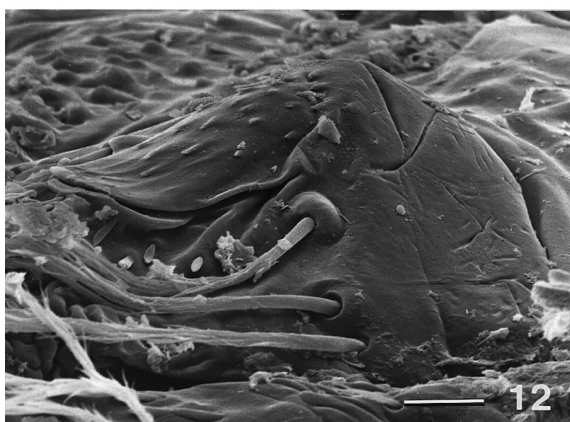
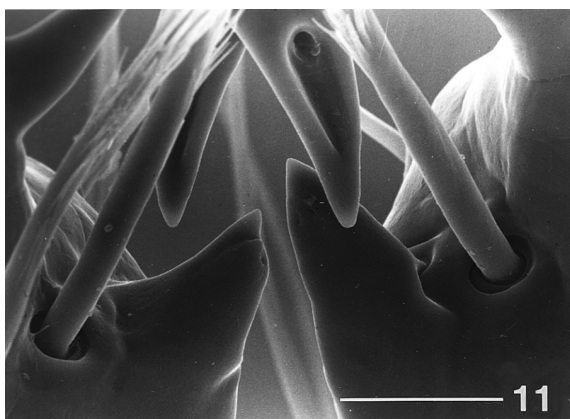
Opisthosoma: Wholly covered by large, sclerotised scute (Fig. 1), ventral plate surrounding opening at which pedicel is attached, extending to epigastric furrow, spinnerets surrounded by chitinous ring; large, fleshy colulus



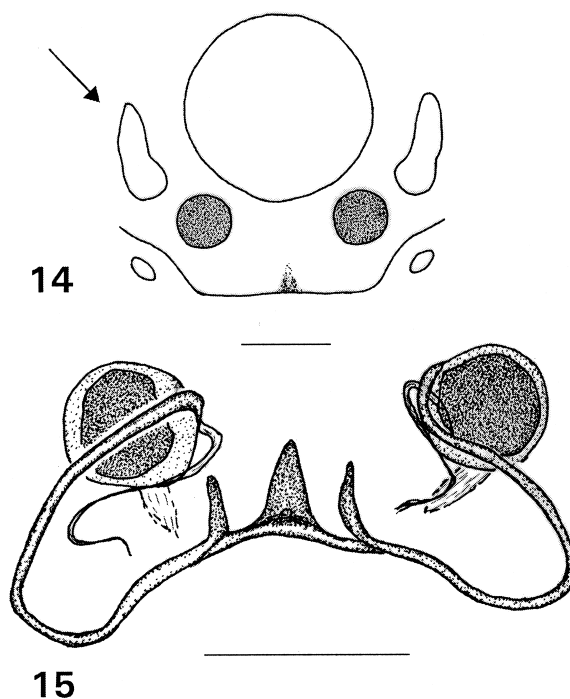
Figs. 3–10: *Crozetulus rhodesiensis*. **3** Male carapace, frontal view; **4** Female carapace, frontal view; **5** Male carapace, dorsal view; **6** Male prosoma, ventral view; **7** Male left chelicera, frontal view; **8** Female right gnathocoxa, ventral view (arrow indicates vestigial pedipalp); **9** Male left pedipalp, prolateral view; **10** Male left pedipalp, retrolateral view. Scale lines=0.1 mm.

present. *Palps*: Patella long, with retrolaterally a basal hook and a rounded projection at apical end (Fig. 10); tibia much shorter than patella, with incomplete border to tarsus; cymbium without paracymbial projections; embolus long and curved, ending in single tip, accompanied by structure that functions as a conductor (Figs. 9, 10).

Female (Figs. 2, 4, 8, 12–15): The female morphology is described only where it differs from the male. Total length 1.06. Carapace length 0.54, height 0.31. Opisthosoma length 0.78 (measured vertical to petiolus). Opisthosoma light yellow in upper front half, getting darker towards spinnerets. *Prosoma*: Carapace similar



Figs. 11–13: *Crozetulus rhodesiensis*. **11** Male cheliceral gland mounds, caudal view; **12** Female labrum, oblique lateral view; **13** Female tarsus IV tip, retrolateral view. Scale lines=0.01 mm.



Figs. 14–15: *Crozetulus rhodesiensis*, female. **14** Epigyne and epigastric region, ventral view (arrow indicates booklung cover); **15** Vulva, dorsal view. Scale lines=0.1 mm.

to male, clypeus only slightly concave, bristles longer (Fig. 2), a row of bristles above ventral margin of clypeus (Fig. 4), sternum rather flat. *Mouthparts*: Palp absent, only a small nubbin visible (Fig. 8). *Legs*: Measurements:

	Fe	Pa	Ti	Mt	Ta
I	0.48	0.18	0.37	0.20	0.33
II	0.45	0.17	0.28	0.16	0.31
III	0.31	0.14	0.19	0.14	0.26
IV	0.40	0.14	0.30	0.16	0.28

Opisthosoma: Oval, large, overhanging prosoma, without a scute but with dorsal area differing from rest of opisthosomal surface by lighter colour, shorter hairs, and slight lustre (Fig. 2); two small booklung covers present, not detected in male (Fig. 14); posterior spiracle lacking in both sexes, but two anterior spiracles visible in female. *Genitalia*: As described by Brignoli (1981) except that structures were observed that are at least remnants of fertilisation ducts (Fig. 15); two large, round spermathecae present, clearly separated from long, curved copulation ducts; bursae lacking.

Diagnosis: Males of *C. rhodesiensis* can easily be distinguished from the other two described males of the genus by the shape of the embolus, which is long, curved and ends in a slender tip (Figs. 9, 10); the female differs from those of the other three described species by the shape of the vulval sclerotisation (Fig. 15), which is also visible in ventral view (Fig. 14).

Habitat: All spiders were collected by sieving the litter of shore vegetation of both rivers and lakes, mainly reeds (*Phragmites*) (Table 1). *Crozetulus rhodesiensis* comprised about 15% of the spiders collected in these samples.

Discussion

Anapid spiders occur world-wide but are not commonly found. Nevertheless, with a special search strategy in particular habitats *C. rhodesiensis*, a species that was until now reported only from a single female, could be found in relatively high abundance. Therefore, it may well be that anapids are often overlooked because of unsuitable trapping methods or simply because of their minute size. Up to now only eleven species (assigned to five genera) of Anapidae have been described from the continent of Africa. There is every reason to believe that many more await discovery. *Crozetulus rhodesiensis* is widely distributed at least in southern Africa.

Brignoli (1981) provisionally placed this species in *Crozetulus*, adding: "Until a male shall be found, the status of *C. rhodesiensis* shall be uncertain". The morphology of the male palp, especially the long patella with its two apophyses at opposite ends and the strong, curved embolus, confirms Brignoli's placement of the species in this genus.

The Anapidae are most closely related to the Symphytognathidae and Mysmenidae (Griswold *et al.*, 1998). All three families are characterised by simplified, miniaturised or even missing features, which could be associated with their minute size. Typically for reductions, these features vary intraspecifically, interspecifically, and are often even asymmetrically developed

within a single specimen, probably because of low selection pressure. Thus, anapids have a "tendency" to reduce their anterior median eyes, their female palps are "often" absent, and the booklungs are "in most species" replaced by tracheae. These characters have low systematic value. Only a few newly developed structures have been suggested as autapomorphies of the anapids, of which the labral spur is most often mentioned. This structure was first reported by Wunderlich (1976) and regarded as autapomorphic for anapids by Platnick & Shadab (1978). The term "spur" is misleading, because it is a sclerotised protrusion that does not run to a point but is rather rounded. Its function is unknown. However, this labral bulge or spur is present in *C. rhodesiensis*, but is not as distinctive as in *Anapis* (Platnick & Shadab, 1978: fig. 1).

The second suggested autapomorphy for Anapidae (Platnick & Forster, 1986) is the presence of two round depressions at the margin of the carapace, situated just above the gnathocoxae, with pores that are presumed to serve glands. These depressions are absent in *C. rhodesiensis*. It is conceivable that pore-bearing depressions have evolved in connection with the increasing sclerotisation of the carapace. In contrast to *Anapis*, *Crozetulus* is not a strongly armoured spider; its pleura are rather weak.

Griswold *et al.* (1998), who included two anapids in their cladistic analysis of araneoid spiders, suggested

Places of origin	Co-ordinates	Collecting methods	Dates	Collectors	Spiders
RSA Cape Prov.: De Hoop NR: De Hoop Vlei	34°27.2'S 20°24.2'E	sievings: <i>Phragmites</i>	03.12.1996	Uhlig	2♂ 2♀
RSA Cape Prov.: De Hoop NR: De Hoop Vlei	34°27.2'S 20°24.2'E	sievings: <i>Phragmites</i>	09.11.1997	Uhlig	6♂ 4♀
RSA Cape Prov.: Bontebok NP	34°04'S 20°27'E	sievings: river bank	15.11.1993	Uhlig	3♀
RSA Cape Prov.: Bontebok NP: Acacia Trail	34°04.5'S 20°27.3'E	sievings: <i>Phragmites</i>	11–12.11.1997	Uhlig	3♀
RSA Cape Prov.: Karoo NP: permanent spring at bottom of Pienaars Pass	32°19.2'S 22°30.0'E	shore sievings: grass+leaf litter	16.11.1997	Uhlig+Ndamane	2♂ 2♀
RSA Cape Prov.: Karoo NP: Mountain View River	32°13.6'S 22°31.6'E	shore sievings: <i>Phragmites</i> +grass+litter, 900 m	17.11.1997	Uhlig+Ndamane+Ari	1♂
RSA KwaZulu-Natal: Sordwana Bay NP	27°37'S 32°41'E	wet forest sievings: reed+ <i>Cyperus</i> + <i>Ficus</i> leaf litter	30.01.1994	Uhlig	1♂
RSA KwaZulu-Natal: Sordwana Bay NP	27°37'S 32°41'E	riverine forest litter sievings: <i>Ficus</i> + <i>Cyperus</i> leaf litter	14–15.11.1996	Uhlig	1♂
Namibia Namib-Noukloof NP: Waterkloof	24°16.8'S 16°14.2'S	shore washing: algae + <i>Carex</i> + <i>Phragmites</i>	29.11.1997	Uhlig+Marais	1♂
Namibia Namib-Noukloof NP: Noukloof River	24°15.8'S 16°14.1'E	shore washing+sievings: <i>Phragmites</i> +grass+leaf litter	29–30.11.1997	Uhlig	1♂ 3♀
Zimbabwe Nyanga NP, Rhodes Dam	18°27'S 32°47'E	sievings: <i>Phragmites</i> and fern	07.12.1993	Uhlig	1♀

Table 1: Details of the collections.

among other characters the dorsal scutum on the male opisthosoma as apomorphic for the family. This is true for almost all Anapidae.

Another possible autapomorphy to define the taxon Anapidae is the denticle plate situated on the posterior margin of the cheliceral claw furrow. This is an elevation with many tiny teeth, much smaller than the teeth along the furrow. Unfortunately, with the exception of the scutum these characters are not easily detectable and are therefore more or less unsuitable for identification keys, and the presence of dorsal scuta is not unique to the group but can be found in other armoured spiders as well.

The lungs of anapids and symphytognathids are in most species modified to tracheae, with some anapids showing a transitional stage (Forster, 1959), e.g. *Risdonius parvus* Hickman which has modified lamellae but no real tubes (Hickman, 1939). *Crozetus rhodesiensis* can also serve as an example for a transition of the respiratory system, because on the one hand there are still booklung covers visible, but on the other hand these have no slit at their posterior margin; instead, the respiratory system opens through circular spiracles at both sides of the genital furrow, so it seems likely that under the lung-cover we could find tubular tracheae.

Although the female lacks a distinct sclerotised epigynum, this spider has to be assigned to the entelegyne type owing to the structure of the vulva which has separated ducts for copulation and fertilisation and most probably (this is not completely discernible) two separated openings for the copulatory ducts (Fig. 15).

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