

New morphological information of the parasitic copepod *Kroyeria dispar* Wilson, 1935 (Copepoda: Kroyeriidae) from the east coast of South Africa

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Features of taxonomic importance of *Kroyeria dispar* Wilson, 1935 are described from females collected from the gills of tiger sharks (*Galeocerdo cuvier*) captured in the southern Indian Ocean. This is a first record of *K. dispar* from South Africa and additional morphological information is given. Observations were made with the aid of scanning electron microscopy (SEM).

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Introduction

Kroyeria, with 18 nominal species, is the largest of the three genera of the family Kroyeriidae (Deets 1994). The major host taxon for *Kroyeria* is the Carcharhiniformes, which constitutes an estimated 200 species of sharks. *Kroyeria dispar* was first described by Wilson (1935) from an unidentified shark. Yamaguti (1963), Cressey (1967, 1970) and Pillai (1985) also described or reported *K. dispar*. All these reports are from the same host, *Galeocerdo cuvier* (Peron & Lesueur, 1822) from the following localities: Puerto Rico (Caribbean Sea), Florida (Atlantic Ocean) and Madagascar (Indian Ocean). This is the first report of *K. dispar* from the east coast of South Africa.

K. dispar can be distinguished from other *Kroyeria* species by an unusually wide cephalothorax, armature of the swimming legs, denticulated endopod setae of the maxillule, cuticular flaps on the myxal area of the maxilliped (Deets 1994) and the absence of spines on the interpodal bars (Pillai 1985).

Two tiger sharks were examined at the facilities of the Natal Sharks Board (Umhlanga Rocks, near Durban, KwaZulu-Natal). One was caught during February 1996 at Ansteys Beach and the other during May 1997 at Umzumbé. A total of 362 female and 260 male *K. dispar* was collected. All parasites were attached to the gill filaments of the host and no preference for specific gills was noted. Collected specimens were preserved in 70% ethanol. Cleaning of the specimens was facilitated with the aid of a BRANSON 3200 ultrasonic cleaner after which the material was dehydrated through graded ethanol (70%–100% at 5–10 min intervals), critical point dried (CPD) and sputter-coated for SEM-studies.

Terminology used is adopted from Kabata (1979) and the host species identified according to Smith & Heemstra (1988).

Kroyeria dispar Wilson, 1935

Kroyeria dispar Wilson, 1935:7

Material Examined: 10 females and 10 males: 10 specimens (5 females and 5 males) deposited in the South African Museum (SAM A43369 – SAM A43370).

Host: *Galeocerdo cuvier* (Peron & Lesueur, 1822) collected

at Ansteys Beach 29°55'S 31°01'E (February 1996) and Umzumbé 30°32'S 30°37'E (May 1997), KwaZulu-Natal, South Africa.

Location on host: Attached to gill filaments.

Description

Female (Figures 1–13). Dorsal stylets articulating with cephalic shield in sinuses medial to posterolateral lobes of cephalic shield (Figure 1). Articulation resembling complex ball-and-socket joint. Dorsal stylets forming part of complex sclerotized ring appearing to be articulating with bases of maxillipeds (Deets 1994). Stylets extending in length to almost middle of second free thoracic segment; each with prominent ventrolateral groove extending along entire length (Figure 2).



Figure 1 *Kroyeria dispar*, female, antero-dorsal view

Free thoracic segments slightly increasing in length and decreasing in width posteriorly, fourth segment posteriorly rounded. Abdomen short, two segmented; first segment almost twice as long as second, with posterodorsal projection overhanging second segment; second segment apparently subdivided about at mid length (Figure 3).



Figure 2 *Kroyeria dispar*, female, tip of dorsal stylet



Figure 3 *Kroyeria dispar*, female, posterior tip of genital complex, abdomen and caudal rami



Figure 4 *Kroyeria dispar*, female, antennule

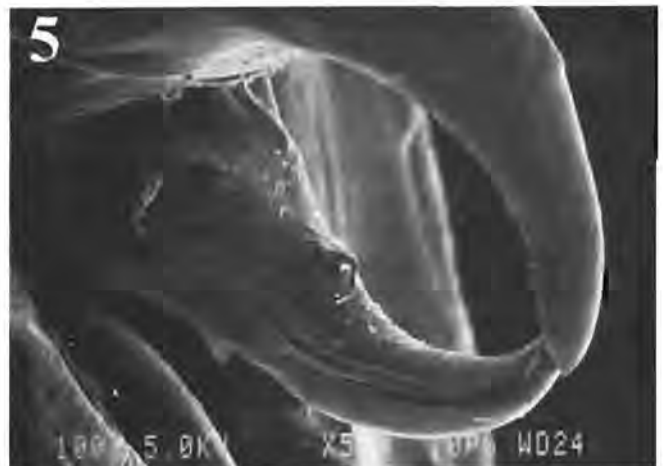


Figure 5 *Kroyeria dispar*, female, antenna

Antennule seven-segmented (Figure 4), armature (base to apex) as follows: 9, 5, 2, 3, 1, 1, 13 + 1 aesthete; first two segments somewhat stouter than last five; segmentation distinct, except between second and third segments; last segment distally concave with 12 setae and one aesthete located in concave area and one seta more proximally.

Antenna robust, chelate, with stout prehensile claw and thumb-like chela, claw with prominent inner distal spine secured in groove along inner distal margin and two smaller setae, one midway along claw, one more proximally (Figure 5).

Posterior to, and largely obscured by antennae, a conspicuous transverse cuticular ridge (*r*) is present, connecting two papilla-like processes (Figures 6 & 7). These processes with interconnecting ridge are proposed to be postantennal processes, similar to that found in Caligidae, Lernanthropidae and Taeniacanthidae (Olivier, Dippenaar & Van Niekerk 1997).

Mouth cone typically siphonostomatoid; labrum with distal

flap-like flanges (distinctly shaped as depicted in Figure 8), medially with fringe of minute digitiform structures, laterally with two prominent denticulated bulges, each longitudinally grooved; labium with similar distal flanges flanked distally by two small digitiform sensory structures (Figure 9), laterally with single row of denticles and denticulated patch more medially, inner distal margin with tooth-like fringe lining entrance to pre-oral cavity.

Maxillule biramous, exopod small, one-segmented, with two naked setae; endopod elongated with two long, denticulated setae, one of which sometimes extending into mouth tube, other curving outwards (Figure 8).

Maxilliped subchelate, three-segmented; basal segment with three stout processes (Figure 10), anterior margin of second segment of corpus maxillipedis prominently bulged, subchela



Figure 6 *Kroyeria dispar*, female, postantennal process. r = transverse cuticular ridge; p = papilla



Figure 7 *Kroyeria dispar*, female, papilla of postantennal process

strongly curved with minute seta on each side about halfway between tip and curve, lateral margins of curved region of subchela with membranous flange (Figure 11).

Legs 1 to 4 biramous, rami three-segmented, sympods two-segmented. First exopod segments elongated, all other segments rounded with broad outer flange, and first exopodal segments with medial fringe of setules; endopod segments with lateral fringe of setules. All exopod spines enveloped in membrane, thus appearing leaf-like. Interpodal stylets absent. Leg 5, situated halfway along genital complex, reduced to three setose and one naked seta (Figure 12).



Figure 8 *Kroyeria dispar*, female, ventral view of mouth cone

Ventral surface of anterior part of genital complex with prominent rectangular denticulated patches (Figure 13).

Discussion

The use of SEM made it possible to supplement previous descriptions in the following respects (additional features as described for the female, are similar for the male):

The shape of the dorsal stylets was noted to be curving slightly inward with blunt tips (Deets 1994). In this study, it was additionally shown to have a ventrolateral groove extending over the entire length of the stylet.

Deets (1994) described the antennule as indistinctly nine-segmented with a chaetotaxy (base to tip) of 9, 1, 1, 5, 2, 3, 1, 1, 13 + 1 aesthete, while Pillai (1985) described it as eight-segmented and sparsely setose. In this study the antennule

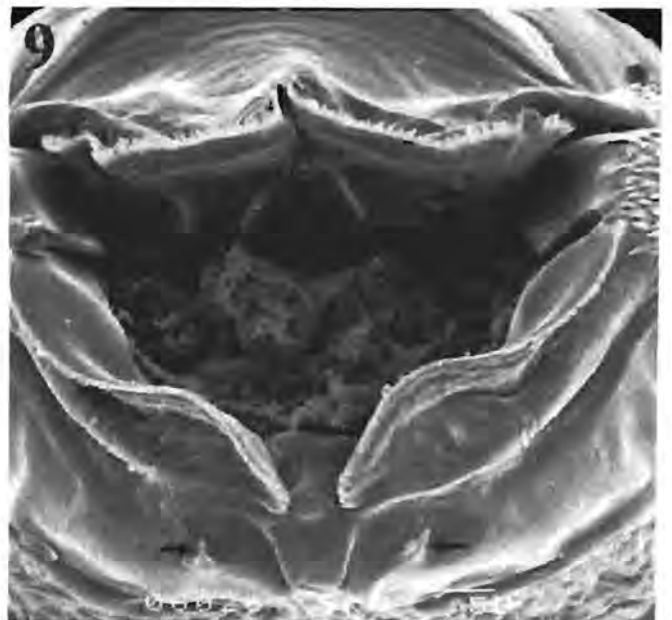


Figure 9 *Kroyeria dispar*, female, tip of mouth cone. p = sensory structure

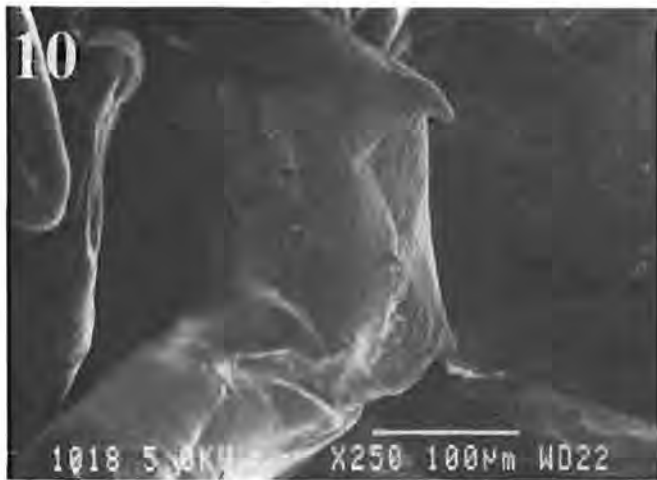


Figure 10 *Kroyeria dispar*, female, basal segment of maxilliped

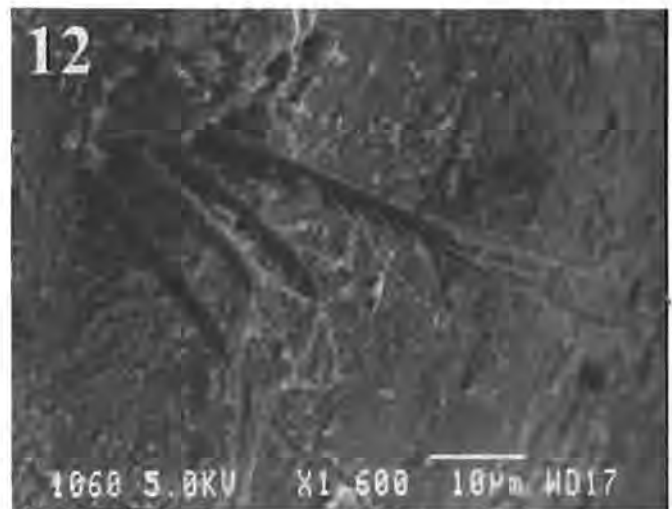


Figure 12 *Kroyeria dispar*, female, leg 5

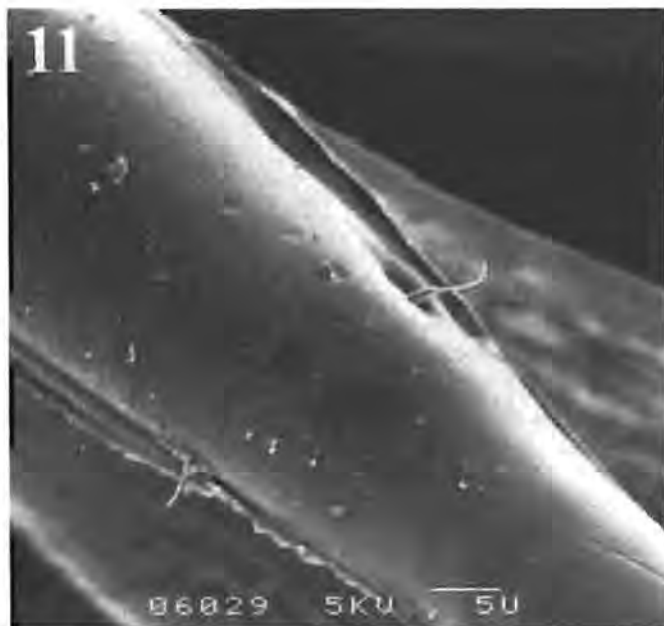


Figure 11 *Kroyeria dispar*, female, curved region of subchela, showing lateral flanges and small setae

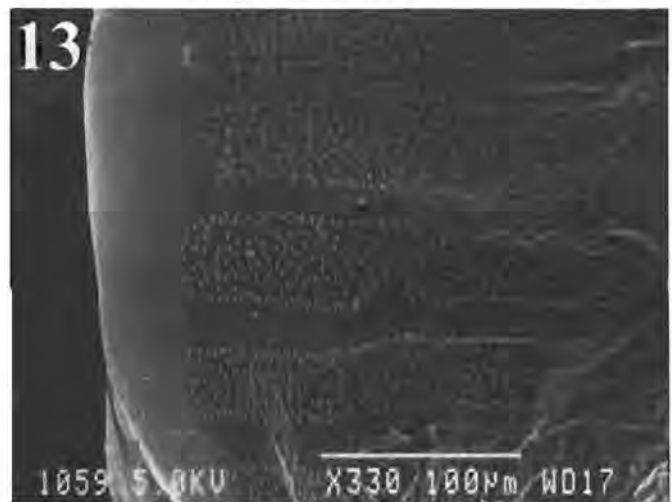


Figure 13 *Kroyeria dispar*, female, denticulated patches of genital complex

was found to be seven-segmented with an armature of 9, 5, 2, 3, 1, 1, 13 + 1 aesthete.

The long seta on the claw of the antenna, mentioned by Deets (1994), was found to be a long, blunt spine, rather than a seta, secured in an inner distal groove. Pillai (1985) also observed this structure as a spine, but much smaller than in the present study and without any reference to the groove. None of the other two setae of the claw was observed by Pillai (1985).

The presence of postantennal processes posterior to the antennae, was not mentioned by any of the other authors. The paired structures located posterior to the antennae and referred to here as the postantennal processes are reported from the family Kroyeriidae for the first time. The homology of these structures are still uncertain. Paired processes in similar

positions have previously been reported from the Caligidae and Lernanthropidae within the order Siphonostomatoidea and from Taeniacanthidae within the order Poecilostomatoidea (Olivier, Dippenaar & Van Niekerk 1997).

Detail of the morphology of the mouth cone was not mentioned by Pillai (1985), whereas Deets (1994) considered the structure to be quite uniform throughout the genus. In a SEM examination of the mouth cone of different species of *Kroyeria*, morphological differences were found which may be valuable for taxonomic purposes. These differences were mainly in the shape and denticulation of the labrum and labium. A pair of small digitiform sensory structures, not previously mentioned, were also observed on the labium of *K. dispar*. The two rows of denticles lateral to the labium reported by Deets (1994) appeared to be a single row of denticles and a denticulated patch.

Deets (1994) noted the presence of a single minute seta on the maxilliped. In this study the occurrence of two minute setae, one on each side of the maxilliped, about halfway between the curve and the tip of the subchela, were noted.

Additionally a membranous flange on the lateral margins of the curved region of the subchela was observed.

For the first time denticulated areas, ventrally on the proximal part of the genital complex, are reported. The pattern of denticulation seems to differ among species and may, therefore, be of taxonomic importance.

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