

A new tegastid (Tegastidae: Harpacticoida: Copepoda) from southwestern Australia: *Syngastes dentipes* sp. nov.

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Abstract – In coastal waters of Western Australia, the harpacticoid family Tegastidae is represented by about two dozen species, belonging to the genera *Syngastes*, *Tegastes* and *Parategastes*. A new species, *Syngastes dentipes*, is described. The species is characterized by the enlarged maxilliped with prominent teeth on its claw.

INTRODUCTION

In the littoral meiobenthos, copepods generally are second to nematodes in abundance, and in habitats rich in coarse interstitia, they may be the most numerically important taxon. Most meiobenthic copepods are harpacticoids. Recent studies on shallow water meiobenthos at Rottnest Island, Western Australia, revealed a remarkably rich fauna. Harpacticoids were represented with a diversity of body forms which reflect a wide range of adaptations to ecological niches. The majority of species were more or less pyriform or cylindrical, with or without conspicuous spines. Others, such as the dorsoventrally flattened Porcellidiidae, were very abundant on and amongst algae on exposed or semi-exposed shore-lines, whereas the laterally compressed, amphipod-shaped Tegastidae, also members of the phytal fauna, were found in less exposed areas, generally associated with habitats rich in microcavernes.

From southern Australia, a single tegastid species (*Tegastes* sp.) was mentioned by Nicholls (1941) half a century ago. Shallow water samples, taken recently around Rottnest Island, proved the existence of almost two dozen tegastid species, with representatives of the genera *Syngastes*, *Tegastes* and *Parategastes*. Four species have been described recently (Bartsch 1993, 1994), and emendations and descriptions of other species are in preparation.

MATERIAL AND METHODS

The specimens described were collected in January 1991 off Rottnest Island, Western Australia, from a substratum including algal holdfasts, sponges and other colonial organisms at a depth of 7–10 m. Animals were extracted by washing over a 100 µm sieve. The meiofauna was preserved in ethanol.

Measurements of whole specimens were made in lactic acid. Dissected specimens were mounted in glycerine jelly. The figures were drawn using a camera lucida. The decimal system gives position of a seta, or other structure, with reference from proximal to distal end of a segment. The setal formula shows number of inner setae on the basal segment : inner setae on succeeding segment : inner, apical and outer setae on distal segment : outer setae on preceding segment : outer setae on basal segment. Filaments and denticles mean seta-like or scale-like structures not arising from a pore.

Abbreviations used in text and figures: Ae, aesthetasc; A1, first antenna (antennule); A2, second antenna; c, cavity; ca, cylindrical appendage; dd, denticles; enp, endopod; ep, epicuticular droplets; exp, exopod; lr, lamellar ridges; Md, mandible; mp, median process; mt, median tine; Mx1, first maxilla (maxillula); Mx2, second maxilla; Mxp, maxilliped; p, pore(s); pp, porosity; ps, pore from seta; pvc, posteroventral corner; P1 to P5, first to fifth leg; s, seta; sP5, setae of P5; ss, setulae; ta, tongue-like appendage.

The holotype is deposited in the Western Australian Museum, Perth (WAM), and paratypes in the WAM and the author's collection.

SYSTEMATICS

Family Syngastidae

Genus *Syngastes* Monard

Syngastes dentipes sp. nov.

Figures 1–30

Material Examined

Holotype

♀, Duck Rock off Rottnest Island, Western Australia, Australia (31°59'S, 115°32'E), sample

with algal holdfasts and sponges, sand, 7–10 m depth, 9 January 1991, coll. P.A. Hutchings (WAM 17–95).

Paratypes

Australia: Western Australia: 1 ♂ (WAM 18–95); 1 ♂ (WAM 19–95); 2 ♀, 2 ♂ (author's collection); all from type locality and date.

Diagnosis

Female 530–560 µm, male 427–458 µm. Integument uniformly and delicately punctate. Female and male with four and three free thoracic somites respectively. Female A1 five-segmented, male A1 seven-segmented. Mx2 slender, its basis seven times longer than wide. Maxillipedal endopod widened; basal appendage cylindrical, heavily sclerotised; tongue-like appendage slender. Maxillipedal claw with two rows of conspicuous teeth. P1-exp slightly smaller than endopod. P4-enp with a single seta. Female P5 with baseoendopod and exopod almost completely fused. Male P5 undivided.

Description

Female

Length 530 (holotype, Figure 1) to 560 µm, height 360 (holotype) to 365 µm. Colour of ethanol-preserved specimens light-brown. Integument of most of cephalothorax, as well as that of posterior somites, delicately punctate; in a 20–25 µm wide ventral portion fine punctation of cephalosome replaced by epicuticular droplets (Figure 2), which are arranged like beads on a string. Integument of lateral flanks of genital somite delicately reticulate rather than punctate. All somites with pores (Figure 1); pores generally opening at outer surface of somites; row of four ventralmost pores on cephalosome opening at inner flank of cephalosomal shield.

Cephalothorax 295 µm long. Ventral margin of cephalosome with about eight 4–5 µm long setulae; each setula with 10–15 µm long canaliculus penetrating the tegument. Similar setulae present also on cephalic shield and on posterior somites. Cephalothorax with two pairs of setae, one lateral, the other dorsal. Cephalothorax with internal sclerite extending dorsally for 90 µm. Succeeding four free thoracic somites 65, 90, 127, and 68 µm long. Third somite almost twice length of second and fourth free somite. First to third somite with one, two, and two setae, respectively. Delicate setulae, similar to those present along ventral margin of cephalosome, inserted 10–20 µm removed from ventral margin of epimera. Genital somite 74 µm long. Enlarged egg-reservoir with posteriormost edge extending slightly beyond anal

cone; ventral edge truncate. Postgenital somites small, not fused with genital somite.

A1 (Figure 3) five-segmented; segments 55, 57, 38, 22, and 30 µm long. Number of setae: 1, 11, 9, 4 + Ae, 16 + Ae. Seta on A1–1 as long as segment 1. Aesthetasc on A1–4 90 µm (holotype) to 110 µm long, and 4 µm wide, that on A1–5 50 µm long, 1–2 µm wide.

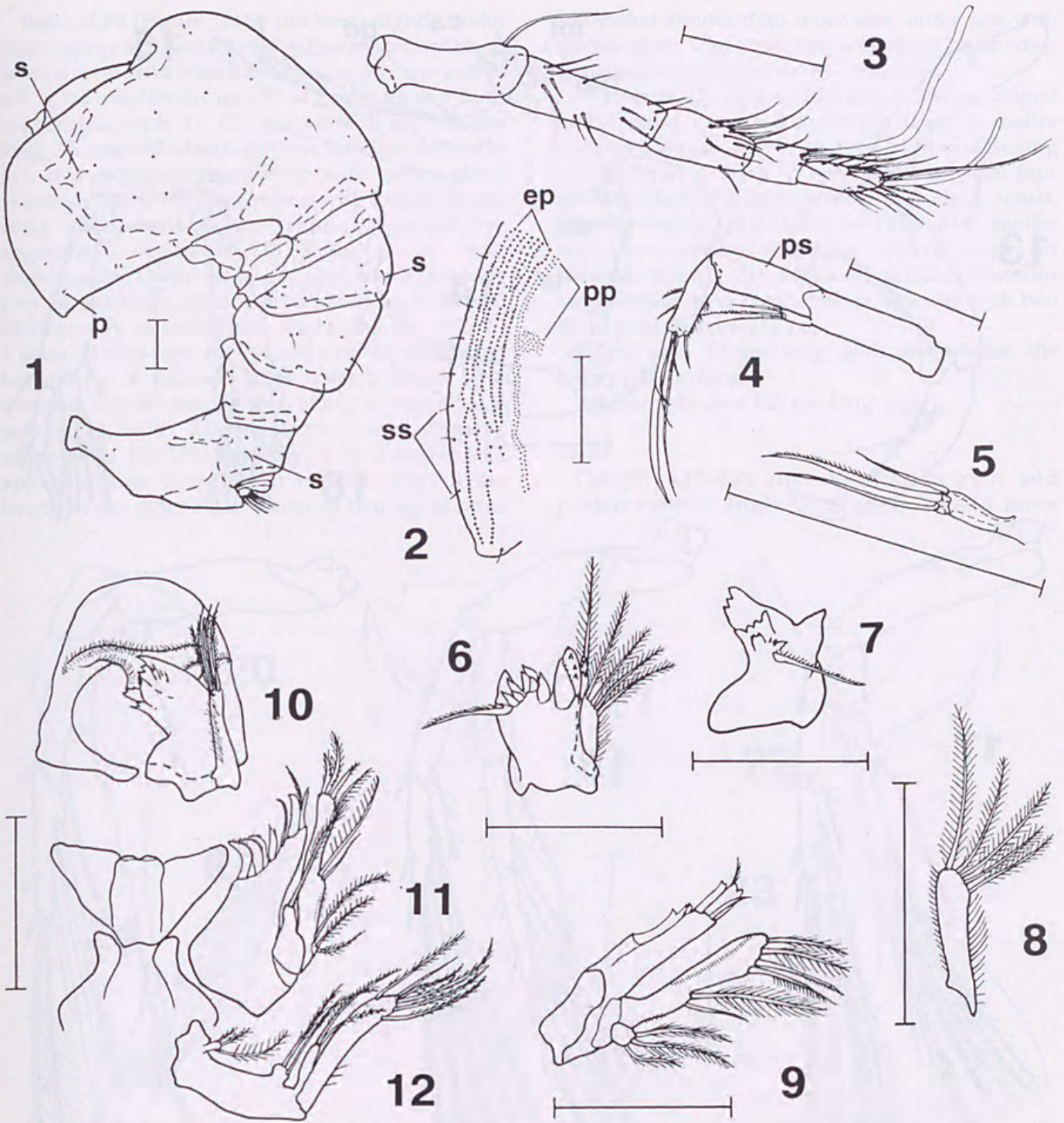
Exopod (Figures 4, 5) of A2 small, two-segmented; 11 µm long basal segment with one seta; 2 µm long apical segment with two setae, both longer than exopod, one of the setae distinctly serrate. Basal and apical segment of endopod 40 and 30 µm long. Basal segment with row of delicate filaments along posterior (ventral) margin, and a pore, but no seta, on anterior (dorsal) margin at 0.55 relative to length of segment. Apical segment posteriorly with three contiguous clusters of filaments, and anteriorly with two slightly plumose setae at 0.4 and 0.6 respectively. With six apical setae, two of which are claw-like, 25 and 60 µm long; remaining setae slender.

Mandibular gnathobase (Figures 6, 7, 10) with stout, serrate and two to three crowned teeth, and a long seta. Palp (Figure 8) undivided, flattened and ending with five bilaterally plumose setae. Edges of palp lined with filaments.

Mx1 as in male (Figure 11) with wide, flattened arthrite armed with five wide, apically serrate spines and three setae. Seta of coxa bearing two rows of filaments and extending to apex of basis. Flattened basis (Figure 9) with row of delicate filaments; four terminal setae with filaments. Two endopodal setae present, the longer one almost twice as long as the other seta and lined with filaments. Exopod with three setae, one of which is short, the two other subequal in length; all three setae with bilateral filaments.

Mx2 as in male (Figure 12) with two slender segments. Basal segment (syncoxa) 44 µm long and 12 µm wide, its posterior margin bare. Basal endite with three, middle endite with two plumose setae. Two setae on distal endite 2.0 and 2.5 times longer than endite and bearing filaments. Basis of Mx2 very slender, 42 µm long and 6 µm wide, with scattered, delicate filaments. Basis ending with setiform claw and five plumose setae.

Maxilliped subchelate, inserted on small pedestal. Maxillipedal basis (Figure 13) slender, 130 µm long. Surface of segment smooth. No filaments around medial fovea (fovea from tendon). Endopodal segment widened (Figures 14, 15); with median tooth-like projection, flattened median tine, four small lateral denticles (Figure 14), and about 35 medial denticles (Figure 15). Heavily sclerotised cylindrical appendage with spinose apex and short setula-like aesthetasc. Stalked, tongue-like appendage slender, with spinose edge and short setula. Maxillipedal claw as long as



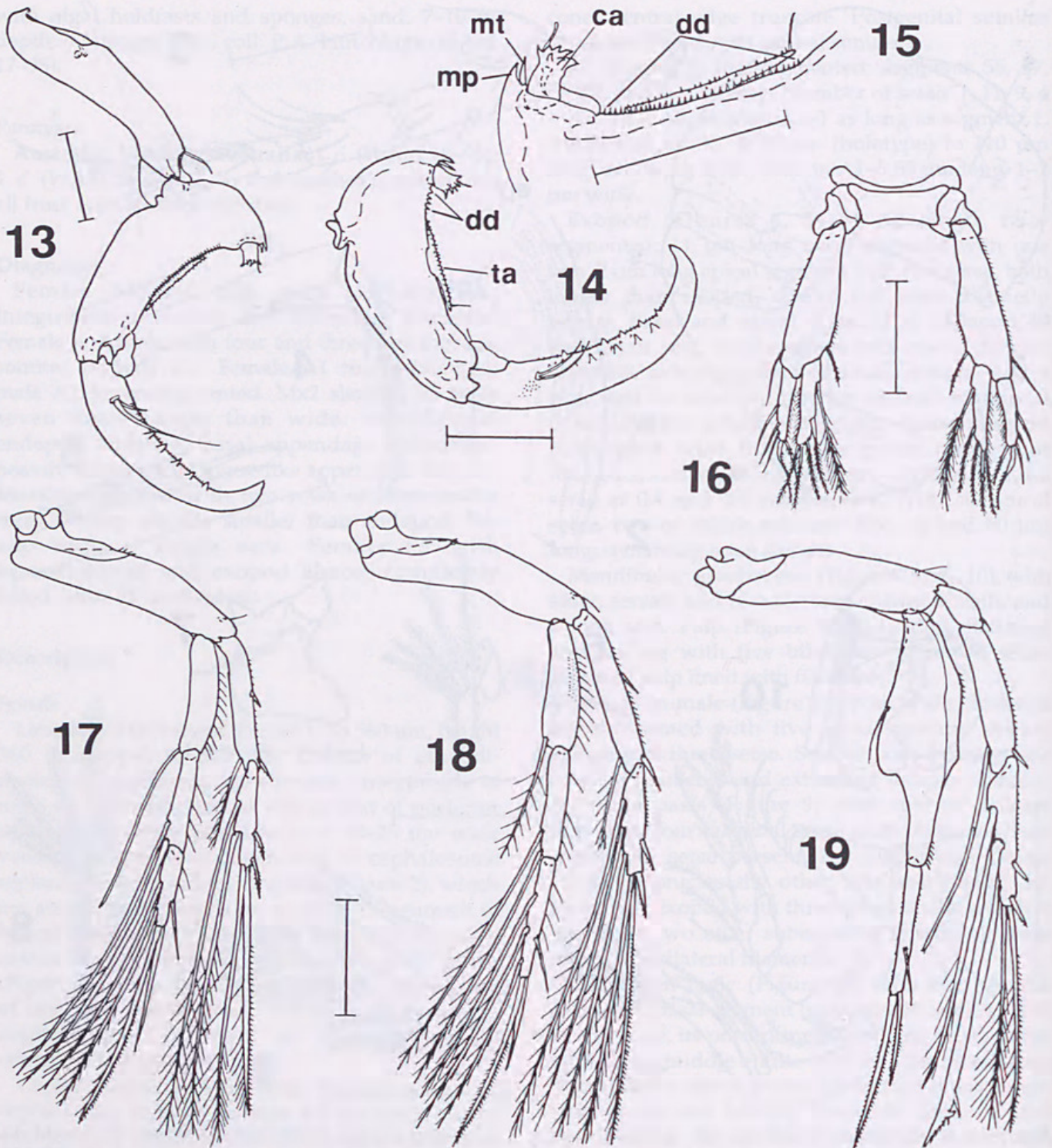
Figures 1–12 *Syngastes dentipes* sp. nov.: 1, lateral aspect, ♀; 2, ventral margin of left cephalic shield, ♀; 3, right A1, anteromedial aspect, ♀; 4, right A2, medial aspect, ♀; 5, right A2-exp, medial aspect, ♀; 6, left Md, medial aspect, ♀; 7, right mandibular gnathobase, medial aspect, ♀; 8, right mandibular palp, medial aspect, ♀; 9, right Mx1, lateral aspect, ♀ (coxa obscured by basis); 10, portion of head capsule with Md, ventral aspect, ♂; 11, portion of head capsule with Mx1, ventral and medial aspect, ♂; 12, Mx2, medial aspect, ♂. Scale lines = 50 µm.

proximal segment. Claw with two rows of conspicuous teeth; holotype female with four large and three small lateral teeth, and five or six (unilateral variation) large and two or three small medial ones. Area between series of teeth with delicate spines. Two setae on either flank of claw.

P1 as in male (Figure 16), short. Basis 2.4 longer than exopod and about twice as long as endopod.

Basis flattened; medially and laterally each with seta and line of filaments. P1-enp with basalmost, coarsely plumose inner seta inserted at 0.25 relative to length of endopod, succeeding seta at 0.7. Exopod with two serrate apical and three delicately plumose outer setae.

P2 (Figure 17) and P3 (Figure 18) similar in outline, each with short coxa, elongate basis,



Figures 13–19 *Syngastes dentipes* sp. nov.: 13, left Mxp, medial aspect, ♀; 14, right Mxp-emp, lateral aspect, ♀; 15, portion of left Mxp-emp, medial aspect, ♀; 16, pair of P1, anterior aspect, ♂; 17, left P2, anterior aspect, ♀; 18, left P3, anterior aspect, ♀; 19, left P4, anterior aspect, ♀. Scale lines = 50 µm.

slender three-segmented endopod and shorter two-segmented exopod. Coxae distally serrate. Bases with posterior seta. P2 with endopodal segments decreasing in length from 55 µm (enp1) to 35 µm (enp3). Outer edge of endopodal segments lined with filaments, edge of exp-1 with denticles. Setal formula of P2-emp, 1 : 2 : 221 : 0 : 0, of P2-exp, 1 : 222 : 2. Seta on P2-end1 hollow and extending to apex of end3, seta on exp1 shorter, bearing

filaments. Outer setae on P2-exp spiniform and finely serrate. P3-end and P3-exp with 1 : 2 : 321 : 0 : 0 and 1 : 322 : 2 setae. Endopodal segments subequal in length but decreasing in width distally. Posterior flank and outer edge of P2-emp1 lined with filaments. Outer edge of P3-end2 and end3 with filaments, edge of exopodal segments with denticles. Inner setae on enp1 and exp1 plumose and subequal in length.

Basis of P4 (Figure 19) 95 μm long, slightly wider than bases of P2 and P3 and with a posterior lamella on a level with insertion of endopod. Seta inserted at 0.8 relative to length of basis. P4-enp two-segmented, with 1 : 021 : 0 setae. Enp1 112 μm long, 35 μm wide, basal portion lamellar, widest at 0.7, then abruptly narrowing; with carina along posterior flank. P4-enp2 almost cylindrical, 60 μm long and about 6 μm wide. P4-exp three-segmented, segments 22, 67 and 62 μm long respectively. Outer edge of exp2 and exp3 with row of denticles. Suture between exp1 and exp2 distinct only on outer flank. Exp with 0 : 1 : 322 : 1 : 1 setae. Hollow seta on P4-exp2 extends somewhat beyond tip of exopod. Three inner setae on exp3 inserted almost equidistant along margin; basal seta solid, with filaments; next seta strongly sclerotised, 140-150 μm long, with harpoon-like apex; third seta very slender and less than half the length of the other setae. Outer of two apical setae

somewhat stouter than inner seta; outer seta with serrate outer edge and filaments along inner edge; inner seta with filaments on either side.

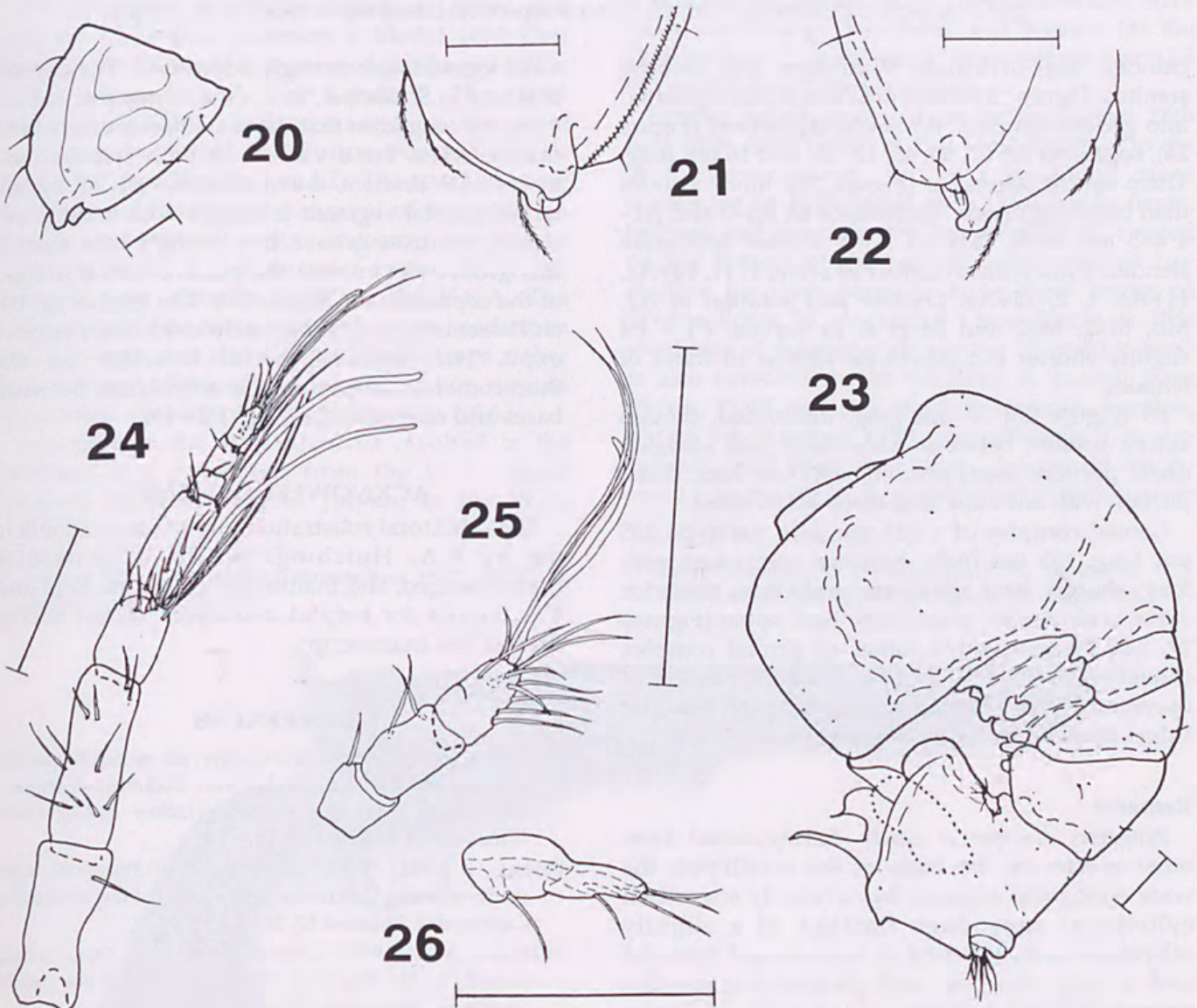
P5 (Figure 20) wide and flattened. Baseoendopod and exopod almost completely fused. Lamellar ventral margin and elongate ridge enclosing narrow groove. Area of baseoendopod with four slender, slightly plumose setae and short setula. Posterior margin of P5 with two ridge-like lamellae which enclose an elongate groove; edges of lamellae (Figure 21) delicately serrate. Posterior margin with three slender setae, apically with two small setae (Figure 22).

Furcal rami 10 μm long; with seven setae, the longest 40 μm long.

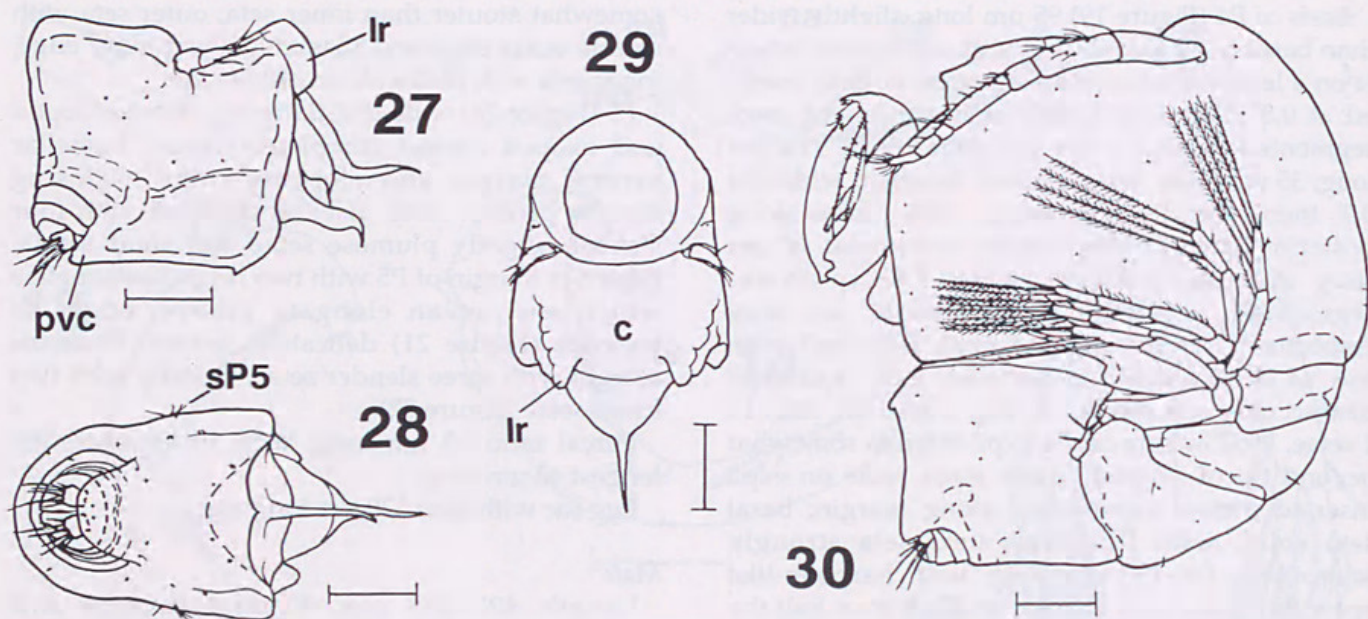
Egg sac with four 120 μm long eggs.

Male

Length 427-458 μm . Ventral margin and posteroventral angle of cephalic shield more



Figures 20-26 *Syngastes dentipes* sp. nov.: 20, left P5, lateral aspect, ♀; 21, posterior portion of right P5, medial aspect, ♀; 22, posterior portion of right P5, lateral aspect, ♀; 23, lateral aspect, ♂; 24, left A1, lateral aspect, ♂; 25, three terminal segments of right A1, lateral aspect, ♂; 26, right P5, lateral aspect, ♂. Scale lines = 50 μm .



Figures 27–30 *Syngastes dentipes* sp. nov., ♂: 27, urosome with P5, lateral aspect from right hand side; 28, urosome posterior aspect; 29, urosome with P5, anterior aspect; 30, lateral aspect. Scale lines = 50 μ m.

truncate than in female. With three free thoracic somites (Figure 23), the fourth somite incorporated into genital complex. A1 seven-segmented (Figure 24), segments 55, 62, 30, 45, 12, 15, and 16 μ m long. Three apical segments (Figure 25) more slender than basal segments. Aesthetascs on A1–3 and A1–4 4–5 μ m wide, that on A1–7 shorter and more slender, 2 μ m wide. Number of setae: 1, 11, 10+Ae, 11+Ae, 1, 2, 12+Ae. Outline and setation of A2, Md, Mx1, Mx2 and Mxp as in female. P1 – P4 slightly shorter but otherwise similar to those of females.

P5 (Figure 26) 37 μ m long, undivided, though suture present between wide basal and elongate distal portion. Basal portion with one seta, distal portion with one basal and three apical setae.

Genital complex of a 434 μ m long paratype 135 μ m long, 155 μ m high. Anterior operculum with long, sharply bent spiniform projection, posterior valve with slender posteriorly bent spine (Figures 27, 28). Posteroventral corner of genital complex extending beyond anal cone. Anterior portion of spermatophore reservoir with pair of lamellar ridges enclosing a cavity (Figure 29).

Remarks

Syngastes dentipes is easily distinguished from other species on the basis of the maxilliped: the wide endopodal segment has a heavily sclerotised cylindrical appendage (instead of a slightly sclerotised semi-spherical or bud-shaped tubercle) and a very elongate and slender tongue-like process; the claw has two rows of teeth. *S. dentipes* is not closely related to any of the species described so far, the female A1 is five-segmented, the second maxillae are very slender and P4-enp bears a single seta.

All tegastids are strongly sclerotised. The cephalic shield in *S. dentipes*, as in other *Syngastes*, is ventrally prolonged so that the maxillipeds can be hidden between these valves. In both females and males of *S. dentipes*, the ventral margin of the enlarged genital segment is armed with a ridge enclosing a narrow groove. In a strongly bent animal, this groove can enclose the posteroventral margin of the cephalosome (Figure 30). The groove on P4-end1 seems to be fitted to enclose the inner edge of exp2. The small epimeral lamellae on the thoracomeres can protect the articulation between bases and exopods of the legs P2 – P4.

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