Description of *Doropygus pyurus* n. sp. (Copepoda, Notodelphyidae) from *Pyura stolonifera* (Echinodermata, Ascidiacea) in South Africa

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The genus *Doropygus* has long been plagued by morphological and taxonomic confusion. Descriptions are often found to be inadequate and finer morphological variations result in laborious and unnecessary description of new species. Although the genus is known to be cosmopolitan in its distribution, only four species have been recorded from the coastal invertebrates of the African coast. *Doropygus apicatus, D. depressus* and *D. humulis* occur in the Dahlak Archipelago off the coast of Ethiopia and *D. pulex* has been recorded from the southern coast of South Africa. Recent samples in the latter locality yielded specimens which showed some resemblance to *D. pulex*, but differed to such an extent that description as a new species is warranted. Unfortunately the South African material reported previously is no longer in existence and the three-line description defies any comparative studies. *Doropygus pyurus* sp. n. differs from most of its congeners in the structure of the antennule and mouth parts, but most significantly from *D. pulex* by virtue of its unique leg armature and setation.

Die genus *Doropygus* is lank reeds onderhewig aan taksonomiese en morfologiese verwarring. Beskrywings is dikwels onherkenbaar en as gevolg van klein morfologiese verskille binne dieselfde spesie kom moeisame en onnodige spesiebeskrywings telkens voor. Alhoewel dit bekend is dat die genus kosmopolities verspreid is, is slegs vier spesies aan die kus van Afrika aangeteken. *Doropygus apicatus, D. depressus* en *D. humulis* kom voor aan die Dahlak argipel op die kus van Ethiopië en *D. pulex* is aangeteken vanaf die Suid-Afrikaanse kus. Onlangse versamelings in laasgenoemde gebied het voorbeelde opgelewer, soortgelyk aan *D. pulex*, maar wat tot so 'n mate verskil dat dit hier as 'n nuwe spesie beskryf word. Die oorspronklike materiaal van *D. pulex* is ongelukkig nie meer beskikbaar nie en die drie-reëlbeskrywing maak vergelyking onmoontlik. *Doropygus pyurus* verskil van die meeste van die spesies in die genus t.o.v. die struktuur van die antennule an monddele, maar veral van *D. pulex* a.g.v. die unieke samestelling van die swempote.

Species of the genus *Doropygus* Thorell, 1859 are cosmopolitan, pharyngeal associates of ascidians, which show considerable variability in minute structure according to the host occupied and the geographical area where they are sampled (Gotto 1993). This is confirmed by the fact that no less than 25 species were listed as indeterminable by Illig (1958).

The same author considered D. cylindrifirmis Schellenberg, 1922 to be incertae sedis and transferred D. novemsetiferus Schellenberg, 1922 to the genus Doropygopsis Aurivillius, 1882 and listed the following 15 valid species of Doropygus, of which seven were new species: D. bayeri Illig, 1958, D. curvatus Gray, 1938, D. demissus Aurivillius, 1885, D. fernaldi Illig, 1958, D. hummi Illig, 1958, D. kerguelensis Schellenberg, 1922, D. longimatrix Schellenberg, 1922, D. laticornis Wilson, 1932, D. mohri Illig, 1958, D. profundus Illig, 1958, D. pulex Thorell, 1859, D. seclusus Illig, 1958, D. schellenbergi, Illig, 1958, D. spiniferus Schellenberg, 1922 and D. trisetosis Schellenberg, 1922. Four species, D. apicatus Stock, 1967, D. depressus Stock, 1967, D. humulis Stock, 1967 and D. rigidus Ooishi 1962, were subsequently added to the list of valid species of the genus by their authors.

Regarding the occurrence of the genus in invertebrates on the African coast, *D. longimatrix* occurs in the Gulf of Suez (Wilson 1932), *D. apicatus*, *D. depressus* and *D. humulis* on the Dahlak Archipelago (Ethiopia) (Stock, 1967) and *D. pulex* on the west and south coasts of the continent (Barnard 1955). Although it is not included in Kensley & Grindley's (1973) discussion of South African parasitic copepods, mention is made of two samples from St. James and Port Elizabeth, taken from *P. stolonifera* and an ascidian respectively, in an appendix listing specimens in the collection of the South African Museum. Barnard (1955) listed Luderitzbucht, False Bay, Kleinmond, the Zwartkops River estuary and Durban as additional localities where *D. pulex* occurred.

Given the morphological complexity and probable variation in the fine structure of the animal in different hosts, together with Barnard's three-line description and single figure of the female habitus, the recent acquisition of a fresh sample of *Doropygus* from *P. stolonifera* from Kleinmond on the south-western coast of South Africa warrants a detailed description. Up to 15 specimens were collected from the pharynx of *P. stolonifera*, fixed in 4% buffered neutral formalin, cleaned with 1% sodium hypochlorite and cleared for 24 h in 70% lactic acid prior to dissection, using the wooden slide technique of Humes & Gooding (1964).

Description

Doropygus pyurus sp. n.

Adult female

Total length of adult, ovigerous female (Figure 1a) 3,01 mm (2,97-3,03). Body typically arched, cephalosome and third thoracic segments of equal size, trapezoid and tapered ventrally, first thin segment square. Second thoracic segment ovally elongated and bears large, posteriorly extended and rounded brood pouch, containing numerous maturing eggs. Urosome consists of four rounded segments, the first two are longer than wide, the third square and the fourth shorter than wide. First urosomal segment bears the fifth leg and the fourth the

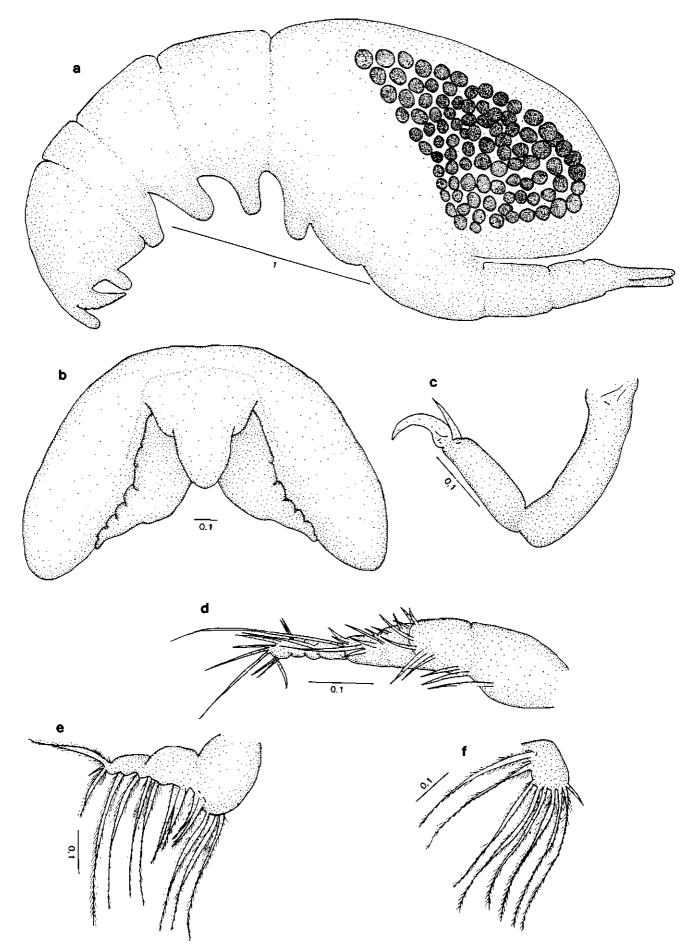


Figure 1 Doropygus pyurus n.sp., female. (a) habitus, lateral; (b) frontal view of cephalosome; (c) antenna; (d) antemule; (e) maxilla; (f) maxillule. Measurements in mm.

simple, cylindrical caudal rami. Anteriorly rounded rostrum present on a tapered base anteriorly (Figure 1b), covering the stout terminally tapering antennules. Antennules consist of eight segments (Figure 1d), bearing the following number of setae, of varying lengths, from proximal segment: 2-6-4-6-1-0-2-7. Antenna (Figure 1c) three segmented, first two segments smooth and long, except for a stout, smooth spine originating from the distal end of second segment. The terminal segment modified into a sharp, curved and heavily sclerotized hook.

Maxilla (Figure 1e) three segmented. Basal segment bulbous, second and third much reduced in diameter. The segments bear numbers of plumose setae of varying lengths; first three long and two shorter setae, second two long and two short and terminal segment two long, two short and a single smooth spine terminally. Maxillule consists of a single small segment (Figure 1f), bearing eight long, plumose setae and a single, smooth spine on its ventro-lateral margin. Mandible biramous (Figure 2a), basipodite smooth except for a minute, lateral spine bordering on the first segment of the exopod and a protruding group of nine long spines medial to the endoped. The first exopodal segment bears, in addition, two very small and one larger, smooth spines. Second exopodal segment bears six long, plumose setae. Endoped consists of a single segment with four long, terminal, plumose setae. Maxilliped biramous (Figure 2b), basipodite smooth with a single large spine ventro-laterally. First exopodal segment bears a single, lateral spine and the second segment one lateral spine and six terminal, long, plumose setae. Endopod four segmented. First segment triangular with a single plumose seta, second segment smooth, third segment with single plumose seta and the fourth segment bears, in addition to four plumose setae, a sclerotized, flat blade-like structure laterally.

Five pairs of swimming legs present, fifth is vestigial. First four pairs biramous. Exopod of first leg (Figure 2c) three segmented. First and second segments bear one and two smooth, stout spines respectively. Single rows of fine spinules present laterally on both segments. Terminal segment bears two medial and two lateral spines, a minute spine and a terminal row of four minute spinules, in addition to two short, plumose setae. First two endopodal segments smooth, terminal segment bears two terminal and one subterminal, plumose setae. Basipodite of second leg (Figure 2d) smooth, both endo- and exopods three segmented. First exopodal segment bears a single, medial, plumose seta and a single row of minute spinules laterally. Second segment similar except for the presence of an additional smooth spine laterally. Terminal segment bears six long, plumose setae, three shorter, smooth spines and a single row of three minute spinules. First two segments of the endopod each with a single row of spinules on their distal segmental borders and a single plumose seta. Terminal segment bears three terminal and one lateral, plumose setae, a smooth spine with a row of five spinules around its origin and two short stout and blunt setae on prominent bases. Exopod of third leg three segmented. First two segments each with one medial and one lateral spine and lateral rows of minute spinules (Figure 2e). Terminal segment bears seven plumose setae and a single row of five minute spinules terminally. Endopod four segmented. First two segments smooth except

for single, lateral plumose setae. Third segment with medial plumose seta and a row of minute spinules around its base. Fourth segment bears four plumose setae in addition to two short, smooth setae on prominent bases (cf. leg 2 in Figure 2d). Exopod of fourth leg three segmented. First two segments smooth (Figure 2f), except for single rows of fine spinules on the distal segmental borders. Third segment approximately twice as long as wide, bearing five plumose setae and a small lateral process, terminating in a striated scleritorization. Endoped three segmented. First two segments bear two and one stout spines with single, lateral rows of spines, respectively. Terminal segment bears seven terminal and two lateral plumose setae. Single rows of spinules are present along the bases of the terminal setae. Fifth leg (Figure 2g) rudimentary, consisting of a single, elongated segment with a short, smooth spine terminally.

Remarks

Despite the apparent variation in the fine morphology within species of the genus Doropygus, D. pyurus can be clearly distinguished from its congeners. The shape, segmentation and setation of the antennule serves to distinguish it from D. bayeri Illig, D. demissus Aurivillius, D. fernaldi Illig, D. hummi Illig, D. laticornis Wilson, D. mohri Illig, D. profundus Illig, D. schellenbergi Illig and D. seclusus Illig. The setation in these species differs significantly from D. pulex. Another unique feature of the new species described here is that only setae and no spines are present on the antennule. As was the case with material from North America, South African specimens had only eight segments in the antennule, as opposed to the more common nine in most other species. Furthermore, it has six setae on the distal exopodal segment of the mandible, which distinguishes it from D. trisetosis Schellenberg with four, and D. kerguelensis Schellenberg and D. longimatrix Schellenberg with five setae respectively. In D. curvatus Gray, the endopeds of the legs are all three segmented, whereas the third endopod is four segmented in the D. pyurus. The mandibular endopod bears only two to four spines in D. spiniferus Schellenberg as opposed to the nine in D. pyurus.

The general features of the South African *D. pyurus* correspond well with those of North American specimens of *D. pulex* described by Illig (1958). Only four urosomal segments could be distinguished in the present specimens, however, as opposed to the six of Illig (1958). Barnard's (1955) drawing of specimens from Port Elizabeth appears to have five segments (p. 236, Figure 6) and no mention is made of the urosome in the three-line description, except for the fact that the last segment is cleft and bears the caudal rami.

Although the segments of the antennule were observed to taper progressively distally, as mentioned by Illig (1958) (Figure 1b), they appeared much more uniform in lateral view (Figure 1d), suggesting that the segments are dorsoventrally flattened. Mention is also made by this author of specimens from Florida with nine segments, but this condition was not encountered in the present study. Nor is there a second reduced seta on the distal margin of the second antennal segment. A single, stout seta is present in the South African specimens. Nine stout spines were found on the

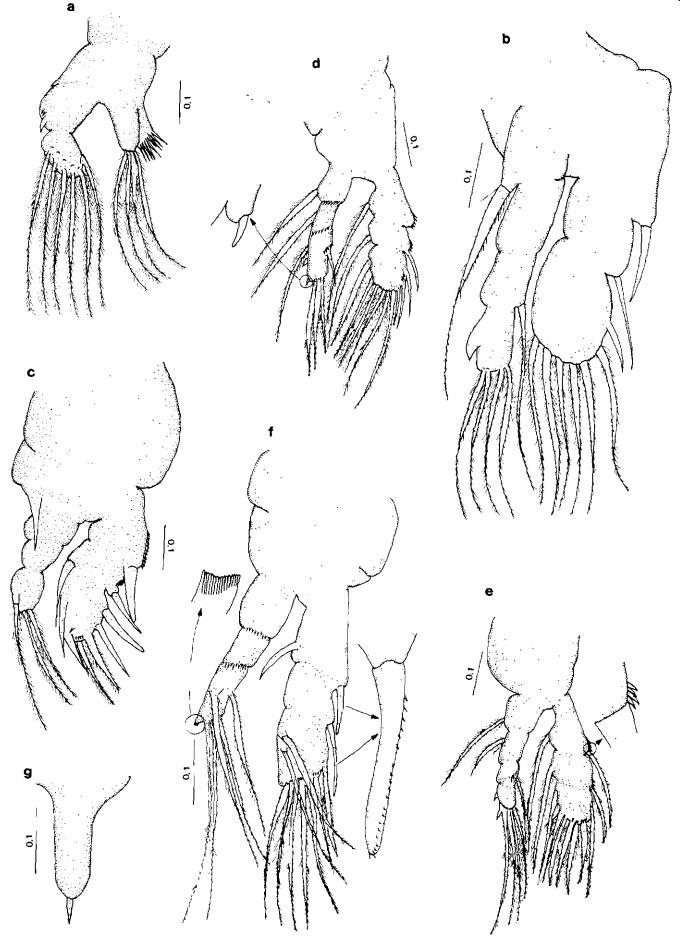


Figure 2 Doropygus pyurus n.sp., female. (a) mandible; (b) maxilliped; (c) leg 1; (d) leg 2; (e) leg 3; (f) leg 4; (g) leg 5. Measurements in mm.

mandibular endopod, which differs from Illig's (1958) eight. This setation is much reduced in Norwegian specimens (cf. Sars 1921). No segmentation could be distinguished in the maxillule and only eight long, plumose setae were present. Mention has been made previously regarding the degree of coalescence of this appendage by Illig (1958), who found nine plumose setae on the maxillule.

The segmentation and setation of the legs differ significantly from all other species of the genus and especially from that of *D. pulex*, described by Illig (1958). The comparative spine-setae formulae are as follows:

D. pyurus		D. pulex	
Exopod	Endopod	Exopod	Endopod
1-0/2-0/4-2	0-0/0-0/0-3	1-1/1-1/4-4	0-1/0-1/0-3
0-1/1-1/3-6	0-1/0-1/1-3	0-2/0-2/0-9	0-1/0-8
0-2/0-2/0-7	0-1/0-1/0-1/0-4	0-2/0-2/0-9	0-1/0-8
0-0/0-0/0-5	20/10/09	0-2/0-2/0-8	0-1/0-7
0-1		0-0/2-2	
	Exopod 1-0/2-0/4-2 0-1/1-1/3-6 0-2/0-2/0-7 0-0/0-0/0-5	Exopod Endopod 1-0/2-0/4-2 0-0/0-0/0-3 0-1/1-1/3-6 0-1/0-1/1-3 0-2/0-2/0-7 0-1/0-1/0-1/0-4 0-0/0-0/0-5 2-0/1-0/0-9	Exopod Endopod Exopod 1-0/2-0/4-2 0-0/0-0/0-3 1-1/1-1/4-4 0-1/1-1/3-6 0-1/0-1/1-3 0-2/0-2/0-9 0-2/0-2/0-7 0-1/0-1/0-1/0-4 0-2/0-2/0-9 0-0/0-0/0-5 2-0/1-0/0-9 0-2/0-2/0-8

Although species of *Doropygus* commonly have a two segmented fifth leg, no segmentation could be discerned in any of the specimens of *D. pyurus* studied. The widespread records of this genus along the shores of other continents, compared to the few records from Africa, suggest that a thorough survey of the marine invertebrates of the continent will yield a number of new finds of this and other genera associated with invertebrates. For the moment, however, the description of *D. pyurus* brings the number of species of African *Doropygus* to only six.

References

- BARNARD, K.H. 1955. South African parasitic Copepoda. Ann. S. Afr. Mus. 41: 223-312.
- GOTTO, V. 1993. Commensal and parasitic copepods associated with marine invertebrates (and whales). Synopsis of the British fauna, no. 46, Eds. D.M. Kermack *et. al.* Universal Book Services/Dr. W. Backhuys, Oegstgeest, The Netherlands. 264 pp.
- HUMES, A.G. & GOODING, R.U. 1964. A method for studying the external anatomy of copepods. *Crustaceana* 6(3): 238-240.
- ILLIG, P.L. 1958. North American copepods of the family Notodelphyidae. Proc. U. S. Natn. Mus. 107: 463-647.
- KENSLEY, B. & GRINDLEY, J.R. 1973. South African parasitic Copepoda. Ann. S. Afr. Mus. 62(3): 69-130.
- SARS, G.O. 1921. An Account of the Crustacea of Norway with short descriptions and figures of all the species. Copepoda supplement. *Cyclopoida* 7: 93-121.
- STOCK, J.H. 1967. Report on the Notodelphyidae (Copepoda, Cyclopoida) of the Israel south Red Sea expedition. Israel S. Red Sea Exp. Rep. no. 46: 3-126.
- WILSON, C.B. 1932. The copepods of the Woods Hole region, Massachusetts. Bull. U.S. Nain. Mus. 158: i-xix, 1-624.