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A new species of *Dermoergasilus* Ho & Do, 1982 (Copepoda: Ergasilidae) from freshwater fishes in the south-west of Western Australia

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Abstract A new species of *Dermoergasilus* Ho & Do, 1982 is described from freshwater fish hosts in the south west of Western Australia. *D. occidentalis* n. sp. differs from previously described species in the genus principally by the armature of the legs. The new species was found on the gills of the freshwater cobbler *Tandanus bostocki* Whitely and western minnow *Galaxias occidentalis* Ogilby in two different river systems.

Introduction

The family Ergasilidae Nordmann, 1832 comprises 25 genera and more than 260 species of ectoparasitic copepods found principally on freshwater, brackish

and marine teleosts. Although a number of species of ergasilids have been described from Australian fishes, there are likely to be many more undescribed species (Byrnes, 1986; Kabata, 1992). This is particularly the case for freshwater environments, as the parasite fauna of Australian freshwater fishes has been very poorly studied.

As part of a parasitological survey of the parasites of freshwater fishes in the South West Coast Drainage Division of Western Australia, we found a new ergasilid species, belonging to *Dermoergasilus* Ho & Do, 1982 on two different species of fish. In this paper, we describe this new species and compare it with related species.

Materials and methods

The specimens were found on the gills of freshwater cobbler *Tandanus bostocki* Whitely, caught in the Blackwood River (34°07'S, 115°29'E), and on the gills of western minnow *Galaxias occidentalis* Ogilby, caught in the Swan River (31°56'S, 115°54'E), both sites being in the South West Coast Drainage Division of Western Australia. All specimens were preserved in 70% ethanol, stained with chlorazol black E, dissected and mounted as temporary preparations in lactophenol. Mounted specimens were observed under a Motic BA200 microscope, and measurements and illustrations were made using the software Motic Images Plus 2.0. All measurements

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are presented in micrometres as the mean, with the range in parentheses.

Descriptions are based on four specimens from the Blackwood River and four from the Swan River. These did not differ in any details of body shape or the structure of appendages, but, as they differed in size, measurements are presented separately for each population. Body terminology follows Kabata (1992), El-Rashidy & Boxshall (2001) and Montu & Boxshall (2002). The descriptions refer only to female copepods, as the males and larval stages are free-living and their morphology is not known.

Dermoergasilus occidentalis n. sp.

Type-host: *Tandanus bostocki* Whitely (Plotosidae).

Other host: *Galaxias occidentalis* Ogilby (Galaxiidae).

Type-locality: Jalbarragup, Blackwood River, Western Australia (34°07'S, 115°29'E).

Other locality: Swan River, Western Australia (31°56'S, 115°54'E).

Site: Gills

Type-material: Holotype (WAM C40042); two paratypes (WAM C40379, WAM C40380) deposited in the Western Australian Museum.

Etymology: The specific name indicates the Western Australian origin of this new species.

Description (Figs. 1, 2)

[All measurements are shown in Table 1.] Body gradually narrowed posteriorly (Fig. 1A). Cephalothorax oblong, with anterior margin rounded and posterior transversely rounded; transverse suture-like division extends across posterior half of dorsal surface and partly over lateral walls. Anterior half of dorsal surface markings shaped like inverted 'T' (Fig. 1A). Antennule and antenna visible from dorsal view (Fig. 1A). First pedigerous somite incorporated into cephalothorax. Free pedigerous somites decrease in width posteriorly (Fig. 1A). Fifth pediger fused with genital double-somite. Genital double-somite widest anteriorly, gradually decreasing posteriorly (Fig. 1B). Ventral surface of genital double-somite with coarse spinules and single straight row of spinules close to anterior margin. Abdomen with 3 free somites. Ventral surface of first abdominal

somite with single row of spinules anteriorly; second abdominal somite with single row of spinules along posterior margin (Fig. 1B). Caudal rami armed with digitiform process and 3 setae: 1 long medial seta and 2 small setae on lateral margin (Fig. 1C).

Antennule 6-segmented, tapering; formula 3:10:4:4+ae:3+ae:6+ae (Fig. 1D). Antenna 4-segmented, comprising coxobasis and 3-segmented endopod (Fig. 1E). Coxobasis short; second segment nearly 1.5 times longer than coxobasis. Third segment curved, about half length of second segment. Terminal claw strongly recurved, about 2/3 length of third segment. Antenna, except terminal claw, covered with inflated transparent membrane.

Mouthparts consist of mandible, maxilla and maxillule (Fig. 1F–H). Mandible with 2 blades anteriorly and 1 blade posteriorly. Larger anterior blade bears row of strong, curved teeth along its posterior edge. Other 2 blades with row of thin spinules on anterior margin. Maxillule with 3 setae. Maxilla 2-segmented; proximal segment large; distal segment small, spinulose.

Interpodal sternites wide and ornamented, with rows of spinules at posterior margin (Fig. 2A). Swimming legs 1–4 with rami 3-segmented, except 2-segmented exopod of leg 4. Leg armature as follows (spines—Roman numerals; setae—Arabic numerals):

	Coxa	Basis	Endopod	Exopod
Leg 1	0-0	1-0	0-1; 0-1; II, 4	I-0; 0-1; II, 5
Leg 2	0-0	1-0	0-1; 0-1; I, 4	I-0; 0-1; 6
Leg 3	0-0	1-0	0-1; 0-1; I, 4	I-0; 0-1; 6
Leg 4	0-0	1-0	0-1; 0-2; I, 3	I-0; 5;-

Leg 1 (Fig. 2B) with outer seta on posterior surface of basis and patch of spinules on inner distal surface. Both rami segments spinulate laterally; first exopodal segment pinnulate medially; outer apical spines on both rami spinulate along lateral margins. Leg 2 (Fig. 2C) with outer seta on posterior surface of basis and row of spinules on posterior margin; both rami segments spinulate laterally; first exopodal segment pinnulate medially; outer apical spine on endopodal segment spinulate along lateral margin. Leg 3 (Fig. 2D) with outer seta on posterior surface of basis and row of spinules on posterior margin; both rami segments spinulate laterally; first exopodal segment pinnulate medially; outer apical spine on

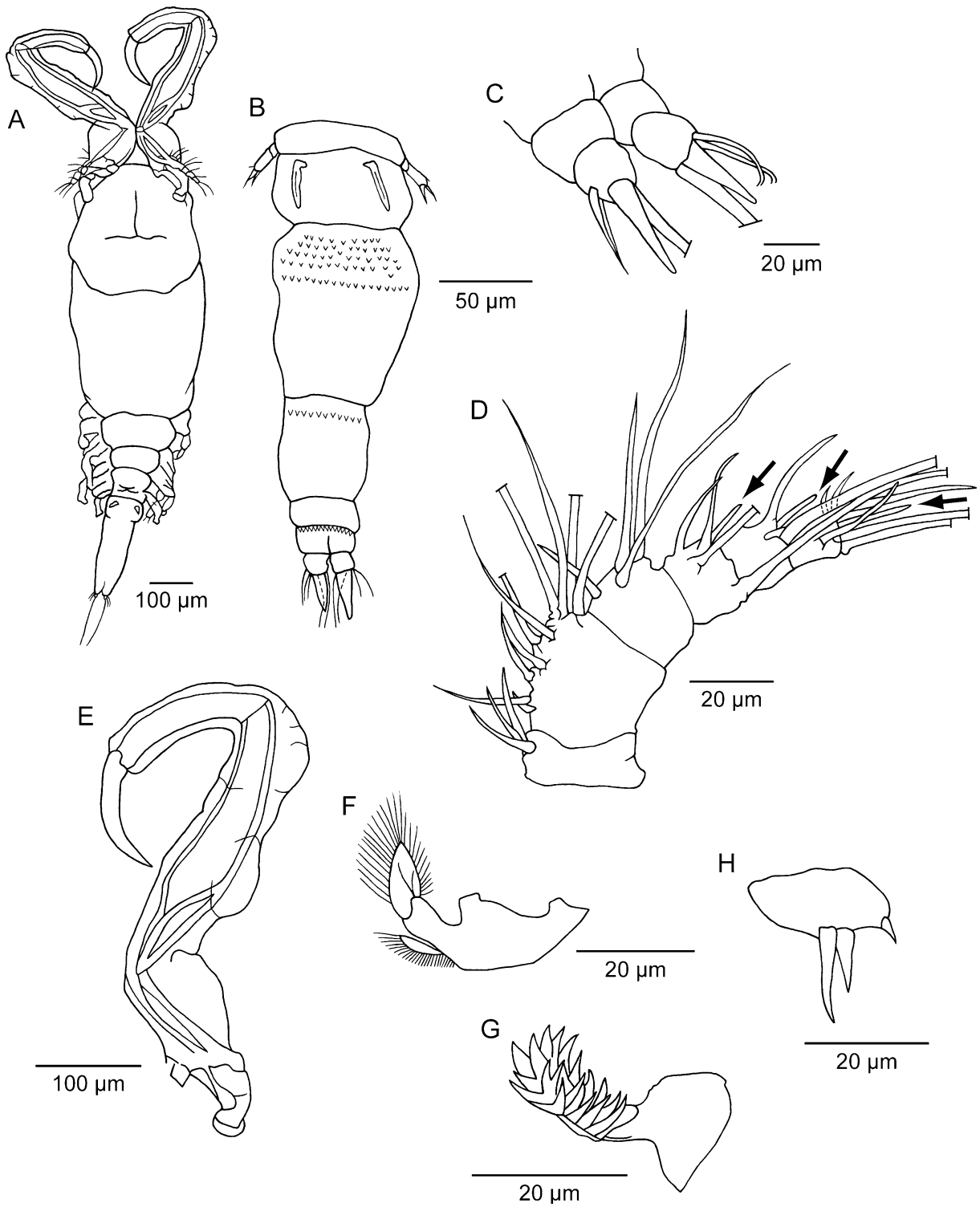


Fig. 1 *Dermoergasilus occidentalis*, n. sp., adult female: A. Dorsal view; B. Genital complex to distal end, ventral view; C. Anal somite and caudal rami, dorsal view; D. Antennule, aesthetascs arrowed; E. Antenna; F. Mouth parts: mandible; G. Mouth parts: maxilla; H. Mouthparts: maxillule

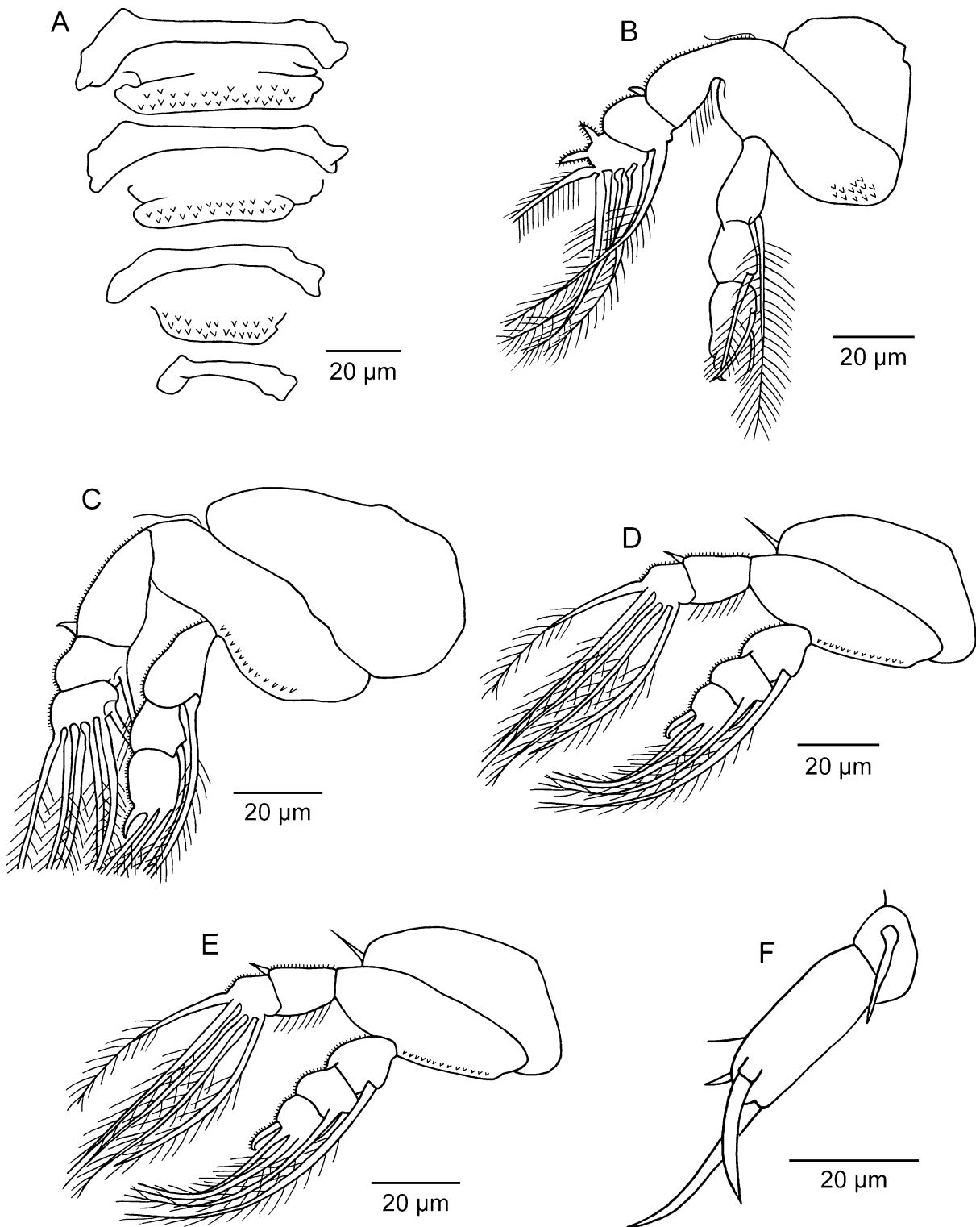


Fig. 2 *Dermoergasilus occidentalis*, n. sp., adult female: A. Interpodal sternites; B. First swimming leg, anterior; C. Second swimming leg, anterior; D. Third swimming leg, anterior; E. Fourth swimming leg, anterior; F. Fifth leg

Table 1 Measurements of specimens of *Dermoergasilus occidentalis* n. sp. from two different localities and hosts

Host Locality Character	<i>Tandanus bostocki</i> Blackwood River (n = 4)	<i>Galaxias occidentalis</i> Swan River (n = 4)
Total length (excluding antennule, antenna and setae of caudal rami)	1,118.5 (1,033–1,212)	930 (752–1,113)
Cephalothorax length	649.5 (598–708)	500 (335–640)
Width	246.5 (216–295)	238.5 (166–306)
Free pedigerous somite length	69 (51–82)	49 (32–61)
Genital double-somite length	116.5 (109–127)	115.5 (84–144)
Width	88 (85–91)	84 (74–95)
Abdominal somite I length	78 (73–82)	63.5 (32–82)
Width	65.5 (61–69)	59.5 (50–70)
Abdominal somite II length	21.5 (20–24)	17.5 (14–24)
Width	52 (38–58)	49 (39–59)
Abdominal somite III length	23.5 (22–25)	20 (15–26)
Width	44 (33–50)	22.5 (18–30)
Caudal rami length	22 (21–23)	13.5 (10–20)
Width	18 (17–19)	17 (14–19)

endopodal segment spinulate along lateral margin. Leg 4 (Fig. 2E) with outer seta on posterior surface of basis and row of spinules on posterior margin; 2-segmented exopod; both rami segments spinulate laterally; first exopodal segment pinnulate medially; outer apical spine on endopodal segment spinulate along lateral margin. Leg 5 (Fig. 2F) with 2 segments; first segment short, with seta; second segment with 2 terminal setae of unequal length and tiny spinule in between; short lateral spinule.

Discussion

Dermoergasilus was proposed by Ho & Do (1982) and, although it is regarded as of uncertain validity, it is currently retained, pending a generic level revision of the family Ergasilidae (see Kabata, 1992; El-Rashidy & Boxshall, 2001). Species of *Dermoergasilus* are found in the Indian and Indo-West Pacific regions. Ten species have been previously described from a range of host groups (Table 2). Four of these

Table 2 Species of *Dermoergasilus* previously described (based on data in El-Rashidy & Boxshall, 2001)

Species	Geographical range (all estuarine or near shore coastal)	Host range (family)
<i>D. acanthopagri</i>	Australia	Sparidae
<i>D. amplexens</i>	Australia, India, Japan, South Africa, Russia	Mugilidae, Cichlidae, Gerreidae, Hemirhamphidae, Megalopidae, Chanidae
<i>D. intermedius</i>	Australia	Clupeidae, Plotosidae, Percichthyidae
<i>D. semicoleus</i>	Australia	Belonidae
<i>D. coleus</i>	Borneo, India, Philippines, South Africa	Belonidae, Sparidae
<i>D. curtus</i>	India	Mugilidae
<i>D. longiabdominalis</i>	India, Philippines, Madagascar	Mugilidae
<i>D. mugilis</i>	South Africa	Mugilidae
<i>D. semiamplexens</i>	Burma, China, India	Mugilidae
<i>D. varicoleus</i>	India, Iraq	Mugilidae

species have been found in Australia, all from marine or estuarine hosts in coastal areas (Byrnes, 1986; Kabata, 1992). The only previous record of *Dermoergasilus* in Western Australia is *D. acanthopagri* Byrnes, 1986 from the sparid *Acanthopagrus butcheri* (Munro) (see Byrnes, 1986).

The new species of *Dermoergasilus* described in this paper is the first record in Australia of this genus on a purely freshwater host species. Specimens from the Blackwood River, found on *Tandanus bostocki*, were larger than specimens from the Swan River, found on *Galaxias occidentalis*, although they were identical in body shape and structure of the appendages. The size difference may indicate genetically differentiated populations, or may be a phenotypic response to different host species or environmental conditions.

The new species is morphologically distinct from all previously described species of *Dermoergasilus*. The armature of the exopods of legs 1–4 differentiates it from *D. amplexans* (Dogiel & Akhmerov, 1952), *D. coleus* (Cressey, 1970), *D. mugilis* Oldewage & van As, 1988 and *D. semicoleus* (Cressey, 1970); and the armature of the endopod differentiates it from *D. acanthopagri* Byrnes, 1986 (see Ho et al., 1992). In leg armature, the new species is most similar to a group formed of *D. varicoleus* Ho, Jayarajan & Radhakrishnan, 1992, *D. longiabdominalis* El-Rashidy & Boxshall, 2001, *D. semiamplexans* El-Rashidy & Boxshall, 2001 and *D. curtis* El-Rashidy & Boxshall, 2001, all of which are parasites of mugilids. The new species can be distinguished from *D. varicoleus* in the armature of the first antennule, the relative proportions of the antenna and the absence of the minute terminal spine on the digital process of the caudal ramus; from *D. longiabdominalis* by the latter's long caudal ramus seta ornamented by fine spinules, rather like a rasp;

from *D. semiamplexans* in the armature of the antennule, the relative proportions of the antenna and the relative proportions of the genital double somite and the three abdominal segments; and from *D. curtis* by the latter's hyaline inflated cuticle which is present only around the first endopod segment of the antenna (El-Rashidy & Boxshall, 2001).

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