

**A new stenothoid species related
to the taxon *Raumahara* Barnard from Australia
(Crustacea, Amphipoda, Gammaridea)**

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ABSTRACT: Benthic samplings along the southern temperate coast of Australia yielded stenothoid specimens related to the taxon *Raumahara* Barnard. *?Raumahara virduorum* sp. n. is described, illustrated, and the systematic position within the genus is discussed. *Raumahara* seems to be a non-monophyletic group, as not one synapomorphic character can be discerned that exactly fits for each member of this taxon.

INTRODUCTION

G. Hartmann and G. Hartmann-Schröder studied the littoral faunal community along the Australian coasts in 1975/76. We had the opportunity to examine the stenothoid amphipods within the genus *Raumahara* Barnard, 1972 derived from their samplings. – During a stay at the Victoria Museum, Melbourne, one of us (T. K.-S.) had the good fortune to see the rich amphipod collection there, as well as carry out additional field work in the littoral zone near Melbourne. Additional specimens found that way showed close similarity to the above mentioned material.

Although the stenothoid specimens dealt with in this paper are not clearly assignable to *Raumahara*, they are provisionally placed into this taxon because of pending changes in the generic classification within the Stenothoidae, and as a major reorganization of the genera will be attempted in the near future (T. K.-S. & G. Poore).

The new species is described and illustrated below, and its interrelationships as well as the systematics of *Raumahara* will be discussed.

MATERIAL AND METHODS

The stenothoid, *Raumahara*-like material studied partly (ca 50 specimens) derived in part from G. Hartmann's and G. Hartmann-Schröder's survey in 1975/76 on the faunal community and biogeography of the littoral polychaetes and ostracods around Australia.

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Additional material was collected by T. K.-S. (1997) near Melbourne, Victoria (1 ind.) or was found in the collection of the Victoria Museum, Melbourne (4 specimens and one partly damaged). All specimens were obtained from qualitative samples washed from algae and sediment, respectively. The localities are situated along the southern, temperate coast section from Port Lincoln to Melbourne.

The material is lodged in the Zoologisches Museum Hamburg (ZMH) and the Victoria Museum, Melbourne (VMM).

Specimens were placed in glycerin and studied first under stereo- and phase-contrast microscope in toto, then dissected and stored in Faure's medium.

The following abbreviations are used: A – antenna; art – article; EP – epimeral plate (epimeron); Gn – gnathopod; Ip – inner plate; l – left; LL – lower lip (paragnath); Md – mandible; Mdi – mandibular incisor; Mdp – mandibular palp; Mx – maxilla; Mxp – maxilliped; Op – outer plate; P – peraeopod; PR – peraeonite; r – right; T – Telson; UL – upper lip (labrum); Up – uropod; UR – urosomite.

SYSTEMATICS

Raumahara Barnard, 1972

- 1972 a *Raumahara* Barnard: 318
 1972 b *Raumahara* – Barnard: 160
 1981 *Raumahara* – Moore: 959
 1991 *Raumahara* – Barnard & Karaman: 697

Barnard & Karaman (1991) emphasized the variability within *Raumahara*, indicating the diversity in characters of generic value. And Barnard (1972 a, b, 1974) himself has already called special attention to the provisional and not phyletic concept of this taxon.

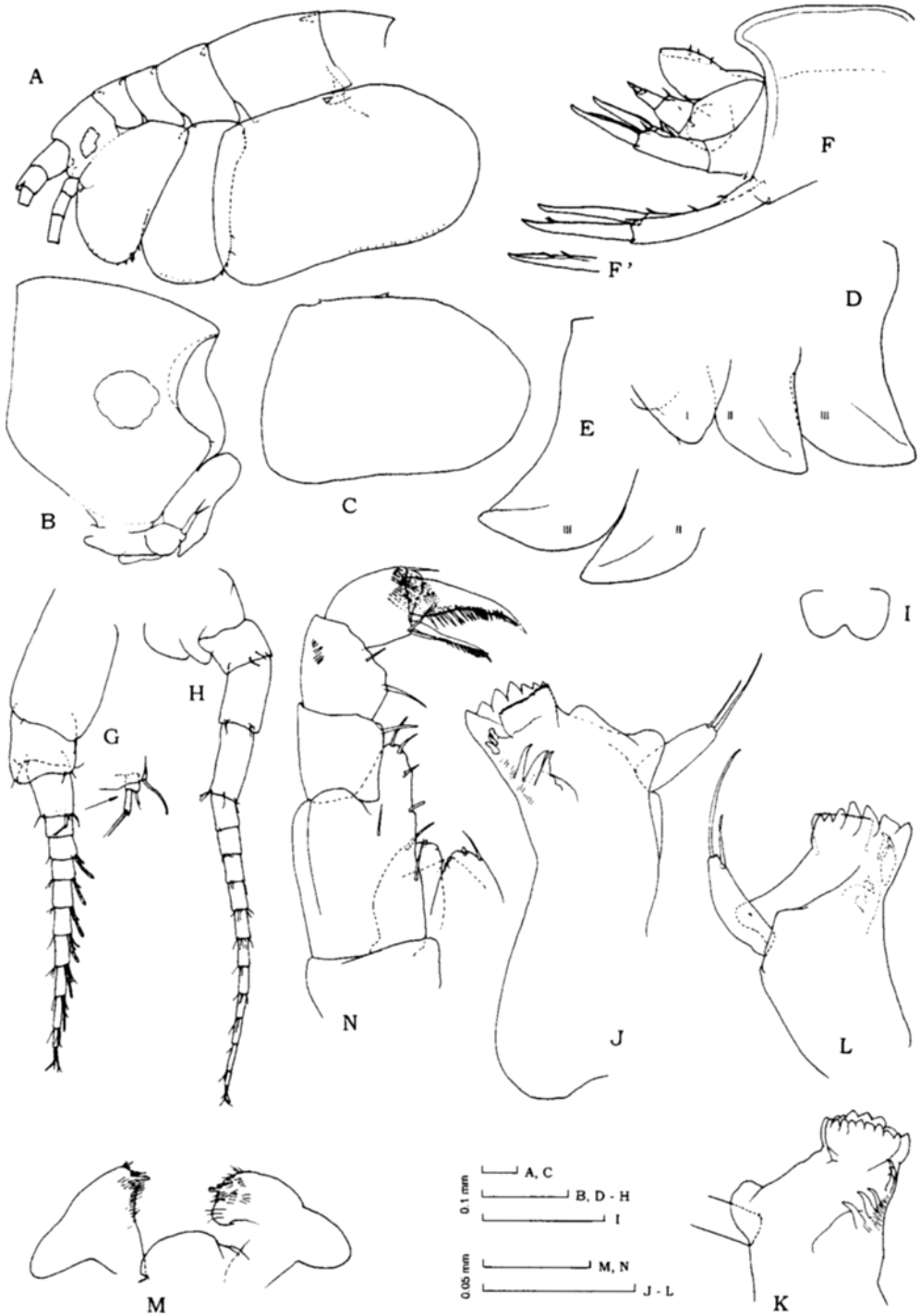
Among the currently recognized five species within the genus *Raumahara* (cf. Barnard & Karaman, 1991), *R. dertoo* Barnard, 1972 a, *R. noko* Barnard, 1974, and *R. judithae* Moore, 1981 share (1) a vaulted urosomite 1 which is strongly (*R. dertoo*) or weakly (*R. noko*, *R. judithae*) overlapping urosomite 2; (2) the scarcely produced mid-cephalic keel above the epistome; (3) one subapical seta on the inner lobe of maxilla 1; (4) a chelate gnathopod 1. – These characters delimit those species from *R. rongo* Barnard, 1972 b (vs. urosomite 1 without dorsal extension; midcephalic keel strongly produced; maxilla 1 inner plate without seta; gnathopod 1 subchelate).

The mandible palp is present with a rudimentary short article in *R. noko*, while all other species are lacking a palp, or it may not have been seen.

A biarticulate accessory flagellum is present in *R. noko* and *R. judithae*; none observed in *R. carinata* Shoemaker, 1955; in all others one article.

Beyond that, further variabilities in characteristic features are discussed by Moore (1981): mediodorsal swelling of second article of antenna 2, size of third article of antenna 2, ocular lobe, number of apical setae on outer plate of maxilla 2, the setation of the in-

Fig. 1. ?*Raumahara virdurorum* sp. n. – D-H, L, M: holotype, female, ovig., 1.6 mm. – A-C: paratype, female, 1.6 mm. – I, J, K, N: paratype, sex?, 1.8 mm. – A: habitus, fore-part (not levelled). B: cephalon with epistome (lateral view). C: coxa 4 (levelled). D: epimeral plates 1-3, left. E: epimeral plates 2 and 3, right. F: urosome (lateral view). F': uropod 3 (left), outer ramus, distal part. G: antenna 1. H: antenna 2. I: upper lip. J and L: mandible, right. K: mandible, left, incisor to molar surface. M: lower lip. N: maxilliped



ner edge of basal segment of maxillipedal palp, the flat and spinose telson in *R. rongo*, in comparison with the spoon-like curved and marginally stiffened, poorly setiferous in *R. dertoo*, *R. noko* and *R. judithae*. Moore (op. cit.) confirms Barnard's (1974) conclusion that the importance of the nasiform process on antenna 1 (then known within *Raumahara* in the species *R. noko* and *R. judithae*) has no importance in generic separation.

The species *R. dertoo*, *R. rongo*, *R. noko*, and *R. judithae* are known from the temperate South Australian regions, while *R. carinata* has an Arctic distribution (Alaska). Reinvestigation is needed (cf. Barnard, 1974: 160), if the assignment of this species to *Raumahara* is to be justified: peraeonite 4 is prominently longer than in the other species; urosomites 2 and 3 should be coalesced (vs. free); maxilla 1 palp uniarticulate (vs. biarticulate); gnathopod 1 subchelate, palma oblique (vs. chelate), and carpus strongly lobate (vs. barely or not lobate).

As acknowledged by Barnard & Karaman (1991: 684), the stenothoids are artificially separated into genera on the basis of mouthpart features, the presence of an accessory flagellum, and the breadth of article 2 of peraeopods 5–7, but little attention has been paid to the structure of gnathopods or other – not yet tried – characters. Considering this and the above mentioned mosaic of different states in phyletically important characters, the actual genus *Raumahara* may include at least three distinct groups, namely (1) *R. dertoo*, *R. noko*, *R. judithae*, (2) *R. rongo*, and (3) *R. carinata*. The significance of a mandibular palp has not been regarded herewith.

Within the first group, mainly constituted on the chelate gnathopods 1, 2 and the horizontal, spoon-like telson, *R. noko* shows a plesiomorphic state in the following characters: a biarticulate accessory flagellum; antenna 2 third article short, not inflated; a rudimental mandibular palp; four apical setae on the outer plate of maxilla 2, and a second ramus article ("heavy spine", cf. Barnard, 1974: 13) on uropod 3. *R. noko* has in common with *R. judithae* the biarticulate accessory flagellum, and also the dorsally produced second article of antenna 1 (an apomorphic character). Further apomorphic character states in *R. judithae* are the reduced number of apical setae (three) on maxilla 2 outer plate, and above all the two-articulate uropod 3 (cf. Moore, 1981). *R. dertoo*, too, shows apomorphic character states on these appendages: two apical setae on outer plate of maxilla 2, and on uropod 3 only a seta instead of a second ramus article.

Within the typical "thaumatelsonins", *Raumahara* differs prominently in having a horizontally inserted telson and almost no modification of the urosome (cf. Barnard, 1972 b: 160). Concerning that character complex, *Raumahara* shows resemblance to *Pseudothaumatelson* Schellenberg, 1931 as well as to *Thaumatelsonella* Rauschert & Andres, 1991, indicated by the dorsal extension of urosomite 1, the spade-like, horizontal telson, and normal uropods. The two genera, however, are discriminated by subchelate gnathopods and the presence of a fully developed mandibular palp. There is also a close similarity to *Prothaumatelson* Schellenberg, 1931 concerning the gnathopods in *R. rongo*, but there are differences in the accessory flagellum (absent in *Prothaumatelson*), urosomites (urosomites 2 and 3 referred to be coalesced in *Prothaumatelson*, free in *Raumahara*), and

Fig. 2. ?*Raumahara virdurorum* sp. n. – B, D–H: holotype, female, ovig., 1.6 mm. – J: paratype, female, 1.6 mm. – A, C: paratype, sex?, 1.8 mm. – A: maxilla 1. B: maxilla 1, outer plate, distal part. C: maxilla 2. D: gnathopod 1. E: gnathopod 2. F: peraeopod 3. G: peraeopod 5. H: peraeopod 7. I: telson



telson (in *Prothaumatelson* vertically inserted, laterally compressed, and huge, lateral surface area equal to lateral area of urosome fide Barnard & Karaman, 1991: 697).

Though *Chucullba* Barnard, 1974 resembles *Raumahara* in the dorsally extended urosomite 1 and in the horizontal and spoon-like telson, an obvious distinction between these genera is to be seen in the slender, subchelate gnathopods of the former (vs. chelate), the strongly reduced uropod 3, and the prolongation of antenna 1 on first article (if present) and not on second article.

?Raumahara virdurorum sp. n. (Figs 1 and 2)

Holotype: female, ovig. 1.6 mm; 3rd Dec. 1975. – ZMH K 38388; G. Hartmann & G. Hartmann-Schröder leg.

Type locality: South Australia, Steatford Bay, about 20 km to the south of Port Lincoln. – Australian Collection – G. Hartmann & G. Hartmann-Schröder 1975/76; Sta. 124.

Paratypes: 41 complete and some incomplete ind., 3rd Dec. 1975. – ZMH K 38389; G. Hartmann & G. Hartmann-Schröder leg. – Locality as for holotype.

Additional material: Australian Collection – G. Hartmann & G. Hartmann-Schröder: – 4 ind., 24th Dec. 1975, Sta. 143, Geelong, Pt. Lonsdale, on abrasion terrace ahead of the lighthouse; ZMH K 38390.

Collection T. Krapp-Schickel: 5 ind., some incomplete. – Localities: Australia, Victoria, Cape Otway, W of Melbourne (4 ind.), and Port Philipp, S of Melbourne (1 ind.). Intertidal zone, wash of algae (Rhodophyceae, coralline, and epiphytes).

Etymology: The specific name *virdurorum* is dedicated to the couple Dr. habil. Gesa Hartmann-Schröder and Prof. Dr. Dr. h.c. Gerd Hartmann, who collected abundant amphipod material, notwithstanding their interest in other very different groups. The specific name *virdurorum* refers to the scientists' latinized surname "Hartmann": *vir* = Mann (Engl. = man), *durus* = hart (Engl. = hard), the genitive case denoting that the material belonged to the "Hartmann collection".

Diagnose: Antenna 1 second article with nasiform process; mandible palp present, unarticulate; gnathopod 1 subchelate, palm transverse; gnathopod 2 propodoche-late, forcipate, dactylus about 1/3 length of total propodus; urosomite 1 vaulting over urosomite 2; uropod 3 ramus biarticulate; telson spoon-like, horizontally inserted.

Description: Holotype, female, 1.6 mm (variations of different specimens in brackets): Body smooth. Peraeonite 4 about as long as PR 1+2+3 [in ad.; in juv. PR 2+3]. Urosomites 1–3 free. UR 3 with dorsal hump vaulting over UR 2. – Head about as long as PR 1+2. Rostrum inconspicuous. Eyes: of stenothoid shape, normal. Lateral cephalic lobes shortly produced, rounded. Subantennal sinus not present. Mid-cephalic keel developed, strongly produced, rounded, separated from regularly rounded epistome by narrow groove. – Epimeral plate 2 more extensively produced posterodistally than EP 3.

Antenna 1 and 2 subequal. – **Antenna 1** longer than head+PR 1+2 (dorsal length). Peduncular art 1 and 3 without process, art 2 with nasiform process dorsomedially [extension depending on age, from scarcely longer than ventrally to reaching half art 3]. Length ratios of peduncular art 1:2:3 = 7:3:3. Accessory flagellum short, biarticulate; art 2 much narrower than basal art; art 1 with one seta, art 2 with two terminal setae. Flagellum subequal to peduncle, [7] 9 art, aesthetascs present. – **Antenna 2:** shape of peduncular art 3 subquadrate; art 4 and 5 subequal. Flagellum subequal to peduncle, [7] 11 art. Aesthetascs lacking.

Mouthparts. – **Upper lip** ventrally notched, lobes rounded. – **Mandible:** MdI well developed, with broad cusps. Lacinia mobilis on Md I broad, with major incisions,

on Md r finely serrated. Raker (spine row) developed, 3 [4?] short spines, dentated terminally. Molar hump with 3 robust spines. Palp clearly developed, uniaarticulate, about same length as Mdi, two setae apically. – Lower lip: inner lobes coalesced; mandibular lobes well developed. – Maxilla 1: Ip one subapical seta. Op mediodistally setose, apically armed with 4 serrated, robust spines, 1 stout, simple spine, and 1 thin, short and stiff one. Palp biarticulate, length ratios 2:5 [or 3:5, depending on contusion of slide], extending beyond Op, with spines and teeth medio-apically. – Maxilla 2: plates tandem-grouped. Op extending Ip, apically 4-5 setae, 1 on outer margin. Ip with 2 long apical setae, on inner margin 2 shorter, stiff ones mediodistally. – Maxilliped: Ip reaching half ischium, 1 seta and 1 spine tooth apically. Op extending 50-75 % merus (= palp art 1); 2 setae apically, [0] 3 medially. Palp 4-articulate; length of merus to propodus subequal; art 3 (propodus) narrower than art 2; propodus distally furry; inner margin of dactylus strongly combed.

Gnathopod 1 subchelate, shorter than Gn 2. Coxa reduced, subquadrate, covered by Coxa 2. Basis weakly channelled distoanteriorly with translucent lobe. Merus rounded posterodistally, about as long as triangular carpus, which is slightly produced between merus and propodus. Propodus rectangular, anterior margin slightly convex with two setae, posterior margin concave; length:breadth about 2:1. Palm transverse, finely pectinate proximally, distally serrated, additionally armed with lateral and medial spines; palmar corner defined by a pair of robust spines. Dactylus as long as palm; inner margin finely pectinate and armed with spines. – Gnathopod 2 propodochelate, forcipate. Coxa expanded, longer than basis, anterior margin regularly convex, posterior one nearly straight, ventrally rounded; posterior and posteroventral margin with isolated spines. Ischium longer than merus. Carpus subtriangular; lobe with dense, short setae, distoapically 2 longer ones. Propodus slender, length ratio of dactylus : total propodus = 33 %, terminally a hooked cusp and notch, defined by one pair of spines; palm armed with small spines. Dactylus also terminally hooked, matching well with the propodal notch; inner margin with small spines.

Peraeopods 3 and 4 slender, subequal, but carpus in P 4 longer. Dactylus about half propodus length, hind margin with prominent setal comb outside and inside. Coxa 3 more than twice as deep as broad; postero-distally some spines. Coxa 4 dominant; wider than deep [getting wider with age]; front margin slightly convex, ventral margin very slightly concave [or straight], posterior margin strongly convex; depth anteriorly and posteriorly subequal.

Peraeopods 5 to 7 slender, length ratios of corresponding art only slightly different [ratio basis : propodus in smaller specimens about 1.3, in large ones up to 2.0]. Coxa 5 to 7 short. Coxa 5 trapeziform, weakly produced posteriorly. Coxa 6 oblong, roundly produced posteriorly. Coxa 7 blunt. Dactylus with prominent setal comb on anterior margin outside and inside.

Gills and oostegites on P 2 to P 5 (in P 6 and P 7 not found).

Uropods 1 to 3 extending less far caudad in succession. – Uropod 1: peduncle longer than subequal rami [peduncle subequal to subequal rami], peduncle scarcely spinose dorsolaterally and -medially; only outer ramus (the longer extending and more distally inserted one) with two spines [one]; both rami dorsolaterally and -medially very finely pectinate. – Uropod 2: peduncle as long as outer ramus; inner ramus a little shorter than outer ramus, inserted more proximally; both rami with same fine pectination

as Up 1. – Uropod 3: peduncle + ramus about as long as peduncle of Up 2; peduncle sub-equal to biarticulate ramus, apicodorsally one stiff seta; art 1 longer than art 2, one seta terminally; art 2 strong, like a nail ("heavy spine" after Barnard).

Telson reaching end of Up 3 ramus art 1, longer than twice the breadth (if measured from the very basal part, which is situated under the vaulted UR 1 and fused with UR 3 medially; see figs), distad tapering, apex rounded, spoon-like, dorsolaterally and basally sclerotic clasps, poorly setiferous.

Geographical distribution: Southern Australia, from Port Lincoln (South Australia, W of Adelaide) to Cape Otway (Victoria, W of Melbourne).

Ecology: Intertidal, wash of algae (mostly Rhodophyceae including coralline and epiphytes).

Remarks: The discovered *Raumahara*-like species resembles conspicuously *R. rongo* (group 2) in the subchelate gnathopod 1, the produced mid-cephalic keel and the well developed, spiniform article 2 of uropod 3. Differences in the new species *Raumahara virdurorum*, however, are the presence of a mandibular palp, a spoon-like, barely setiferous telson, the dorsocaudal process on urosomite 1, the dorsal process on antenna 1 article 2 and the biarticulate accessory flagellum. *R. rongo* is further discriminated by the following apomorphic characters: maxilla 1 inner plate smooth, the single subapical seta is lacking; more slender outer plate in maxilla 2, bearing only two apical setae.

While some characters of *Pseudothamatelson* and *Thamatelsonella*, e. g. the mandibular palp, dorsocaudal process on urosomite 1, spade-like, poorly setiferous telson and normal uropods, show resemblances to the specimens studied, they are clearly distinguished by the chelate gnathopod 2.

Barnard's statement (1974: 112) on the phyletic situation in *Raumahara* genus is still valid "... perhaps several genera will be found within *Raumahara*, but presently any division seems unwise as several more southern species may be found and certain other problems arise."

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