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Discovery of the genus *Rybocyclops* Dussart, 1982 (Crustacea, Copepoda, Cyclopoida) in subterranean groundwaters of southeastern India, with the description of a new species and its biogeographic significance

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Abstract

Rybocyclops Dussart, 1982 is a little-known stygobitic genus, hitherto represented by its type and only species, *R. pauliani* (Lindberg, 1954), from Madagascar. A second species, named *Rybocyclops dussarti* **sp. nov.**, is described herein from an agricultural bore-well in southeastern India. The new species has a unique combination of morphological characters, which, *inter alia*, include: genital double-somite enlarged; anal operculum moderately large; furcal rami somewhat outcurved and about twice as long as wide; female antennules 11-segmented; legs 1–4 with spine formula 2.2.2.2, and setal formula 5.5.5.4; legs 1 and 4 without seta on inner margin of coxa and basis; leg 4 male with one seta more than in female on second endopodal segment; leg 5 fused to somite and represented by vague protuberance, bearing three setae; and leg 6 reduced to two setae. The generic diagnosis is partially amended for accommodating the new species. The discovery of *R. dussarti* **sp. nov.** is of much biogeographic interest because it is the first record of *Rybocyclops* from Asia and only the second freshwater stygobitic cyclopoid taxon from India, with apparent Gondwanan distribution.

Key words: copepod, cyclopoid, stygofauna, *Rybocyclops dussarti* **sp. nov.**, taxonomy, Gondwanan distribution

Introduction

Until recently, India has remained almost a grey area as far as the freshwater subterranean copepods are concerned. Regarding the stygobitic cyclopoid copepods from the Indian subcontinent, *Haplocyclops (Kiefercyclops) fiersi* Karanovic & Ranga Reddy, 2005 is the only species known to date. The four cyclopoids reported by Pesce & Pace (1984), viz. *Thermocyclops oblongatus* (G. O. Sars, 1927), *Eucyclops serrulatus* (Fischer, 1851), *Mesocyclops aspericornis* (Daday, 1906), and *Tropocyclops prasinus* (Fischer, 1860) from several freshwater wells near New Delhi are "actually all stygophiles (or even stygoxenes), not stygobites" (Karanovic & Ranga Reddy, 2004b).

Ongoing investigations of the Indian stygofauna have yielded a stygobitic population representing a new species of the little-known Gondwanan genus *Rybocyclops* Dussart, 1982. The genus was established for a single Madagascan species, *Rybocyclops pauliani* (Lindberg, 1954). Subsequently no author has recorded either this species or added any further species to the genus. This paper gives an illustrated description of a new species, named *Rybocyclops dussarti* **sp. nov.** Further, the original definition of the genus *Rybocyclops* is amended and a brief note on the biogeographic significance of the new species added.

Up till 2001, only seven freshwater stygobitic crustacean species were reported from India (Ranga Reddy, 2004a). They are: *Indoniphargus indicus* (Chilton, 1923) (Amphipoda), *Nichollsia kashiense* Chopra & Tiwari, 1950 and *N. menoni* Twari, 1958 (Isopoda), *Macrobrachium cavernicola* (Kemp, 1924) and *Troglindi-*

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cus phreaticus Sankolli & Shenoy, 1979 (Decapoda), *Spelaeomysis longipes* (Pillai & Mariamma, 1963) (Mysidacea), and *Elaphoidella crassa* Chappuis, 1954 (Copepoda). The recent studies on the Indian stygofauna have yielded a number of phylogenetically and/ or biogeographically significant finds of copepods (Ranga Reddy, 2001; Karanovic & Pesce, 2001; Karanovic & Ranga Reddy, 2004a, b, 2005; Ranga Reddy & Defaye, 2007), bathynellaceans (Ranga Reddy, 2002, 2004b, 2006; Ranga Reddy & Schminke, 2005a, b), amphipods (Holsinger et al., 2006; Messouli et al., 2007), and ostracods (Karanovic, 2005; Karanovic & Ranga Reddy, 2008). With *R. dussarti* **sp. nov.**, the total number of described stygobitic Indian crustacean species has gone up to 23.

Methods

The specimens studied were collected from an agricultural bore-well by filtering the groundwater with a plankton net (mesh size 70 µm). The net was tied to the outlet delivery tube of a pump-set for about one hour, and the filtrate fixed in 5% formaldehyde.

Specimens were isolated into 70% alcohol and subsequently transferred into glycerol. Dissection was carried out in glycerol under a binocular stereomicroscope at a magnification of 90 X. Drawings were made with the aid of a drawing tube mounted on a Leica-DMLB bright-field compound microscope. Permanent preparations were mounted in glycerol and sealed with Eukitt (O. Kindler GmbH & Co, Freiburg, Germany).

The type material has been deposited in the National Museum of Natural History, Paris (Muséum national d'Histoire naturelle, prefix MNHN).

Systematics

Order Cyclopoida Rafinesque, 1815

Family Cyclopidae Rafinesque, 1815

Subfamily Cyclopinae Rafinesque, 1815

Genus *Rybocyclops* Dussart, 1982

Amended diagnosis. Cyclopidae, Cyclopinae of small size, less than 500 µm in length. Body robust, with a pseudosomite present between prosome and genital double-somite, the latter broader than long. Anal operculum produced; caudal rami short. Antennule 11-segmented in female, 14 to 16-segmented in male. Setal formula of last exopodal segment of legs 1–4 is either 5.4.4.3 or 5.5.5.4; leg 4 with two-segmented rami in male and one- or two-segmented endopod in female. Spine at the inner corner of basipodite of P1 absent, inner coxopodal seta absent at least on P1 and P4; sexual dimorphism in the armature of second endopodal segment of P3 or P4. Intercoxal plates of P1-P4 with rounded small prominences. P5 reduced to three setae, one outer, the two inner ones inserted close to each other. P6 reduced to two very small elements.

Type species: *Rybocyclops pauliani* (Lindberg, 1954).

Other species: *Rybocyclops dussarti* **sp. nov.**

Rybocyclops dussarti sp. nov.

(Figs 1–3)

Material examined. Holotype, adult female, dissected on one slide (MNHN-Cp2360); allotype, adult male, dissected on one slide (MNHN-Cp2361); paratypes, dissected on one slide each; 8 females (MNHN-Cp2362

to MNHN-Cp2368, MNHN-Cp2370) and 5 males (MNHN-Cp2369, MNHN-Cp2371 to MNHN-Cp2374); all from Chollaveedu village, 14 January 2006, leg. Y. Ranga Reddy, India, Andhra Pradesh, a roadside agricultural bore-well, about one km from Chollaveedu village, 15° 31'39" N, 78° 56' 56" E, elevation 231 m, on the way to Turimella via Akkapalli, in Racharla Mandal of Prakasam District.

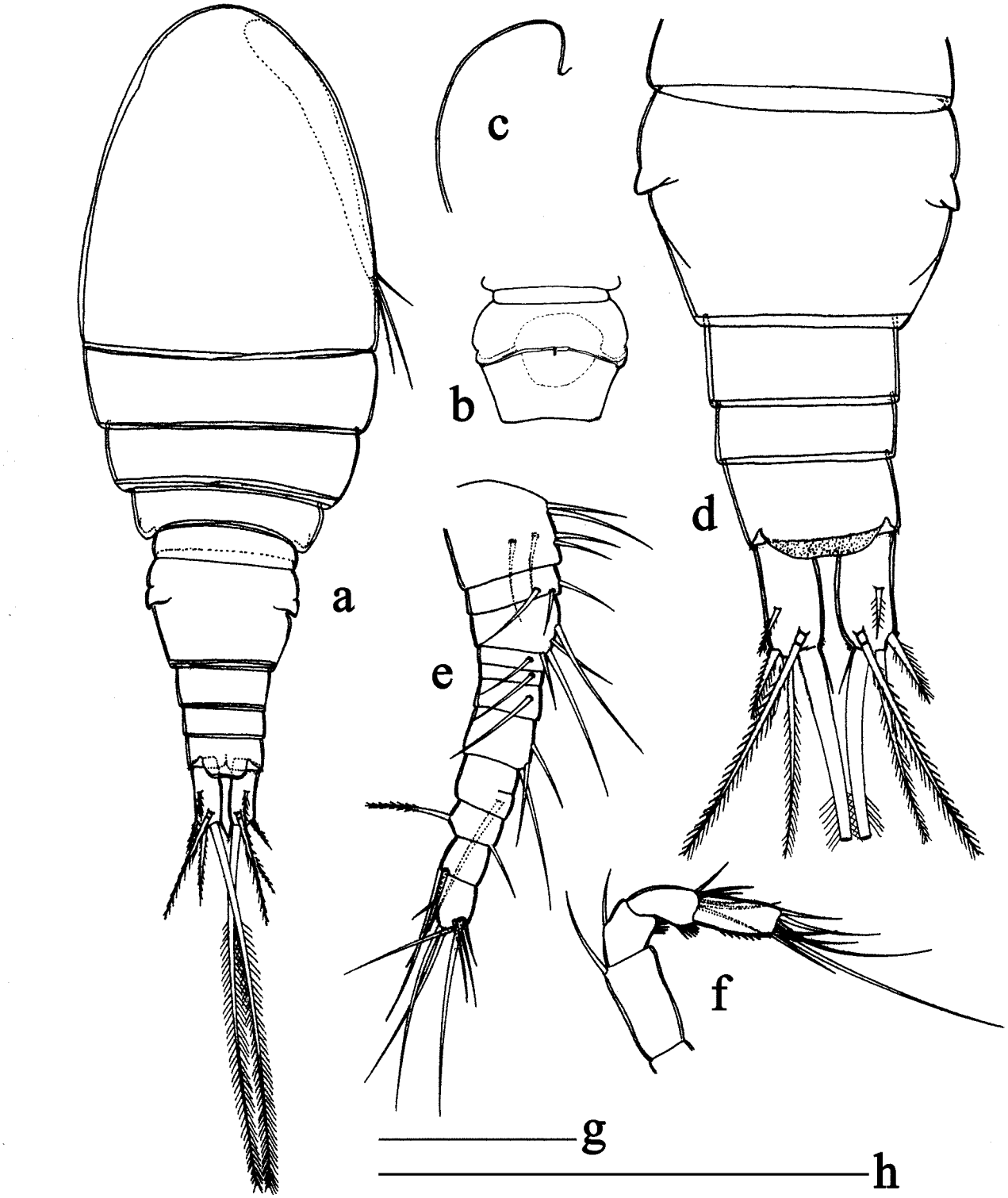

FIGURE 1. *Rybocyclops dussarti* **sp. nov.**, holotype (adult female): a, habitus, dorsal; paratype (adult female): b, genital double-somite, ventral; c, rostrum, lateral; d, abdomen, dorsal; e, antennule; f, antenna. Scale g for a, b; scale h for c–f. Scales = 100 µm.

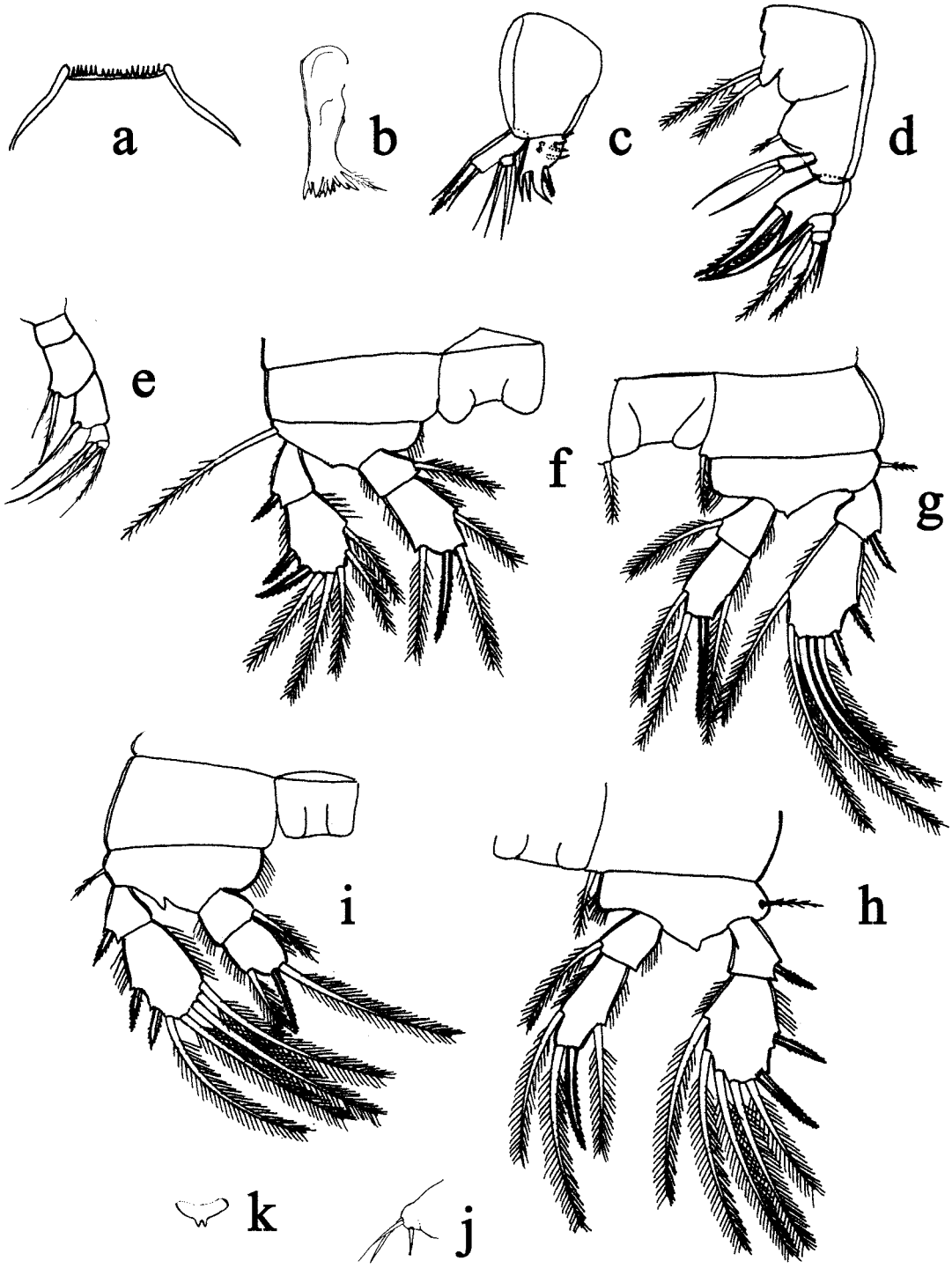

FIGURE 2. *Rybocyclops dussarti* **sp. nov.**, paratype (adult female): a, labrum; b, mandible; c, maxillule; d, maxilla; e, maxilliped; f, leg 1; g, leg 2; h, leg 3; i, leg 4; j, leg 5; k, leg 6. Scale = 100 µm.

Two males MNHN-Cp2375 and (MNHN-Cp2391), dissected on one slide each, two females and three males (MNHN-Cp 2376), preserved in 70% ethanol, from Araveetikota. 10 April 2006, leg. Y. Ranga Reddy, India, Andhra Pradesh, village bore-well at Araveetikota, 15° 34' 49" N, 78° 55' 56" E, elevation 235 m, about

7 km from the type locality. All this material has been deposited in the National Museum of Natural History, Paris.

Etymology. The new species is named in honour of Dr. Bernard H. Dussart, an eminent copepodologist and a chief contributor to our knowledge of the copepod fauna of Madagascar. The name is a noun in the genitive singular.

Diagnosis. Small cyclopoids, mostly less than 400 µm in length, with smooth integument. Genital double-somite 0.7 as long as wide and as long as next three urosomites combined. Seminal receptacle consisting of anterior and posterior parts, anterior part slightly larger, with both external edges rounded; copulatory pore lying in median ventral position. Anal somite with moderately large operculum. Caudal rami characteristic in shape, about twice as long as wide, parallel, with lateral seta inserted in distal half dorsally and principal seta outcurved proximally and without breaking plane. Female antennule 11-segmented, with three setae on seventh segment. Male antennule 16-segmented. Antenna 4-segmented, with setal formula 1.1.6.7 and without seta representing exopod. Mandibular palp lacking. Maxillulary palp, with distinct endopod bearing one inner and two apical setae. Maxilliped 5-segmented, with 0, 2, 1, 1 and 2 setae. Legs 1–4 with 2-segmented rami. Legs 1 and 4 without coxal seta. Spine formula of second exopodal segment 2.2.2.2. and setal formula 5.5.5.4. Second endopodal segment of leg 4 in male with one seta more than in female. Leg 5 completely fused to somite, represented by three slender setae. Leg 6 a distinct cuticular plate, armed with two setae in both sexes.

Description of the female holotype. Total body length, measured from base of rostrum to posterior margin of caudal rami (excluding caudal setae) 416 µm (paratypes 485–520 µm, n = 3). Preserved specimens colourless. Naupliar eye absent. Body (Fig. 1a) somewhat robust, dorsoventrally compressed, with prosome/urosome ratio 1.7 and greatest width (139 µm) at posterior end of cephalothorax. Body length/width ratio 2.8. Cephalothorax 1.9 times as wide as genital double-somite, not produced posterolaterally. Rostral projection (Fig. 1c) moderately developed, broadly triangular in ventral view. Free pedigerous somites with unproduced, rounded posterolateral corners. Pseudosomite present between prosome and urosome, but discernible more clearly in ventral view. Fifth pedigerous somite 0.9 as wide as genital double-somite and with rounded lateral margins.

Cephalothorax (Fig. 1a) 1.2 times as long as its greatest width and 42.9% of total body length. Hyaline fringes of prosomites narrow and smooth. Fifth pedigerous somite with smooth fringe dorsally and ventrally. Sensilla not discernible under the optics used.

Genital double-somite (Fig. 1a, b) 0.7 as long as wide. Hyaline fringe of genital double-somite and next two somites smooth on either surface. Seminal receptacle composed of anterior and posterior parts, anterior part slightly larger, with both external margins rounded; a small internal cuticular thickening visible; copulatory duct short and straight.

Anal somite (Fig. 1a, d) ornamented with transverse row of spinules on ventral posterior margin (not illustrated). Anal operculum smooth, broad, 79% of somite's width, overreaching posterior margin of somite, with slightly depressed mid-posterior margin. Anal sinus without apparent ornamentation.

Caudal rami (Fig. 1d) symmetrical, appearing parallel and close to each other and 36% longer than anal somite; each ramus twice as long as maximum width, with outer edge slightly concave and inner edge slightly convex, and with a row of tiny spinules at base; similar spinules also occurring at base of outermost apical setae and at distal inner corners. Dorsal seta longer than outer median seta, inserted at 4/5 of ramus length and uniarticulate at base. Lateral seta arising from dorsal surface close to outer margin at 3/5 of ramus length and about as long as maximum width of ramus. Outermost apical seta spiniform, 0.7 as long as ramus, inserted subterminally. Innermost apical seta slenderer and shorter than outermost apical seta. Outer median apical seta proximally outcurved, without breaking plane, 4.7 times as long as outer seta and nearly half as long as whole body. Inner median terminal seta 1.7 times as long as caudal ramus. All furcal setae plumose.

Antennule (Fig. 1e) 11-segmented, extending up to 5/4 of cephalothorax in length, unornamented, segment 8 with incomplete septum. Setal formula: 6, 3, 4, 1, 1, 1, 3, 1, 2, 2, and 7 (segmental homologies: I-V,

VI-VII, VIII-XI, XII-XIII, XIV, XV-XVI, XVII-XX, XXI-XXIII, XXIV, XXV, XXVI-XXVIII). Length ratio of antennular segments along median axis: 1.0: 0.3: 0.5: 0.2: 0.1: 0.3: 0.6: 0.6: 0.4: 0.5: 0.6.

Antenna (Fig. 1f) 4-segmented, consisting of coxobasis and 3-segmented endopod. Setal formula of endopod: 1, 6, and 7 (setae on second endopodal segment appearing on fig.1f as all terminal, due to mounting distortion; two of these setae actually inserted on the internal distal quarter of the antenna). Coxobasis twice as long as wide, unornamented and with one robust seta at distal inner corner; exopodal seta absent. First endopodal segment 1.2 times as long as wide, ornamented with a row of long spinules at distal outer corner and armed with one seta at about midlength of inner margin. Second segment 1.6 times as long as maximum width, ornamented with a row of spinules at distal outer corner and armed with six unequal setae at distal inner corner. Third segment 2.2 times as long as wide, ornamented with tiny spinules on distal half of outer margin and armed with seven unequal setae, one of them particularly long.

Labrum (Fig. 2a) trapezoidal, no ornamentation discernible. Anterior edge almost straight, with 18 acute teeth (middle teeth relatively small) between slightly produced rounded lateral corners.

Mandible (Fig. 2b): coxal gnathobase with 11 teeth and a long external bipinnate spine. No palp observed.

Maxillule (Fig. 2c): praecoxa shorter but stouter than palp. Arthrite of praecoxa with four apical spines, one of them strong, claw-like; innermost one distinct and pinnate; third one (from inner side) also distinct but naked. Praecoxa armed with six small claw-like spines on inner side. Palp with distinct endopod bearing one inner and two apical setae, one exopodal seta, and armed apically with two slender, smooth setae and one stout, bipinnate spine.

Maxilla (Fig. 2d): praecoxa fused to coxa on posterior surface and with well-developed proximal endite, bearing two plumose setae; distal endite small, unarmed. Proximal endite of coxa with one short, bipinnate seta; distal endite highly mobile, elongate and armed apically with two unequal setae, proximal seta longer. Basis expanded with robust unipinnate claw, carrying two very unequal setae; stouter seta bipinnate and slightly longer than claw. Endopod two-segmented; proximal segment armed with one stout, bipinnate seta and one weak, smooth seta. Distal segment small and armed with one strong bipinnate seta and two small, smooth setae.

Maxilliped (Fig. 2e) apparently five-segmented, with two-segmented endopod. Syncoxa showing a wider-than-long, unarmed and unornamented part and a second, longer-than-wide, armed part with two pinnate setae at distal inner margin and ornamented with a row of fine spinules on distal outer margin (not figured). Basis somewhat dilated distally, armed with a single pinnate seta (or two?) at distal inner corner, and ornamented with a row of spinules near base of seta and on distal outer margin. First endopodal segment small and armed with one seta, and second segment with two long pinnate setae (ornamentation not figured).

Legs 1–4 (Figs 2f–i) relatively short, with two-segmented exo- and endopods. Hairs present on inner margin of basis, lateral margins of second exo- and endopodal segments and outer margin of both endopodal segments of all legs. Endopod nearly equal in length to exopod on legs 1–3, but distinctly shorter on leg 4. Spine and setal formula as follows:

	Coxa	Basis	Exopod	Endopod
Leg 1	0–0	1–0	I–0; II, 2, 3	0–1; 1, I+1, 1
Leg 2	0–1	1–0	I–0;II, 2, 3	0–1; 1, I+1, 1
Leg 3	0–1	1–0	I–0;II, 2, 3	0–1; 1, I+1, 1
Leg 4	0–0	1–0	I–0; II, 2, 2	0–1; 1, I+1, 0

Second exopodal spine formula: 2.2.2.2. Second exopodal setal formula: 5.5.5.4. Intercoxal plates with rounded small prominences, and no ornamentation on all legs. Outer seta on basis of leg 1 very long and plumose distally; same seta on legs 2–4 short and plumose. Coxa without seta on legs 1 and 4, but with short plumose seta on legs 2 and 3.

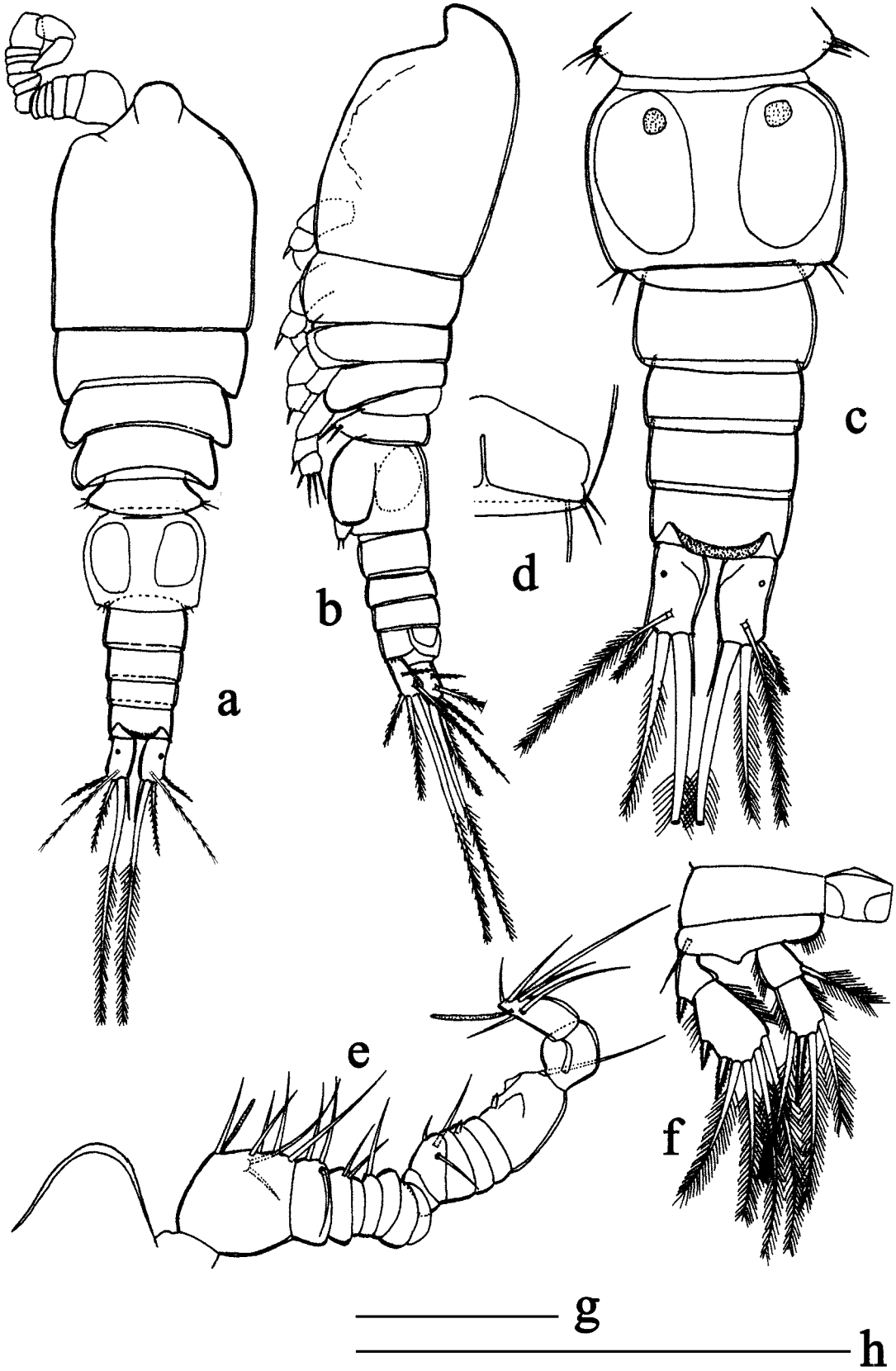

FIGURE 3. *Rybocyclops dussarti* **sp. nov.**, allotype (adult male): a, habitus, dorsal, b, habitus, lateral; paratype (adult male): c, urosome, dorsal (spermatophores discernible); d, leg 6; e, antennule (with rostrum); f, leg 4. Scale g for a, b; scale h for c–f. Scales = 100 µm.

Leg 5 (Fig. 2j) completely fused to somite and represented by three slender setae. Remnant of basal segment represented by barely visible elevation, with outer basal seta; two other setae representing ancestral distal segment, slightly unequal and shorter than basal seta.

Leg 6 (Fig. 2k) located laterally on genital double-somite on a small hump, composed of a small rounded plate bearing two tiny conical processes.

Description of the male allotype. Total body length excluding caudal setae 325 µm (paratypes 415, 500 µm). Habitus (Fig. 3a) slenderer than, and somewhat different in shape, from female. Prosome/urosome ratio 1.25, greatest width at about midlength of cephalothorax. Body length/width ratio 3.4. Rostral expansion well developed (Fig. 3b, e). Cephalothorax 1.8 times as wide as genital somite and representing 35.7% of total body length; anterior one-fifth narrow; posterolateral corners not produced. Free pedigerous somites somewhat produced at posterolateral corners. Hyaline fringes of all somites narrow and smooth. Fifth pedigerous somite expanded at midlength and almost as wide as genital somite. Genital somite slightly wider than long. Third, fourth and fifth urosomites unornamented. Anal somite similar to female, anal operculum not extending beyond posterior margin of somite.

Caudal rami (Fig. 3c) similar to female, 32% longer than anal somite; each ramus 1.7 times as long as maximum width. Armature and ornamentation almost as in female.

Antennule (Fig. 3e) digeniculate, 16-segmented. Segments 1 and 16 with one slender aesthetasc each. Setal formula: 7, 3, 2, 0, 1, 0, 0, 0, 0, 3, 0, 1, 0, 2, 1, and 6.

Other cephalic appendages and legs 1, 2, 3 and 5 as in female.

Leg 4 (Fig. 3f): second endopodal segment with one additional seta on inner margin; otherwise as in female.

Leg 6 (Fig. 3d): both legs partly fused medially; each leg large, cuticular plate-like, armed with two unequal setae.

Discussion

Dussart (1982) established *Rybocyclops* as a subgenus of the genus *Bryocyclops* Kiefer, 1927. This subgenus correspondeds to the group V, as defined by Lindberg (1956) for the Madagascan *Bryocyclops pauliani* Lindberg, 1954, in his attempt to elucidate the status of the genus *Bryocyclops*, which he divided into six groups. Dussart (1982) described, with no illustrations, the salient morphological features of *Bryocyclops (Rybocyclops) pauliani*, on the basis of Lindberg's description and illustrations of the syntypes. Later, Dussart & Defaye (1985) listed this species as such in their directory. Recently, Dussart & Defaye (2001) elevated the subgenus *Rybocyclops* Dussart, 1982 to generic status, providing a formal definition of the genus, with *Bryocyclops pauliani* Lindberg, 1954 as its type and only species (see also Dussart & Defaye, 2006).

The new species is assigned to the genus *Rybocyclops* because it fulfils the principal generic criteria, as defined by Dussart & Defaye (2001): genital double-somite enlarged; female antennules 11-segmented; leg 1 without seta on inner margin of coxa and basis; legs 1, 2 and 3 with 2-segmented rami; legs 1–4 with spine formula as 2.2.2.2; endopodite of P4 bearing a maximum 4 setae, P4 without inner coxal seta; leg 5 fused to somite and represented by three setae; male leg 6 reduced to two setae. However, *R. dussarti* **sp. nov.** displays certain characters that might militate against its inclusion in the genus *Rybocyclops*. For example, the setal formula of legs 1–4 is 5.5.5.4 instead of 5.4.4.3, and leg 4 has two-segmented rami in both sexes; whereas, according to the generic definition, leg 4 has two-segmented rami in the male, but a one-segmented endopod in the female. This character needs to be further confirmed because according to Lindberg's (1954) drawing of the female P4, the median constriction on the endopod suggests the presence of a vague suture (in other specimens?). In *R. dussarti* **sp. nov.**, leg 4 is sexually dimorphic, with the second endopodal segment in female having only three instead of four armature elements as in male. The two species differ by the setation of the second endopodal segment of male P3: it is identical in both sexes of *R. dussarti* n. sp, but in *B. pauliani*, the

female has, according to Lindberg (1954), from outer to inner side: one apical spine, one apical and two inner setae, and the male has one apical spine and one apical seta; the sexual dimorphism is thus on P3 and not on P4. The genital double-somite in the new species has no trace of a suture on the ventral aspect, while in Lindberg's account, the genital somite, though not clearly depicted, could be interpreted as showing remnants of this suture line. This point will remain unresolved, as it has not been possible for us to locate Lindberg's type-material.

Despite the above differences, it appears more appropriate at this juncture to amend the existing generic definition of *Rybocyclops* for accommodating the new species, than to erect a new genus for it. Hence, considering the distinctive characters of *R. dussarti* **sp. nov.** in question (not all characters, mainly of the oral parts, are known for *Rybocyclops pauliani)*, we have given above an amended diagnosis of *Rybocyclops*.

At this juncture, it is rather difficult to discuss the affinities of *Rybocyclops* with its allied genera, mainly because our current knowledge of the precise morphology of several species of these genera is clearly insufficient, as also stressed by Fiers (2002). The status of the genus *Bryocyclops* Kiefer, 1927 and of the genera classically considered as related has been much debated during the last several decades (from Kiefer, 1927; Lindberg, 1956; Dussart, 1982; Rocha *et al.*, 1998; Dussart & Defaye, 2001; Fiers, 2002; see also Dussart & Defaye, 2006) and is still unresolved. The genera *Bryocyclops* Kiefer, 1927 (as *Bryocyclops (Bryocyclops)* Kiefer, 1927 and *Bryocyclops (Palaeocyclops)* Monchenko, 1972), *Haplocyclops* Kiefer, 1952, *Speocyclops* Kiefer, 1937, and *Itocyclops* Reid & Ishida, 2000 show resemblances with *Rybocyclops.* All these genera have in common the following characters: antennules 11-segmented, legs 1–4 with bi-segmented rami and leg 5 bearing three setae, the inner two inserted on a small protuberance. We agree with Fiers' (2002) viewpoint that "*Haplocyclops* and *Rybocyclops* are more closely related to each other than to any other" genera mentioned above. *Rybocyclops*, however, differs from *Haplocyclops (Haplocyclops)* mainly by the following features: the absence of a spine on the internal edge of the basipodite of leg 1, the spine formula of exopods 2.2.2.2, the endopod of male leg 4 bearing four setae, the female antennule with three setae on the seventh segment, the shape and location of the seminal receptacle, and the location of the gonopores. The seminal receptacle is rounded and centrally located, which *per se* is quite characteristic of the new species, whereas it is "flattened" and located in the posterior half of the somite in *Haplocyclops* (Fiers, 2002). *Rybocyclops* shares with *Haplocyclops* the following characters*:* the presence of pseudosomite, the outer apical caudal seta inserted subterminally, the dorsal seta longer than the outermost apical furcal seta, the inner median caudal seta without breaking planes, the antenna without exopodal seta, the maxillary endopod two-segmented (the last two characters not observed in *R. pauliani*), the legs 1-3 with bisegmented rami, P5 composed of three setae (although arranged differently) and P6 of two elements. Karanovic & Ranga Reddy (2005) previously described from the same State of Andhra Pradesh a small subterranean cyclopid with remarkably reduced natatory legs, and designated it as the type species of a new subgenus of *Haplocyclops*: *Haplocyclops (Kiefercyclops).* Both *Haplocyclops (Kiefercyclops) fiersi* Karanovic & Ranga Reddy, 2005 and *R. dussarti* have 11-segmented antennules in the female, antenna without exopodal seta, and almost analogous mandible, maxillule and maxilla. They, however, distinctly differ from each other in a number of other details concerning the armature, segmentation of natatory legs, and the morphology and location of the seminal receptacle. Further findings on the representatives of *Rybocyclops* are necessary for confirming the status of its two species and also for deciphering its relationships with the allied genera, i. e. "*Bryocyclops* genera complex".

Biogeographically the new species extends the range of *Rybocyclops* from Madagascar to Asia, suggesting its Gondwanan distribution. The morphological differences observed between its two congeners might be related to their contrasting habitat conditions-- *R. pauliani* inhabiting a cave (Andranoboka cave, north of Majunga), and *R. dussarti* **sp. nov.**, a bore-well. The discovery of the new *Rybocyclops* species on the Indian subcontinent is yet another instance of a clear Gondwanan distribution of stygobitic crustaceans. Recently, a parabathynellid genus *Habrobathynella* Schminke, 1973, and a representative each of the freshwater cyclopid genus *Haplocyclops* Kiefer, 1952, and the brackish water cyclopinid genus *Allocyclopina* Kiefer, 1954, the

type species of which are also known from Madagascar, have come to light in India (Ranga Reddy, 2002, 2004b; Ranga Reddy & Schminke, 2005a; Karanovic & Ranga Reddy, 2005; Defaye & Ranga Reddy, in press). The very ancient lineage of these cyclopoid and bathynellaceans taxa would have existed before the separation of Antarctica-Australia block (at about 130 Ma) from Madagascar-India block. The separation of Madagascan and Indian blocks occurred at about 90 Ma ago. Up to that period, Madagascar was joined to greater India, its eastern margin being fused to the western margin of India (Raval & Veeraswamy, 2003). Future investigations are, therefore, quite likely to reveal a much widespread distribution of phylogenetically close stygobitic taxa on other Gondwana landmasses.

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