

The external morphology of immature stages of *Ricinoides karschi* (Arachnida: Ricinulei)

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Introduction

During the last ten years our knowledge of the order Ricinulei has increased considerably. Before this time the works on the order were few and scattered, those of note including Hansen and Sørensen (1904) and Millot (1945). Much of the recent work has centred on the New World genus *Cryptocellus* Westwood 1874. Current studies by the present author are endeavouring to improve our knowledge of the African genus *Ricinoides* Ewing 1929, in addition to that of the biology of the order as a whole.

The external morphology of the immature stages of ricinuleids was imperfectly known until Pittard and Mitchell (1972) published their detailed study of the Mexican species *Cryptocellus pelaezi* Coronado 1970. More recently, Legg (1976) has included an account of the immature stages in his description of the new species *Ricinoides hanseni* from Sierra Leone. In the present paper the immature stages of *R. karschi* (Hansen and Sørensen, 1904) are described from material collected in Gabon. The type material of this species (2 males and 3 females) has been redescribed recently by Tuxen (1974).

Material

An extensive collection of soil animals was made in 1962 by Prof. B. Condé of the Centre National de la Recherche Scientifique, Mission biologique de Gabon (Directeur Prof. P. P. Grassé). This collection included several specimens of immature ricinuleids, which were determined by the present author as *Ricinoides karschi*. Details of the specimens are given in Table 1.

A female *R. karschi* was examined and drawn for comparison (Fig. 1) (see Hansen and Sørensen (1904) and Tuxen (1974) for details of the male). The female was borrowed from Dr P. L. G. Benoit of the Musée Royal de l'Afrique Centrale (Belgium).

The immature specimens (Figs. 2-5) of *R. karschi* used in the following description have been deposited in, and are the property of the Université de Nancy I, Zoologie Approfondie, 34 rue Ste Catherine, Nancy, France.

Results

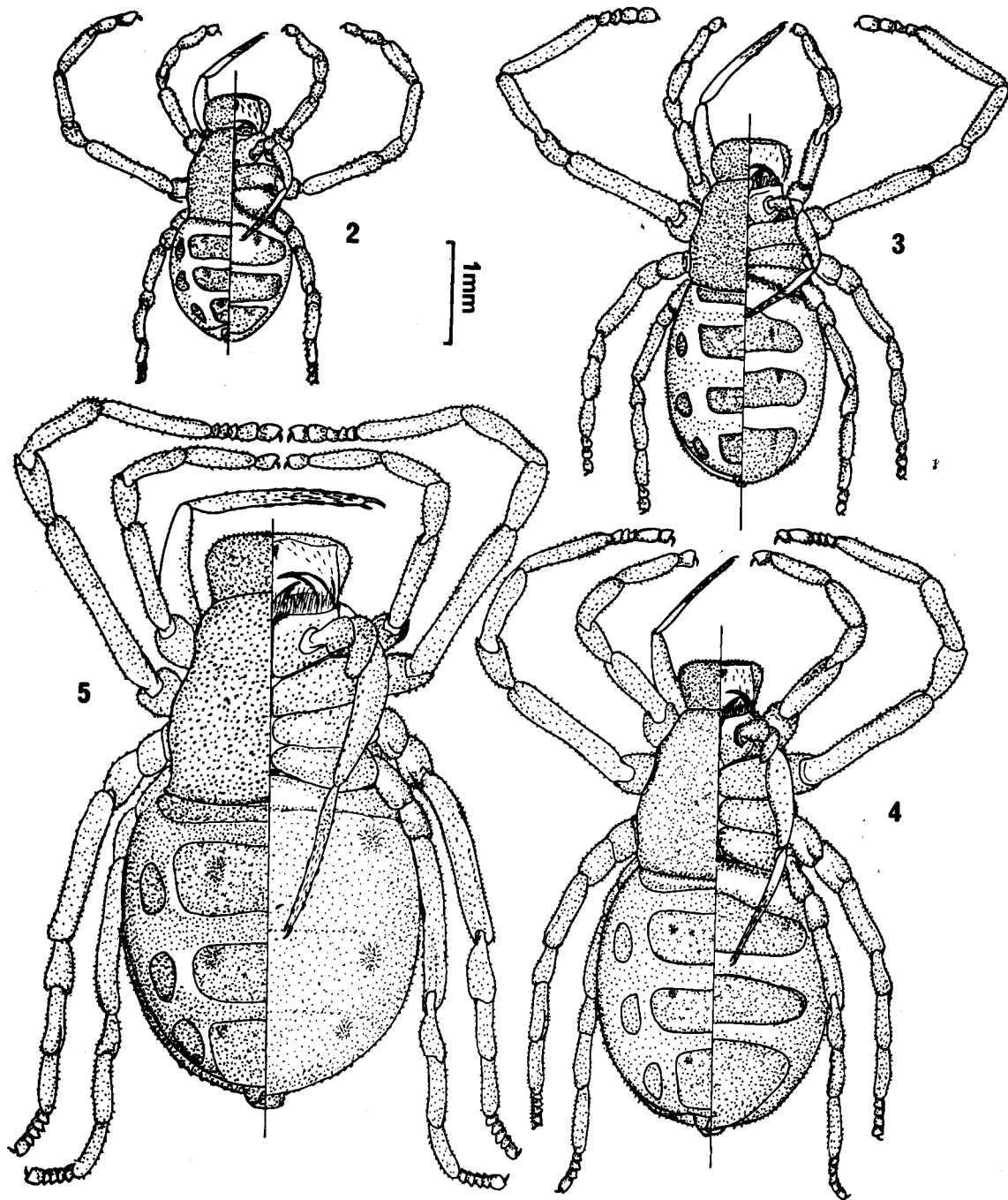
Table 2 gives details of the entire lengths, and lengths and breadths of the cucullus, prosoma and opisthosoma of the various life stages. For information concerning the methods of taking measurements see Tuxen (1974) and Legg (1976). All measurements are in mm.

Integument

At each moult the cuticle of the different instars becomes progressively darker, that of the larvae being

Specimen	Life Stage	Label details
1	Protonymph	3 bis Loualouah 8.3.62
2	Larva (early)	53 Camp Central 21.7.62 Condé
3	Larva (2 originally listed)	33 ter MGB Condé Belinga 13.3.62
4	Deutonymph	71 Forêt Camp Central 8.8.62 Condé
5	2 larvae (4 originally listed)	3 bis Loualouah 8.3.62 Tamiss
6	Larva	MGB Remy Mars 62 Makokou Tamiss
7	Tritonymph female	99 Mvathi 127A 18.9.62 Condé
8	Adult female	<i>Ricinoides karschii</i> Soer Det. P.L.G. Benoit 1969 Loc. Cameroun: Yaounde Rec. J. Amiet R.G. Mus. Afr. Centr. 134, 817.

Table 1. Details of specimens of *R. karschi* examined



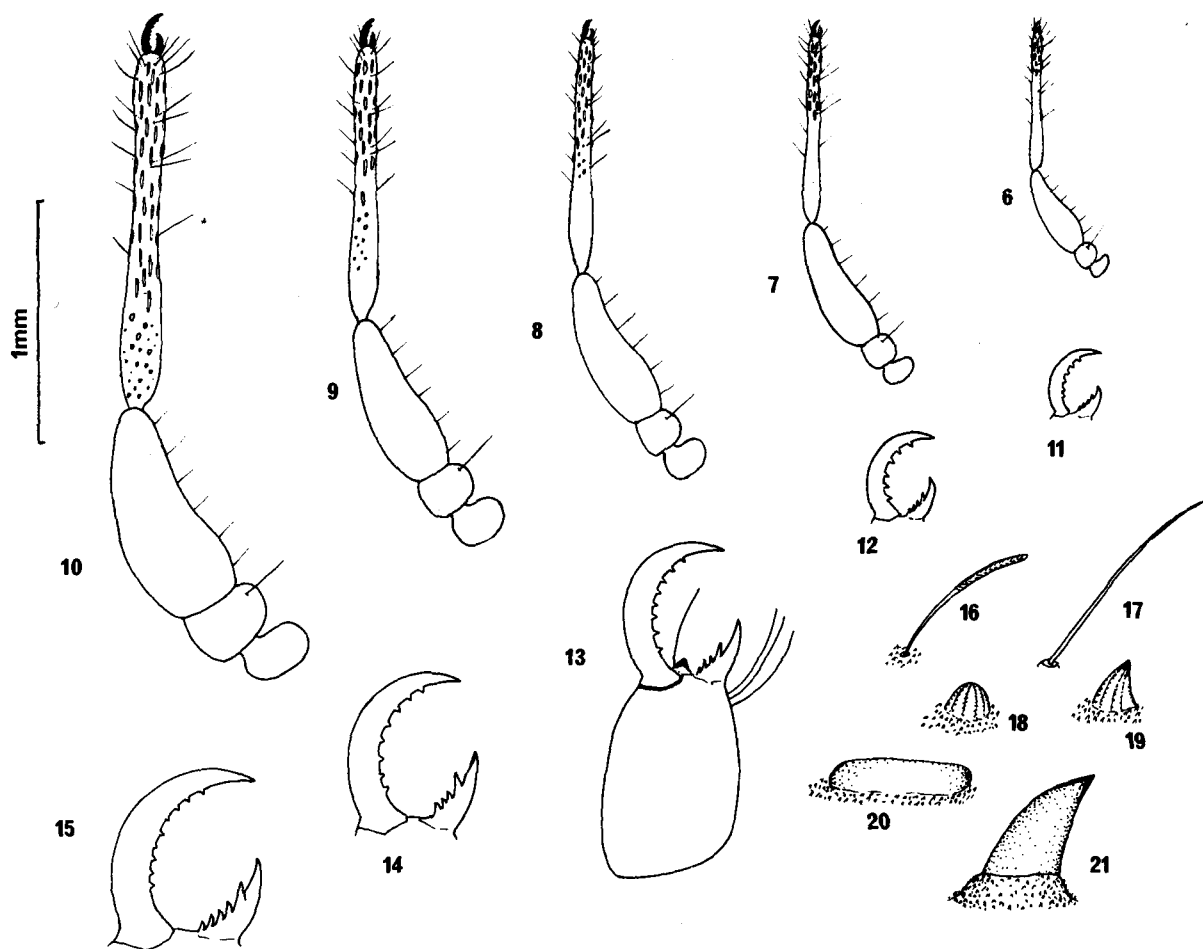
Figs. 2-5: *Ricinoides karschi*. Dorsal and ventral views of immature stages. 2 Larva; 3 Protonymph; 4 Deutonymph; 5 Tritonymph (female).

Legs

Like the pedipalps and body, the legs are covered in tubercles and setae. Ensate setae predominate as they do on the body and pedipalps. With increase in size from instar to instar there is a corresponding increase in the numbers of setae and tubercles.

Sexual dimorphism

Both primary and secondary sexual characters are manifest in the morphology of the second and third pairs of limbs of tritonymphs and adults. Adult males possess expanded femora of the second pair of legs whilst females have more typical femora (Fig. 1). In



Figs. 6-10: *Ricinoides karschi*. Ventral views of pedipalps, showing distribution of tubercles and trichobothria. 6 Larva; 7 Protonymph; 8 Deutonymph; 9 Tritonymph; 10 Adult.

Figs. 11-15: *Ricinoides karschi*. Ventral views of chelicerae. 11 Larva; 12 Protonymph; 13 Deutonymph; 14 Tritonymph; 15 Adult.

Figs. 16-21: Setae and tubercles from the integument of *Ricinoides karschi*. 16 Ensate seta; 17 Acuminate seta; 18 Rounded tubercle from the prosoma; 19 Conical tubercle from the pedipalp; 20 Long tubercle from the pedipalp; 21 Large conical tubercle from the posterior margin of the opisthosoma.

male ricinuleids the tarsal and metatarsal segments of the third pair of legs are modified for sperm transfer. Females lack such elaborations. Only a single female tritonymph was available for examination and therefore no comment can be made on the form of the male tritonymphal third leg. However, it is likely to be similar to other species, for example *R. hanseni* (Legg, 1976). The single female tritonymph however did possess precursors of the genital lips, which are also present in deutonymphs (Pittard and Mitchell, 1972; Legg, 1976).

Conclusions

It is evident that the changes in the external morphology of *R. karschi* from instar to instar are comparable to those changes which occur during the life history of other ricinuleids, for example *R. hanseni* (Legg, 1976).

Acknowledgements

My thanks go to Prof. B. Condé of the Faculté de Sciences de Nancy and Dr P. L. G. Benoit of the

Musée Royal de l'Afrique Centrale (Belgium) for their kind loan of the material used in this paper.

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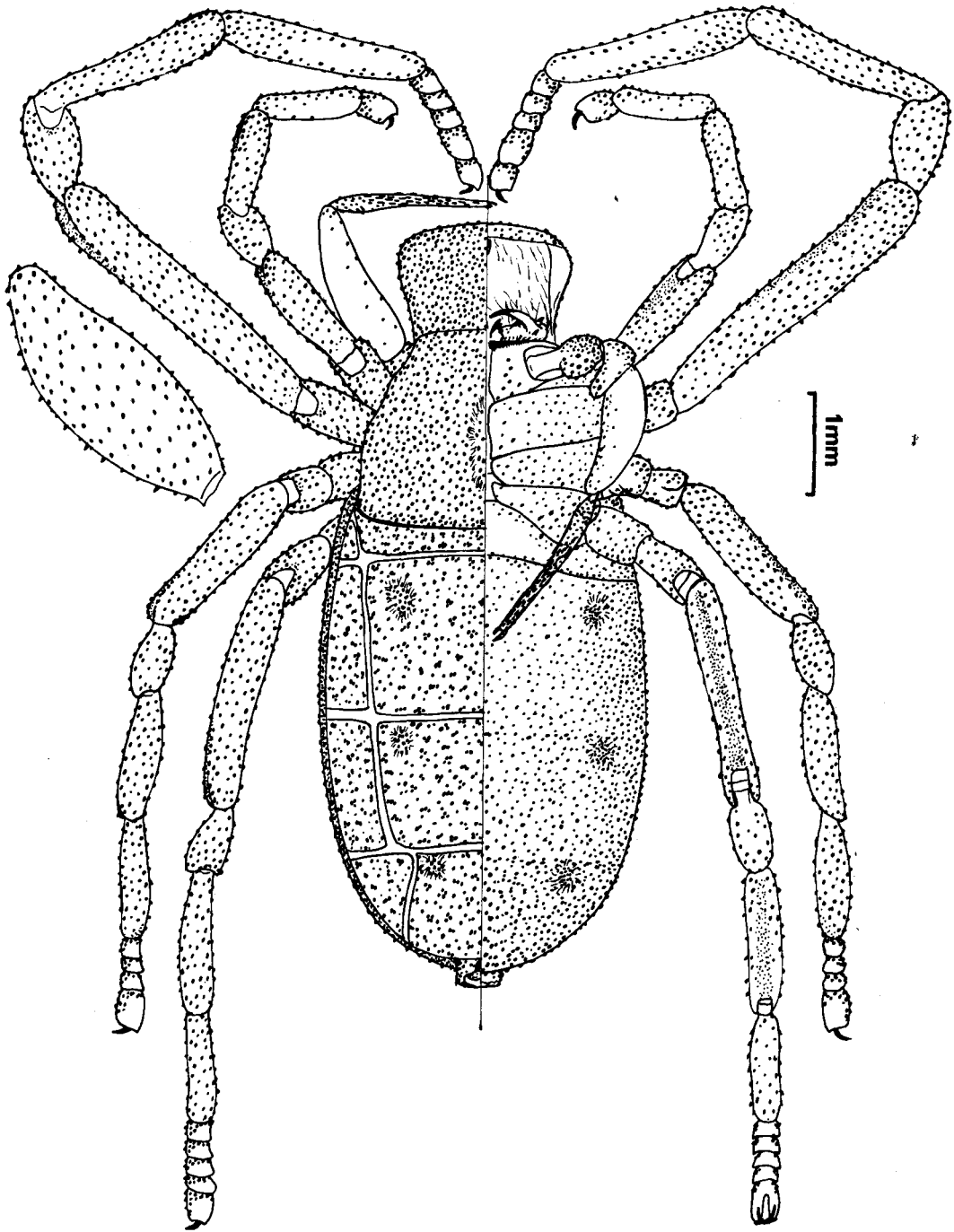


Fig. 1: *Ricinoides karschi*. Dorsal and ventral views of adult female with insert – femur of male leg two.

a pale yellowish-brown colour and almost transparent, whilst the tritonymphs are a rich brown and the adults a black-brown colour.

The surface of the body is covered in acuminate and ensate setae (see also Legg, 1976) together with the distinctive conical and rounded tubercles (Figs. 16-19).

There is a gradual increase in the numbers of both the setae and tubercles present, from instar to instar. Changes also occur in the distribution of these integumental structures, particularly the tubercles. In the early instars the body tubercles are more aggregated and are also associated in distinct groups of 3 or more. With the increase in body size at each moult the tubercles become more widespread and less distinctly clumped.

Chelicerae

Figs. 11-15 show the chelicerae and their teeth. The number of fine teeth on the fixed fingers of the chelicerae increases from 6 in the larva and protonymph to 8 in the deutonymph and 9-11 in the tritonymph and adult. There are 4 triangular teeth on the movable finger of the larval, protonymphal, deutonymphal and tritonymphal chelicerae and 5 on the adult chelicerae. One larva examined possessed only 3 teeth on the movable finger of the chelicera.

Apart from the typical large group of plumose, retro-lateral ventral setae on the cheliceral hand there are three prolateral and a single dorsal seta.

Pedipalps

The pedipalps are among the most important morphological structures of ricinuleids (Tuxen, 1974). They are diagnostic for any one species in *Ricinoides* (but not in *Cryptocellus*). Those of adult *R. karschi* have been described and figured by Tuxen (1974). Figs. 6-10 show the relative sizes of the pedipalps of the different instars and the distribution of the elongate and rounded tubercles and large acuminate setae. The most striking feature is the change in the distribution of the tubercles on the tibia, which are of two types, long and circular. Larvae possess only the long narrow tubercles which occupy approximately 34% of the tibia, leaving the proximal 66% clear and smooth (Fig. 6). In the protonymph (Fig. 7) this distribution changes such that 40% of the tibia is tuberculate. It is not until the deutonymph (Fig. 8) that circular tubercles appear on the tibia, proximal to the elongate tubercles. At this stage the tibia has a 60% covering of tubercles. On reaching the tritonymph stage (Fig. 9) nearly 70% of the tibia is tuberculate and in the adult (Fig. 10) virtually the entire length of the tibia is covered in tubercles, of which the distal ones are elongate and the proximal tubercles rounded.

Long acuminate setae, which are probably trichobothria, occur on the trochanter, femur and tibia. In all life stages a single trichobothrium occurs on the trochanter, a row of six on the femur and 16 trichobothria on the tibia (Figs. 6-10). Ensate setae occur over the entire length of the pedipalps.

	Larva	Protonymph	Deutonymph	Tritonymph
Entire length	2.20	3.00	4.00	5.00
Cucullus length	0.56	0.66	0.75	1.00
breadth	0.85	0.96	1.10	1.40
Prosoma length	1.08	1.10	1.50	2.05
breadth	1.00	1.15	1.70	2.00
Opisthosoma length	1.50	2.00	2.20	3.00
breadth	1.50	1.95	2.05	2.90

Mean adult entire length 6.00 mm. Larva: mean of 5 specimens

Other stages: single specimens

Table 2. Dimensions of immature stages of *R. karschi*