

A review of the *Metacrangon jacqueti* group, with descriptions of two new species (Decapoda, Caridea, Crangonidae)

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ABSTRACT

The species of the *jacqueti* group of the crangonid genus *Metacrangon* Zarenkov, 1965 are reviewed. A total of eight species, including two new species, are recognized. *Metacrangon jacqueti* (A. Milne Edwards, 1881), *M. agassizii* (Smith, 1882) and *M. bellmarleyi* (Stebbing, 1914) are given full specific status. The taxonomic status of *M. knoxi* (Yaldwyn, 1960), *M. ochotensis* (Kobjakova, 1955) and *M. procax* (Faxon, 1893) is made clearer by an examination of the types. *Crago lomae* Schmitt, 1921 is synonymized with *M. procax*. Two new species, *M. crosnieri* from Madagascar and *M. similis* from Japan, are described and illustrated. Specimens from north-west Africa remain undeterminable, and are referred to *M. aff. bellmarleyi*. Distribution of the species is briefly discussed.

KEY WORDS

Crustacea,
Caridea,
Crangonidae,
Metacrangon,
jacqueti group,
Madagascar,
Japan.

RÉSUMÉ

Les espèces du groupe *jacqueti* du genre *Metacrangon* Zarenkov, 1965 (Crangonidae) sont révisées. Huit espèces, dont deux nouvelles, sont reconnues. *Metacrangon jacqueti* (A. Milne Edwards, 1881), *M. agassizii* (Smith, 1882) et *M. bellmarleyi* (Stebbing, 1914) sont considérées comme des espèces à part entière. Le statut taxonomique de *M. knoxi* (Yaldwyn, 1960), *M. ochotensis* (Kobjakova, 1955) et *M. procax* (Faxon, 1893) est précisé grâce à l'examen des types. *Crago lomae* Schmitt, 1921 est mis en synonymie avec *M. procax*. Deux espèces nouvelles, *M. crosnieri*, de Madagascar, et *M. similis*, du Japon, sont décrites et illustrées. Des spécimens provenant du nord-ouest de l'Afrique n'ont pu être identifiés de façon satisfaisante, et sont cités ici comme *M. aff. bellmarleyi*. La distribution des espèces est brièvement discutée.

MOTS CLÉS

Crustacea,
Caridea,
Crangonidae,
Metacrangon,
groupe *jacqueti*,
Madagascar,
Japon.

INTRODUCTION

Seven described taxa of the genus *Metacrangon* Zarenkov, 1965, i.e., *M. jacqueti* (A. Milne Edwards, 1881), *M. agassizii* (Smith, 1882), *M. procax* (Faxon, 1893), *M. bellmarleyi* (Stebbing, 1914), *M. lomae* (Schmitt, 1921), *M. ochotensis* (Kobjakova, 1955) and *M. knoxi* (Yaldwyn, 1960), form a distinct group within the genus *Metacrangon* in having the anterior median spine of the carapace strongly developed and arising from anterior to or slightly posterior to the level of the posterior margin of the orbit and thus, at least partially, overhanging the rostrum dorsally, and in having the first to third abdominal pleura each armed with a ventral tooth or projection. An undetermined *Metacrangon* from Japan, reported by Toriyama *et al.* (1990), is also referable to this group. These species display a scattered or rather restricted distributional pattern in the world's oceans. Yaldwyn (1960) recognized an informal species group for these species within *Sclerocrangon* s.l. at that time, although he omitted *M. lomae* and incorrectly included *M. acclivis* (Rathbun, 1902). The latter species is excluded from the group because it lacks a pleural ventral tooth on each of the first to third abdominal somites. I here call this species group the "*jacqueti* group" of *Metacrangon*.

The taxonomic status of some members of the group has been subject to disagreement. Kemp (1910) considered that *M. agassizii* was synonymous with *M. jacqueti*. Crosnier & Forest (1973) compared three Atlantic taxa and proposed subspecific status for them, i.e., *M. jacqueti jacqueti*, *M. j. agassizii* and *M. j. bellmarleyi*. Two taxa from the Pacific, i.e. *M. ochotensis* and *M. knoxi*, have been represented by only the type material. As differences among the previously described taxa were apparently slight or poorly understood, no evaluations could be made until morphological diversity in this group was adequately understood. Dr. Alain Crosnier of the Institut français de Recherche scientifique pour le Développement en Coopération, Paris, kindly provided me with two specimens belonging to this group from Madagascar for study. Further material from Japan, including the specimens reported by

Toriyama *et al.* (1990), has been accumulated by me. In order to evaluate adequately the taxonomic status of the previously described taxa and of the newly obtained specimens from Madagascar and Japan, I reviewed all described species of the group, based on the type or topotypic materials. Comparative study of the present material revealed that the following characters are useful for species recognition, though intraspecific variations or artificial factor may diminish the diagnostic value of some of them: overall body size; extension and position of the anterior median spine on the carapace; position of the posterior median spine on the carapace; development of the median carina on the third and fourth abdominal somites; stoutness of the ocular peduncle; pigmentation of the eyes; development of the antennular stylocerite; proportion of the intermediate segment of the antennular peduncle; proportion of the antennal scaphocerite; degree of extension of the distolateral tooth of the scaphocerite; configuration of the lateral margin of the scaphocerite; and pilosity of the ambulatory dactyls. As a result, the following previously described taxa are recognized as distinct species: *M. jacqueti*, *M. agassizii*, *M. bellmarleyi*, *M. procax*, *M. ochotensis* and *M. knoxi*; *M. lomae* is synonymized with *M. procax*. Two new species, *M. crosnieri* from Madagascar and *M. similis* from Japan, are described. This increases the number of species in the *jacqueti* group to eight. Other than the usual sexual dimorphism of the pleopods and the antennular flagella of males being much thicker and composed of more numerous articles, marked polymorphism is found between those at the spawning molt and those not. The body of males and young females are generally more slender and have the sculpture and armament on the carapace and abdomen more developed. Adult females are more robust; when they molt for spawning their abdominal sternites and pleura (particularly those of the second somite) are distinctly broadened, the pleopods become heavily setose, the posterior two thoracic sternites are widened and depressed, and the median carina and median teeth on the sternites are reduced (the posterior three median teeth in particular are completely reduced). Additionally, scaphocerite and ambulatory pereopods

Pods may be generally more slender in males than in females. The appendices masculinae of the second pleopod are similar in the five species (i.e. *M. agassizii*, *M. bellmarleyi*, *M. jacqueti*, *M. knoxi*, and *M. similis* n.sp.) of which males have been available for examination, bearing numerous long spines (Fig. 12C). Interestingly, in *M. bellmarleyi*, the development of the median carina on the third and fourth abdominal somites is sexually dimorphic: in males, the median carina is conspicuous, while in females it is absent or only appears as a trace.

CM	Canterbury Museum, Christchurch, New Zealand;
MNHN	Muséum national d'Histoire naturelle, Paris;
NHM	Natural History Museum, London;
NNFRI	Nansei National Fisheries Research Institute, Kochi, Japan;
SAM	South African Museum, Cape Town;
NSMT	National Science Museum, Tokyo;
USNM	National Museum of Natural History, Smithsonian Institution, Washington D. C.;
ZI	Zoological Institute, Akademie Nauk, Saint Petersburg.

MATERIALS AND METHODS

Specimens examined in this study are deposited in the institutions indicated by the following abbreviations:

CBM	Natural History Museum and Institute, Chiba, Japan;
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In the following account, species are arranged alphabetically. In order to avoid needless repetition, diagnoses are given for all species except; *Metacrangon crosnieri* n.sp., which is fully described. Postorbital carapace length (CI) is used as the standard measurement. The drawings were made with the aid of a drawing tube mounted on an Olympus SZH or Leica MZ 8 stereo-microscope.

KEY TO SPECIES OF THE *jacqueti* GROUP OF *Metacrangon* (ADULT FEMALES)

- 1. Rostrum extending as far as branchiostegal spines of carapace; anterior median spine on carapace arising from distinctly anterior to level of posterior margin of orbit; dactyls of fourth and fifth pereopods not setose *M. knoxi*
[New Zealand: Chatham Rise]
- Rostrum not extending as far as branchiostegal spines of carapace; anterior median spine on carapace arising slightly anterior or posterior to level of posterior margin of orbit; dactyls of fourth and fifth pereopods setose 2
- 2. Median carina on third and fourth abdominal somites conspicuous 3
- Median carina on third and fourth abdominal somites absent or only showing a trace 6
- 3. Scaphocerite considerably reduced, less than 0.4 times as long as carapace [anterior median spine on carapace arising posterior to level of posterior margin of orbit, strongly ascending, falling far short of rostral tip] *M. procax*
[Eastern Pacific: California to Peru]
- Scaphocerite normally developed, more than 0.4 times as long as carapace 4
- 4. Scaphocerite with distolateral tooth separated from blade by deep notch, but not

- reaching distal margin of blade; antennule with stylocerite falling far short of distal margin of proximal segment of peduncle *M. ochotensis*
[North Pacific; southern Kurile Islands]
- Scaphocerite with distolateral tooth separated from blade by relatively shallow notch, overreaching distal margin of blade; antennule with stylocerite nearly reaching distal margin of proximal segment of peduncle 5
5. Anterior median spine on carapace arising anterior to or just level of posterior margin of orbit; eye with cornea relatively small; scaphocerite 2.0-2.4 times longer than wide *M. agassizii*
[Northwestern Atlantic: East coast of Canada and eastern United States; Suriname and French Guiana]
- Anterior median spine on carapace arising from posterior to level of posterior margin of orbit; eye with cornea relatively large; scaphocerite 2.5-2.9 times longer than wide *M. similis* n.sp.
[North-western Pacific: Japan]
6. Scaphocerite less than 2.7 times longer than wide; ocular peduncle about 1.4 times longer than corneal width; cornea of eye usually darkly pigmented; relatively small species, carapace length less than 10.0 mm *M. jacqueti*
[North-eastern Atlantic: British Isles; Bay of Biscay]
- Scaphocerite more than 2.7 times longer than wide; ocular peduncle 1.7-2.1 times longer than corneal width; eye poorly pigmented; relatively large, carapace length reaching over 10 mm 7
7. Posterior median spine on carapace arising from 0.60-0.65 length of carapace
..... *M. bellmarleyi*
[Southeastern Atlantic and South Indian Ocean: North to South Africa]
- Posterior median spine on carapace arising from 0.42-0.52 length of carapace
..... *M. crosnieri* n.sp.
[Western Indian Ocean: Madagascar]

SYSTEMATIC ACCOUNT

Family CRANGONIDAE

Genus *Metacrangon* Zarenkov, 1965***Metacrangon agassizii*** (Smith, 1882)
(Figs 1A, 2)

Ceraphilus Agassizii Smith, 1882: 32, pl. 7, figs 4, 4a, 5, 5a [type locality: the Blake series came from five stations off the East coast of North America: stn 317, 31°57.0'N - 78°18.35'W, 599 m; stn 326, 33°42.15'N - 76°0.50'W, 835 m; stn 329,

34°39.40'N - 75°14.40'W, 1085 m; stn 332, 35°45.30'N - 74°48.0'W, 473 m; off Block Island, 39°46'N - 71°10'W, 900 m]; 1884: 362.

Sclerocrangon Agassizii - Smith 1886: 189, 192, 194, 198; 1887: 652.

Crangon (Sclerocrangon) agassizi - Ortmann 1895: 179.

Sclerocrangon agassizii - Faxon 1895: 135, 136.

Metacrangon jacqueti ssp. *agassizi* - Crosnier & Forest 1973: 233, figs 74b, 75a, 76c.

Metacrangon jacqueti - Crosnier & Forest 1973: fig. 77b.

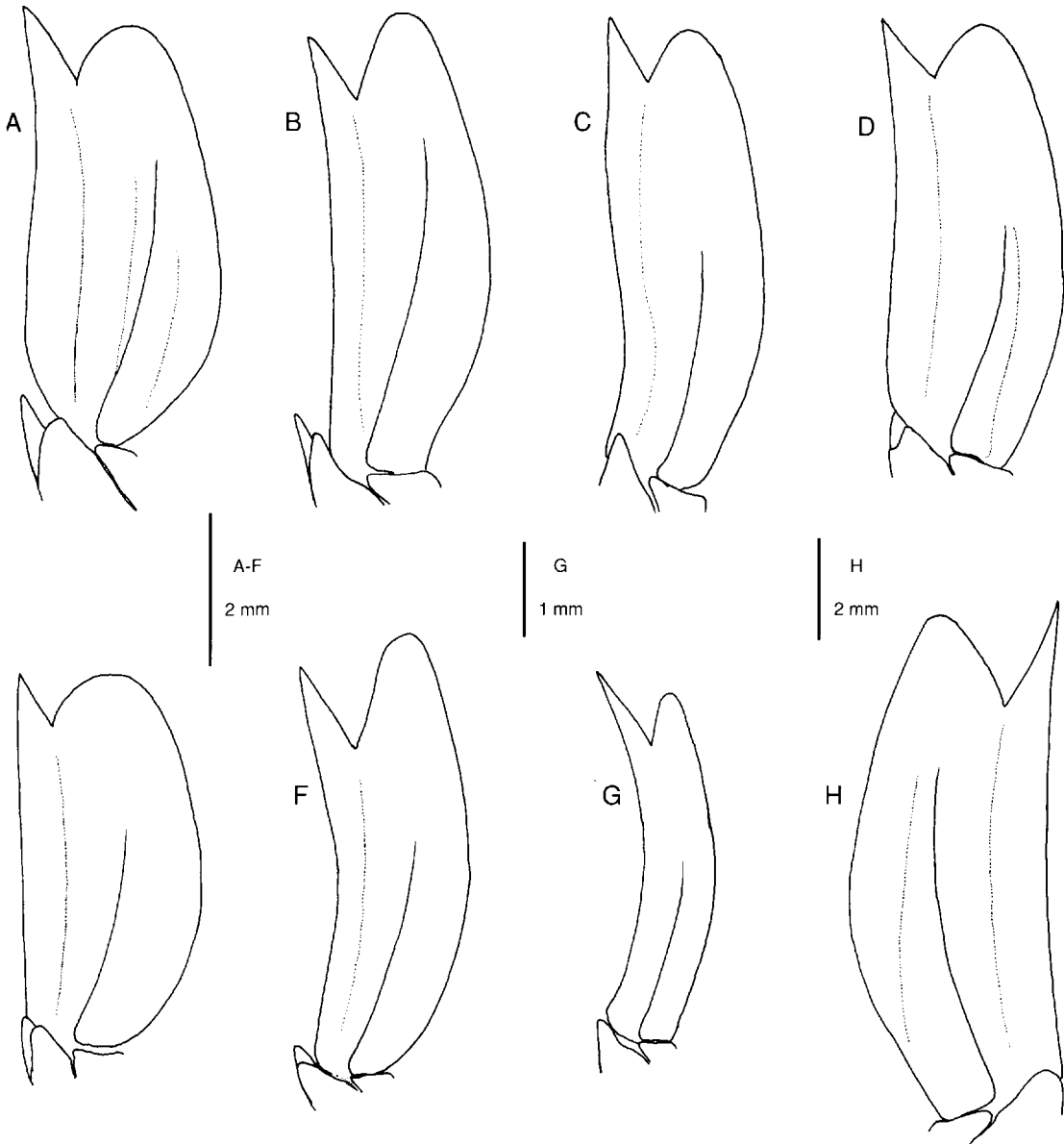


FIG. 1. — Semidiagrammatic figure of scaphocerites of the *jacqueti* group of *Metacrangon*, dorsal view. **A**, *Metacrangon agassizii* (Smith, 1882), ♀, CL 12.1 mm, East coast of North America, USNM 21003; **B**, *Metacrangon bellmarleyi* (Stebbing, 1914), ♀, CL 13.0 mm, off Saldanha, South Africa, SAM 10446; **C**, *Metacrangon crosnieri* n.sp., holotype ♀, CL 12.2 mm, Madagascar, MNHN Na 13277; **D**, *Metacrangon jacqueti* (A. Milne Edwards, 1881), ovigerous ♀, CL 9.0 mm, Ireland, NHM 1911.11.8:1246-1249; **E**, *Metacrangon knoxi* (Yaldwyn, 1960), paratype ♀, CL 10.8 mm, Chatham Rise, CM AQ1228; **F**, *Metacrangon ochotensis* (Kobjakova, 1955), holotype ♀, CL 11.5 mm, Ekateriny Strait, southern Kurile Islands, ZI No. 48793; **G**, *Metacrangon procax* (Faxon, 1893), syntype ♀, CL 16.6 mm, Gulf of California, USNM 21093; **H**, *Metacrangon similis* n.sp., holotype ♀, CL 12.6 mm, off Owase, Japan, CBM-ZC 3250.

Metacrangon agassizii -Takeda & Okutani 1983: 70, fig.

Metacrangon jacqueti agassizi - Squires 1990: 272, figs 148, 149.

MATERIAL EXAMINED. — **North-western Atlantic.** 2 ♀♀ CL 11.2, 11.6 mm and 2 ♂♂ CL 7.4, 8.8 mm, USNM 21003. — Off Long Island, North America, 39°57.6'N - 69°16'W, Norman collection, 1 ♀ CL 13.5 mm and 1 ♂ CL 9.5 mm, NHM 1898.5.7.886, 887.

Central western Atlantic. Off French Guiana, 800 m, October 1988, coll. J. Oliveira, 1 ♀ CL 14.8 mm, MNHN Na 11957. — Off Suriname, 7°51'N - 54°06'W, 810 m, *Nisshin-Maru*, net 51, otter trawl, 25.IV.1980, 1 ♀ CL 15.5 mm, 1 ♂ CL 10.4 mm, NSMT-Cr 8830. — Off Suriname, 7°22'N - 52°38'W, 725 m, *Nisshin-Maru*, otter trawl, 10 ♀♀ CL 13.3-18.2 mm, 1 ♂ CL 13.3 mm, NSMT-Cr 8833.

Smith (1882: 34) cited 12 specimens, including 4 ♂♂, 7 ♀♀ and 1 young specimen in his original account of *Ceraphilus agassizii* n.sp., but he did not designate a holotype. Therefore, the specimens are all syntypes. The type series came from five stations off the East coast of North America, as cited in the synonymy. It is preserved in the collection of the Museum of Comparative Zoology at Harvard University. Not examined.

DISTRIBUTION. — North-western Atlantic: off east coast of North America between 31°57'N and 42°59'N at depths of 481-1754 m (Crosnier & Forest 1973; Squires 1990); central western Atlantic: off Suriname and French Guiana, at depths of 725-810 m.

SIZE. — Largest ♀: 18.2 mm in CL; ♀♀ at spawning molt: 14.2-18.2 mm in CL; largest ♂: 10.4 mm in CL.

DIAGNOSIS

Rostrum falling short of tips of branchiostegal spines. Carapace with median carina distinct between two median spines; anterior median spine relatively large, arising from slightly anterior to or just level of posterior margin of orbit, distinctly overreaching or just reaching tip of rostrum, having angle of about 45°-60° to line joining base of rostrum and posterodorsal margin of carapace; posterior median spine arising from 0.60-0.65 of carapace length, moderately strong, weakly curved; gastric submedian spines strong, bluntly or prominently buttressed; branchiostegal spines slightly divergent anteriorly or

directed forward. First and second abdominal somites with obsolete median carina anteriorly, third and fourth somites with prominent median carina anteriorly or centrally, carina on third somite relatively narrow. Fifth abdominal somite with posterodorsal margin at most weakly produced. Ocular peduncles stout, 1.2-1.5 times longer than corneal width; cornea moderately large, usually darkly pigmented. Antennule with peduncle reaching level of midlength of scaphocerite; intermediate segment moderately stout, 1.18-1.28 times longer than distal width (distolateral process excluded); stylocerite nearly reaching distal margin of proximal peduncular segment, relatively broad, mesially with prominent convexity; outer flagellum composed of 11-16 articles in females, 14-24 articles in males. Scaphocerite 0.46-0.51 times as long as carapace and 2.1-2.4 times longer than wide; lateral margin slightly sinuous, with convexity posteriorly; distolateral tooth separated from blade by moderately deep notch, always overreaching distal margin of blade. Dactyls of fourth and fifth pereopods moderately long, setose, with lateral and mesial margins not sharply edged.

REMARKS

Taxonomic status of this species has been controversial in relation to *M. jacqueti* and *M. bellmarleyi*. Kemp (1910) considered that *M. agassizii* was synonymous with *M. jacqueti*. Crosnier & Forest (1973) compared material of the three nominal taxa from the Atlantic and created *M. agassizii* and *M. bellmarleyi* as subspecies of *M. jacqueti*. Squires (1990) followed Crosnier & Forest. However, the present study concludes that Smith's (1882) taxon is actually different from both *M. jacqueti* and *M. bellmarleyi* and that it warrants full specific status (see "Remarks" under account of *M. crosnieri* n.sp.). This species appears closest to *M. similis* n.sp., from Japan, but it differs from the latter in the more anteriorly-arising anterior median spines on the carapace, the relatively smaller cornea of eyes and the relatively broader antennal scaphocerite.

Crosnier & Forest (1973) referred a specimen from the northeastern Atlantic, off North America, in the collection of the Natural History Museum, London, to *M. jacqueti*. I reexamined

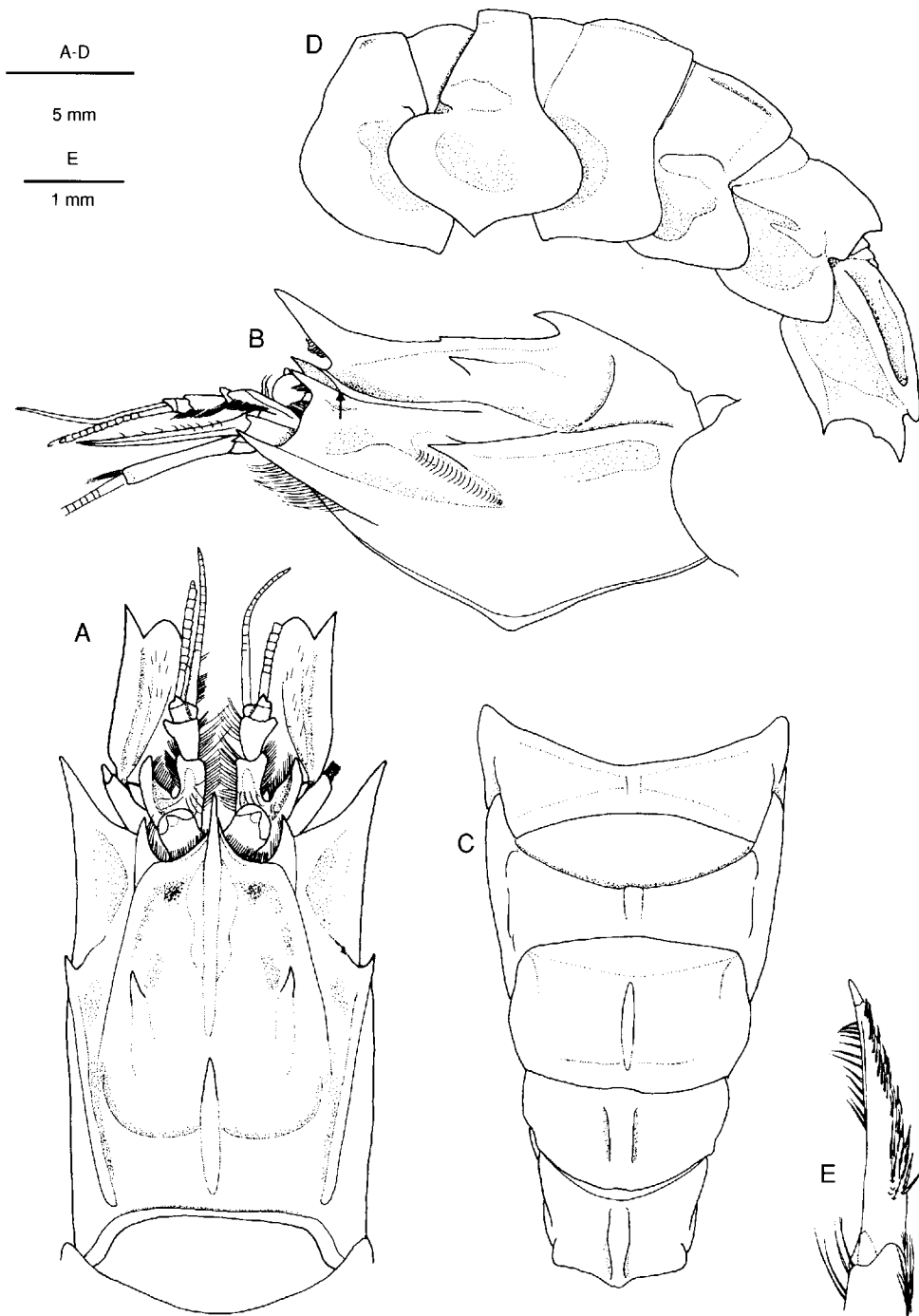


FIG. 2. — *Metacrangon agassizii* (Smith, 1882), ♀, CL 12.1 mm, East coast of North America, USNM 21003. **A**, carapace and cephalic appendages, dorsal, setae on anterior and mesial margins of scaphocerite omitted, right outer antennular flagellum damaged; **B**, same, lateral, minute pits on lateral surface not depicted, arrow indicates level of posterior margin of orbit; **C**, anterior five abdominal somites, dorsal, setae omitted; **D**, abdomen, lateral, setae omitted; **E**, dactyl of left fourth pereopod, lateral.

this specimen (NHM 1898.5.7.886, 887), and found that it was actually identical with *M. agassizii*. Takeda & Okutani (1983) recorded *M. agassizii* from Suriname and French Guiana. The rather remote locality initially led me to expect the South American specimens might represent a new species, but after examining of specimens from the region (MNHN Na 11957; NSMT-Cr 8830; NSMT-Cr 8833), I can confirm that they are clearly conspecific with *M. agassizii*.

Pigmentation of the eyes in the present material appears to be variable. The specimens borrowed from the National Museum of Natural History, Smithsonian Institution (USNM 21003), have a poorly pigmented cornea, while the specimens from the other lots (MNHN Na 11957; NHM 1898.5.7.886, 887; NSMT-Cr 8830; 8833) all have darkly pigmented ones. In all probability, this species has darkly pigmented cornea of the eyes, and the loss of pigmentation in the USNM specimens is an artifact.

Metacrangon bellmarleyi (Stebbing, 1914)
(Figs 1B, 3)

Sclerocrangon bellmarleyi Stebbing, 1914: 29, pl. 10 [type locality: Cape Natal N by E 24 miles, 792 m]. — Barnard 1950: 804, fig. 152. — Kensley 1968: 318; 1972: 64, fig. 30s, t.

Sclerocrangon Bellmarleyi — De Man 1920: 251.

Metacrangon bellmarlei (sic) — Zarenkov 1965: 1764.

Sclerocrangon jacqueti — Crosnier & Forest 1968: 1144.

Metacrangon jacqueti ssp. *bellmarleyi* — Crosnier & Forest 1973: 233, figs 74a, 75b,c, 76a, b.

Metacrangon jacqueti bellmarleyi — Kensley 1974: 76; 1981: 59.

MATERIAL EXAMINED. — **South Africa.** Off Saldanha, 33°50.0'S - 17°21.0'E, 25.VIII.1959, 1 ♀ CL 14.0 mm, SAM-A 10446. — Off East London, 33°19.0'S - 27°52.0'E, *Meiring Naude*, stn 174, 28.V.1978, 1 ♀ CL 12.0 mm, SAM-A 16077.

West Africa. Off Pointe-Noire, 5°02'S - 11°17'E, 595-605 m, *Ombango*, stn 394-25, trawl, 18.III.1967, coll. A. Crosnier, 1 ♀ CL 10.4 mm, MNHN Na 1045. — Off Angola, 11°57'S - 13°15.5'E, 825-1000 m, *Ombango*, stn 398, trawl, 16.IV.1968, coll.

A. Crosnier, 4 ♀♀ CL 13.1-17.2 mm and 2 ♂♂ CL 12.6, 13.4 mm, MNHN Na 8251, 1 ♀ CL 17.3 mm, MNHN Na 8252, 1 ♀ CL 14.3 mm, MNHN Na 8254. — Off Pointe-Noire, 5°06'S - 11°18'E, 800-900 m, *Ombango*, stn 417, trawl, 18.XI.1969, coll. A. Crosnier, 2 ♂♂ CL 10.1, 10.9 mm, MNHN Na 8253. — Off Pointe-Noire, 5°08'S - 11°24'E, 595-605 m, *Ombango*, stn 394-56, trawl, 20.IX.1967, coll. A. Crosnier, 1 ♂ CL 8.8 mm, MNHN Na 8255.

Stebbing (1914) described this species on the basis of two specimens, 1 ♂ (body length 22 mm) and 1 ♀ (body length 40 mm), taken off Cape Natal, N by E, 38 km, South Africa. He did not designate a holotype, and therefore the specimens are syntypes. The types are kept in the collection of the South African Museum under the registration numbers SAM A1077 (♂) and SAM A1564 (♀) (Kensley 1974). Not examined.

Specimens herein referred to *Metacrangon* aff. *bellmarleyi*:

North-west Africa. Tropic of Cancer, 23°N - 17°30'W, 930 m, *Talisman*, dragage 82, 12.VII.1883, 1 ♀ CL 7.7 mm, MNHN Na 1044. — Off Cape Blanc, 20°44'N - 18°07'W, 1495-1283 m, *Talisman*, Dragage 93, 14.VII.1883, 1 ♀ CL 7.3 mm, 3 ovig. ♀♀ CL 10.9-11.2 mm, MNHN Na 1043.

SIZE. — Largest ♀: 17.3 mm; ♀♀ at spawning molt: 16.0-17.3 mm; largest ♂: 13.4 mm.

DISTRIBUTION. — Known with certainty from Central Africa (off Congo) to South Africa, at depths of 595-1098 m.

DIAGNOSIS

Rostrum falling short of tips of branchiostegal spines. Carapace with median carina distinct between two median spines; anterior median spine relatively small, arising from around level of posterior margin of orbit, usually not reaching tip of rostrum at about 45° to 60° to line joining base of rostrum and posterodorsal margin of carapace; posterior median spine arising from 0.60-0.65 of carapace length, moderately strong, weakly curved anteriorly; gastric submedian spines moderately strong, bluntly buttressed; branchiostegal spines weakly divergent anteriorly, sometimes curved mesially; hepatic spine moderately strong. In females, first and second abdominal somites without trace of median carina, third and fourth each with trace of median carina; in males, first and second abdominal somites with trace of median carina, third and fourth each with

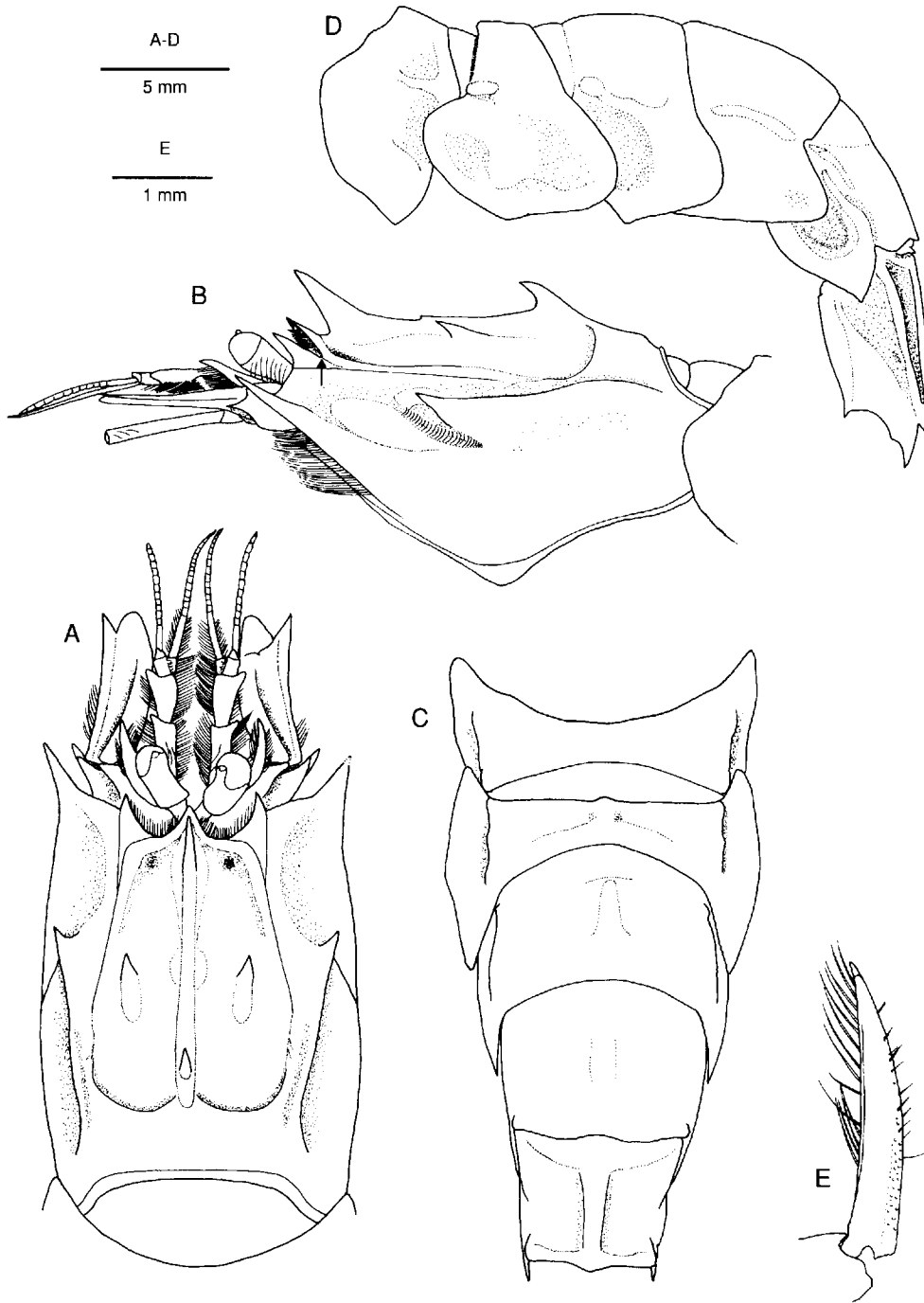


FIG. 3. — *Metacrangon bellmarleyi* (Stebbing, 1914) ♀, CL 13.0 mm, off Saldanha, South Africa, SAM 10446. **A**, carapace and cephalic appendages, dorsal, setae on anterior and mesial margins of scaphocerite omitted, right scaphocerite somewhat damaged at base of blade; **B**, same, lateral; **C**, anterior five abdominal somites, dorsal; **D**, abdomen, lateral; **E**, dactyl of left fourth pereopod, lateral.

conspicuous median carina. Fifth abdominal somite with posterodorsal margin at most weakly produced. Ocular peduncle relatively long, 1.7-2.1 times longer than corneal width; cornea weakly inflated, poorly pigmented. Antennule with peduncle overreaching level of midlength of scaphocerite; intermediate segment relatively slender, 1.40-1.86 times longer than distal width; stylocerite reaching or slightly overreaching distal margin of proximal peduncular segment, relatively more slender, with slight convexity mesio-proximally; outer flagellum composed of 11-16 articles in females (12-16 in ovigerous specimens), 18-33 articles in males. Scaphocerite 0.45-0.50 times as long as carapace and 2.9-3.5 times as long as wide; lateral margin weakly concave or nearly straight; distolateral tooth usually falling short of distal margin of blade. Dactyls of fourth and fifth pereopods setose, with lateral and mesial margins not sharply edged.

REMARKS

The material from the different localities, while apparently belonging to *M. bellmarleyi*, show some variations. The carapace may be proportionally more slender in the West African material than in the South African specimens (carapace length/width ratio: 1.23-1.38 *vs* 1.11-1.21). The palm of the first pereopod may be relatively more slender in the material from West Africa than in the South African specimens (palm of chela length/width ratio: about 4.0 *vs* 3.2). Although the anterior median spine on the carapace reaches the tip of the rostrum and more strongly ascends in the specimen from East London, South Africa, it does not reach the tip of rostrum and less ascends in the specimens from West Africa and Saldanha, South Africa. Nevertheless, in other respects, the specimens examined are almost identical, and they are treated as the same species here. As discussed below, the specimens from Northwest Africa are provisionally referred to *Metacrangon* aff. *bellmarleyi*, because they differ from both South African and Central African populations in some minor points.

As noted elsewhere, Crosnier & Forest (1973) treated for the present taxon and *M. agassizii* as

subspecies of *M. jacqueti*. Nevertheless, the presence of a number of differences justifies to separate this taxon as a full species (see "Remarks" under account of *M. crosnieri* n.sp.). *Metacrangon bellmarleyi* appears to be closest to *M. crosnieri* n.sp. from Madagascar, but it is distinguishable from the latter in having a more posteriorly arising posterior median spine on the carapace.

The proportion of the carapace varies in the present species and cannot be used to distinguish between *M. bellmarleyi* and *M. agassizii*, contrary to the suggestion of Crosnier & Forest (1973).

As noted above, the male specimens examined differ from females in having a conspicuous median carina on the third and fourth abdominal somites, in addition to the characters showing usual sexual dimorphism in crangonids.

REMARKS ON *Metacrangon* aff. *bellmarleyi* FROM NORTHWEST AFRICA

The specimens from off the West coast of Northwest Africa (off Cape Blanc, four females including three ovigerous specimens, MNHN Na 1043; Tropic of Cancer, one female, MNHN Na 1044) are generally similar to *M. bellmarleyi* in the following respects (Fig. 4A, B): the anterior median spine on the carapace does not reach the tip of the rostrum; the third and fourth abdominal somites lack a conspicuous median carina; the ocular peduncle is relatively slender, 1.4-1.8 times longer than the corneal width; the scaphocerite is relatively slender, 2.9-3.5 times longer than wide. However, they differ from the specimens here referred to *M. bellmarleyi* from Central and South Africa in some minor but notable differences. In the specimens from Northwest Africa, the lateral margin of the scaphocerite is slightly sinuous with a convexity anteriorly (as in *M. crosnieri* n.sp.) or nearly straight, and its distolateral tooth reaches or slightly overreaches the distal margin of the blade (Fig. 4C). In contrast, in the specimens from Central and South Africa the lateral margin is usually concave (rarely straight), and the distolateral tooth falls short of (or rarely just reaches) the distal margin of the blade (Fig. 1B). The gastric submedian spines on the carapace are weaker

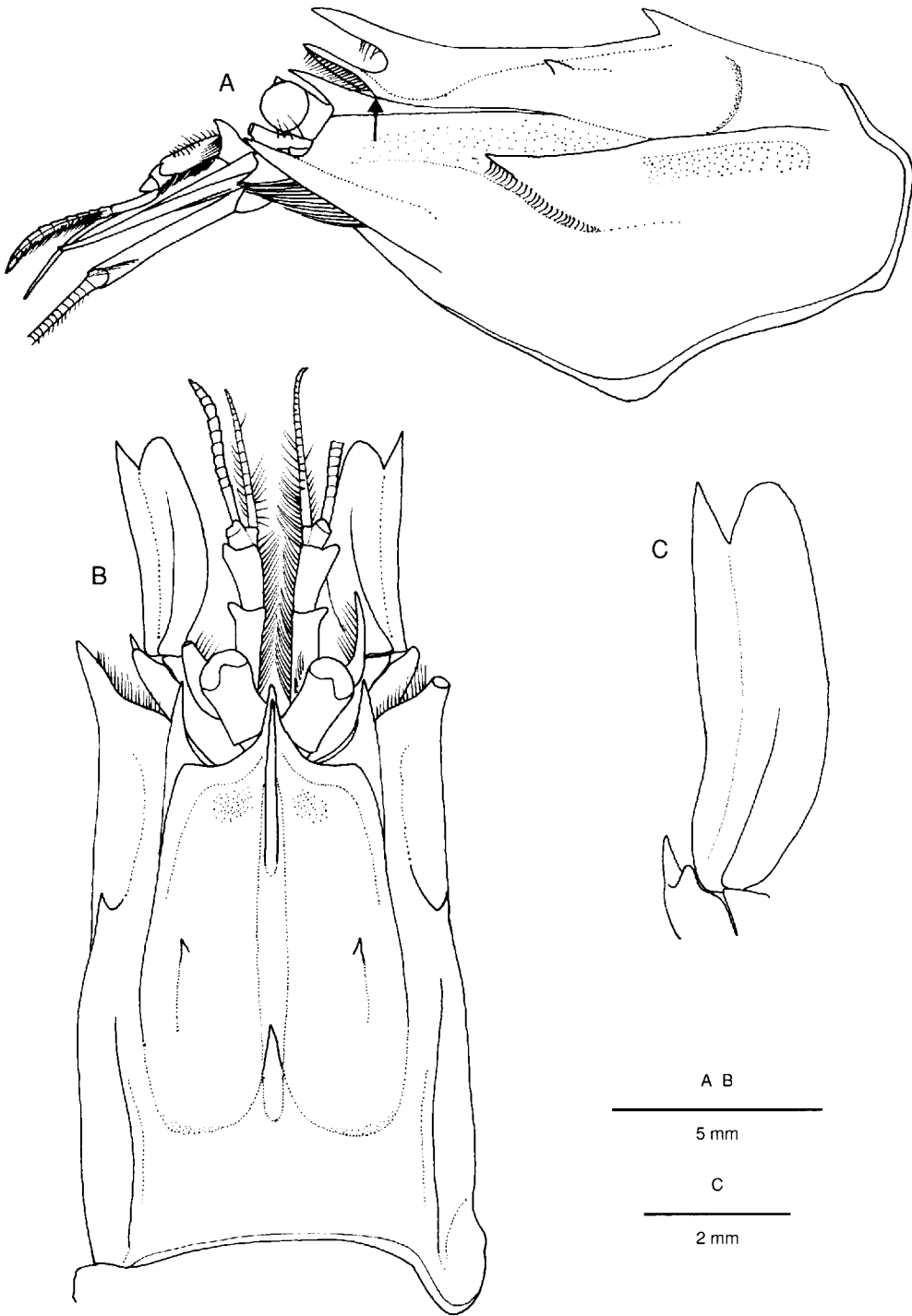


FIG. 4. — *Metacrangon* aff. *bellmarleyi*, ovigerous ♀, CL 10.9 mm, off Cape Blanc, Northwest Africa, MNHN Na 1043. **A**, carapace and cephalic appendages, lateral; **B**, same, dorsal; **C**, left scaphocerite, dorsal.

in the North African specimens than in the Central and South African specimens (cf. Figs 3A, B, 4B). The corneal region of the eye seems to be more darkly pigmented in the Northwest African specimens than in the Central and South African specimens. Additionally, the Northwest African specimens, though including three ovigerous females, are much smaller than the Central and South African specimens (ovigerous females are 10.9-11.2 mm in CL in the Northwest African population, while females at spawning molt are 13.1-17.3 mm in the Central and South African populations). Because of the scarcity of the Northwest African specimens, it is difficult to determine whether these differences are of a specific nature or represent geographical variation. Therefore, I provisionally treat them as "*Metacrangon* aff. *bellmarleyi*". The question of the identity of the Northwest African specimens with *M. bellmarleyi* cannot be decided satisfactorily until additional material from that region becomes available for comparison.

***Metacrangon crosnieri* n.sp.**
(Figs 1C, 5, 6)

MATERIAL EXAMINED. — **Madagascar.** Holotype: off Cape Ambre, 13°02'S - 48°02'E, 1000-1525 m, stn 133, trawl, 21.I.1975, coll. A. Crosnier, 1 ♀ CL 12.2 mm, MNHN Na 13277.

Paratype: off West coast of Madagascar, 22°16.9'S - 42°56'E, 1200 m, stn 109, trawl, 30.XI.1993, coll. A. Crosnier, 1 ♀ CL 9.5 mm, MNHN Na 13278.

SIZE. — The holotype, which is probably at the spawning molt, though still not ovigerous, has a carapace length of 12.2 mm.

DISTRIBUTION. — Madagascar; 1000-1525 m. Apart from *M. bellmarleyi*, which is known from the eastern coast of South Africa, this new species is the sole representative of the genus *Metacrangon* from the western Indian Ocean.

ETYMOLOGY. — This species is named in honor of Alain Crosnier, for his great contributions to the systematics of decapod Crustacea and for his generous help during this study. He collected the type specimens of this new species and made them available for study.

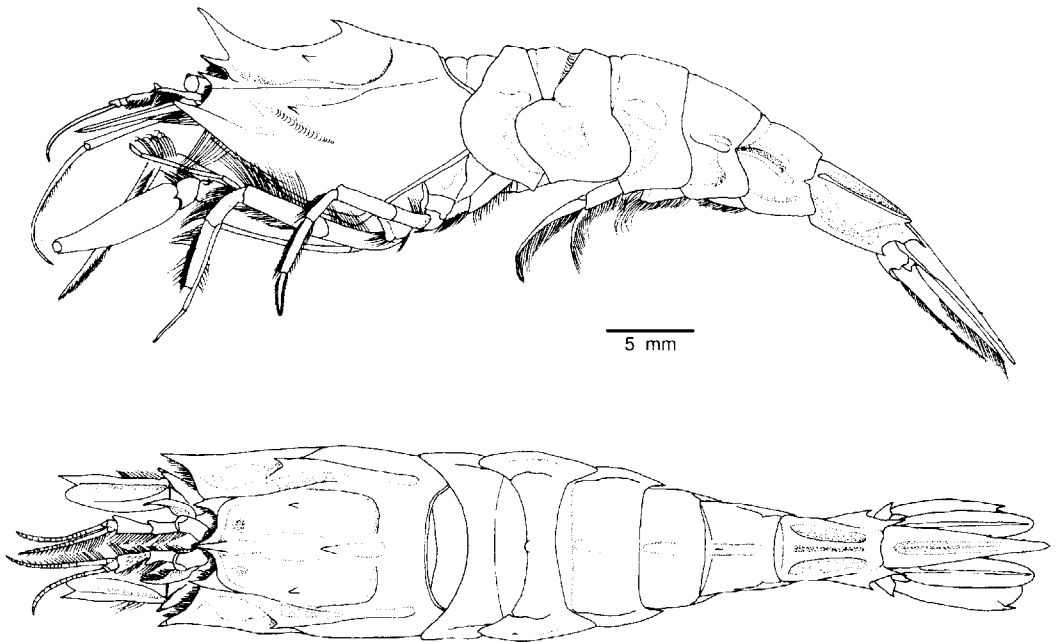


FIG. 5. — *Metacrangon crosnieri* n.sp., holotype ♀, CL 12.2 mm, Madagascar, MNHN Na 13277. Top, entire animal in lateral view, dactyls of third and fourth pereopods missing; bottom, entire animal in dorsal view, setae on anterior and mesial margins of scaphocerite omitted.

DIAGNOSIS (female)

Rostrum falling short of tips of branchiostegal spines. Carapace with median carina obsolete between two median spines; anterior median spine relatively large, arising from level of posterior margin of orbit, just reaching tip of rostrum, at an angle of about 60° to line joining base of rostrum and posterodorsal margin of carapace; posterior median spine arising from 0.42-0.52 of carapace length, moderately strong, weakly curved anteriorly; gastric submedian spines small, not buttressed; branchiostegal spines slightly divergent anteriorly or directed forward. In females, first to fourth abdominal somites with or without trace of median carina. Fifth abdominal somite with posterodorsal margin at most weakly produced. Ocular peduncle relatively long, 1.9-2.0 times longer than corneal width; cornea not inflated, poorly pigmented. Antennule with peduncle reaching beyond level of midlength of scaphocerite; intermediate segment elongate, about 2.0 times longer than distal width; stylocerite overreaching distal margin of proximal peduncular segment, relatively more slender, with slight convexity mesioproximally; outer flagellum composed of 13-15 articles. Scaphocerite 0.5 times as long as carapace and 3.0-3.1 times longer than wide; lateral margin slightly sinuous with convexity anterior to its midlength; distolateral tooth overreaching distal margin of blade. Dactyls of fourth and fifth pereopods setose, with lateral and mesial margins not sharply edged.

DESCRIPTION

Body stout; integument firm.

Rostrum ascending, narrowly triangular in dorsal view, falling far short of tips of branchiostegal spines, tip not acute in dorsal view; dorsal surface not grooved; ventral carina obtuse, slightly convex in lateral view, with a row of long setae. Carapace covered with dense, short pubescence, roughly pitted laterally; median carina between anterior and posterior median spines obscure; anterior median spine arising from level of posterior margin of orbit, at about 60° to line joining base of rostrum and posterodorsal margin of carapace, overhanging rostrum, much stronger

than posterior median spine and more than twice length of rostrum, just reaching tip of rostrum, anterior margin with scattered, curled setae; posterior median spine moderately strong, arising from 0.42-0.52 length of carapace, slightly curved; median denticle inconspicuous; gastric submedian spine small, not buttressed; antennal spine weakly ascending; small marginal spine lateral to base of antennal spine; branchiostegal spines overreaching anterior margin of basicerite (ventrolateral spine excluded), directed forward; anteroventral region strongly folded beneath branchiostegal spine, with small pterygostomial spine; hepatic spine relatively weak; postorbital carina rather obtuse; longitudinal suture extending to level of posterior median spine; posterior transverse carina obsolete; branchial carina distinct; hepatic sulcus moderately deep.

Abdomen glabrous to naked eye, but with sparse short setae dorsally, weakly sculptured. First somite without trace of median carina, but second somite with trace of median carina; anterodorsal margin of posterior section of second somite with obtuse median lobe; third and fourth somites with trace of median carina in holotype, lacking in paratype; fifth somite with low, but conspicuous median carina, posterodorsal margin not produced posteriorly. Pleura of anterior three somites each with subacute or blunt ventral tooth, that of fourth and fifth somite rounded posteroventrally. Sixth abdominal somite 1.45 times as long as proximal width; submedian carinae prominent, not reaching posterior and anterior margins of somite, convergent posteriorly; dorsolateral carinae prominent, continuous with posteriorly produced, slightly bilobed posterodorsal margin; posterolateral process terminating in strong tooth; posteroventral tooth strong. Telson 1.8 times as long as sixth abdominal somite, terminating posteriorly in acute apex, with two pairs of dorsolateral spines, one pair of lateral subterminal spines and two pairs of subterminal, spiniform, plumose setae ventrally. Ocular peduncle relatively long, somewhat constricted, 1.9-2.0 times longer than corneal width, with prominent dorsal tubercle. Corneal region relatively small, not inflated, poorly pigmented.

Antennular peduncle reaching beyond midlength

of scaphocerite, setose laterally and mesially, dorsal surface with curled setae. Proximal segment longer than distal two segments combined, anterodorsal lateral angle strongly produced. Stylocerite slender, weakly curved inward, overreaching anterior margin of proximal peduncular segment. Intermediate segment relatively slender, about 2.0 times longer than distal width, widened anteriorly, anterolateral corner produced into blunt process, partially covering lateral surface of short distal segment. Outer flagellum composed of 13-15 articles. Inner flagellum slightly longer than outer flagellum, composed of about 13 articles, with a row of setae mesially.

Antenna with stout basicerite bearing strong anteroventral spine, anterodorsal corner produced into triangular lobe. Scaphocerite 0.5 times as long as carapace and 3.0-3.1 times as long as wide; lateral margin slightly sinuous with convexity anteriorly, bearing row of setae proximally; distolateral tooth separated by moderately deep notch, overreaching moderately broad, rounded blade. Carpocerite overreaching base of distolateral tooth of scaphocerite. Antennal flagellum with short setae.

Third maxilliped overreaching level of anterior margin of blade of scaphocerite by half length of ultimate segment. Ultimate and penultimate segment flattened dorsoventrally, former tapering distally, 8.6 times as long as basal width.

First pereopod overreaching level of anterior margin of blade of scaphocerite by length of distal three-fifths of palm; palm 3.3 times as long as wide, with cutting edge obliquely transverse. Second pereopod slender, reaching level of anterior margin of blade of scaphocerite by chela; dactyl stout, with rows of minute bristles on cutting edge as well as fixed finger. Third pereopod slender, overreaching level of anterior margin of scaphocerite by length of dactyl. Fourth pereopod reaching level of anterior margin of scaphocerite by dactyl, setose on dorsal and ventral surfaces; dactyl subspatulate, with numerous setae on bluntly-edged dorsal and ventral margins and mesial surface; tip terminating in thin corneous process. Fifth pereopod similar to fourth, but somewhat shorter, reaching level of tip of branchiostegal spine of carapace.

In holotype, thoracic sternite with acute median

carina on sixth somite, teeth on seventh and eighth somites completely reduced; in paratype, smaller than holotype, thoracic sternite armed with acute median teeth on sixth to eighth somites.

REMARKS

The paratype specimen differs from the holotype in the complete absence of a median carina on the third abdominal somite and the less conspicuous median carina of the fourth abdominal somite. In the holotype, the median carina on the third and fourth somites is very faint, but recognizable as a trace. The development of this carina may be slightly variable in this species.

Metacrangon agassizii, *M. bellmarleyi*, *M. jacqueti*, *M. crosnieri* n.sp. and *M. similis* n.sp. are very similar in general appearance. The relatively small differences between the species beg the question as to whether sub-specific rank may be more suitable, since they may merely be geographical variants. However, I consider that full specific status should be given. Although the differences in most cases are small, they are nevertheless constant within a restricted geographical area of occurrence. The present lack of records between the known occurrence of the four species may also support this conclusion, these species being fully isolated geographically.

Features which are important for diagnosing particular species are discussed below.

Female

The available material and literature suggest that *M. jacqueti* is the smallest of the five species discussed here. *Metacrangon jacqueti* can reach at most 9.0 mm in CL, in contrast to over 12 mm in the other species. Although Kemp (1910) considered that *M. agassizii* was synonymous with *M. jacqueti*, he mentioned that the British material was much smaller than the North American material.

The position of the anterior median spine on the carapace provides minor but notable difference among the five species discussed. In *M. similis* (Fig. 11B), the anterior median spine arises clearly posterior to the posterior margin of the orbit, rather than arising slightly anterior to or at just

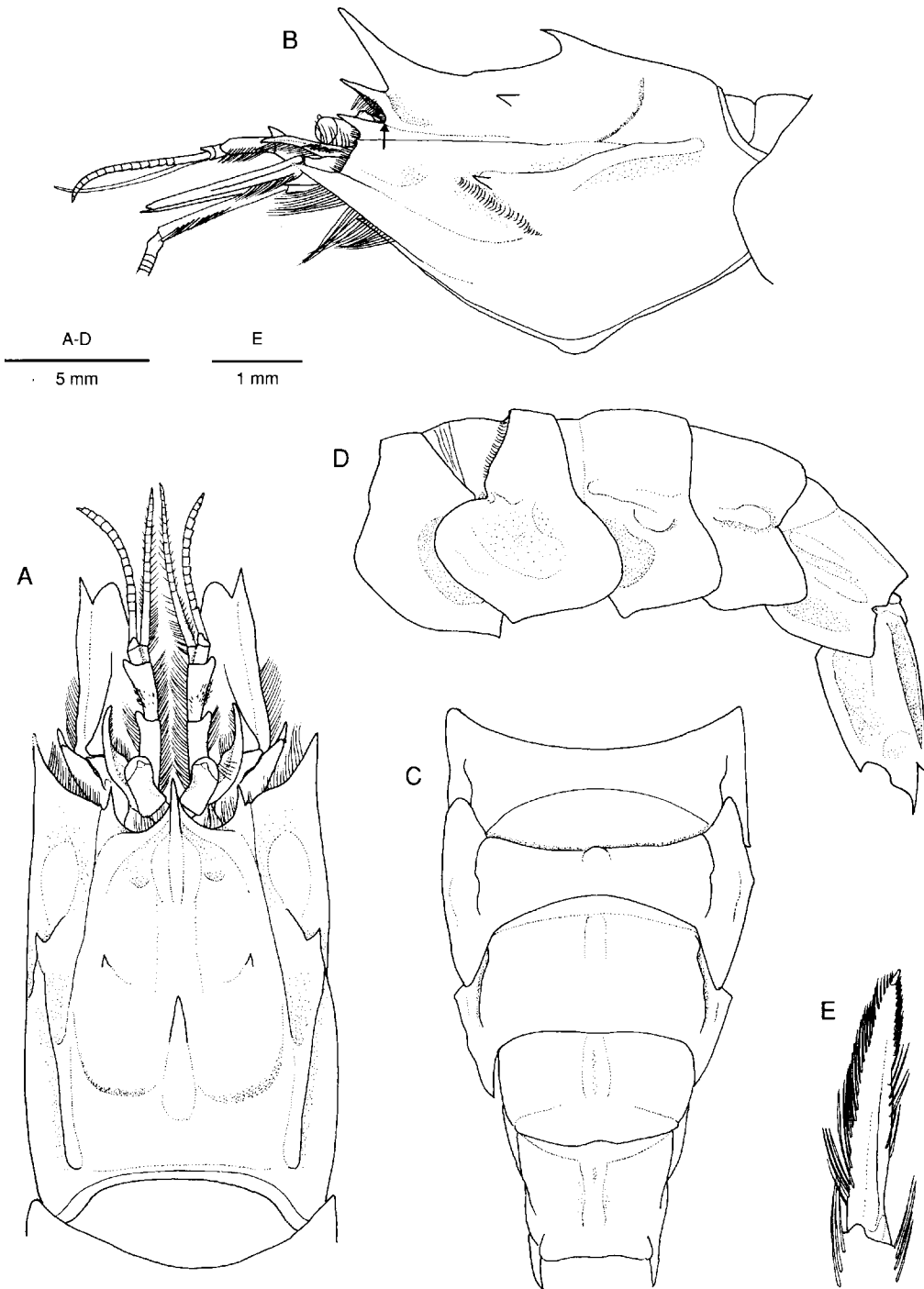


FIG. 6. — *Metacrangon crosnieri* n.sp., holotype ♀, CL 12.2 mm, Madagascar, MNHN Na 13277. **A**, carapace and cephalic appendages, dorsal, setae on anterior and mesial margins of scaphocerite omitted; **B**, same, lateral; **C**, anterior five abdominal somites, dorsal; **D**, abdomen, lateral; **E**, dactyl of fourth third pereopod, lateral.

the margin in *M. agassizii*, *M. crosnieri* and *M. jacqueti* (Figs 2B, 6B, 7B). In *M. bellmarleyi* (Fig. 3B), it arises posterior to or just at the margin.

The posterior median spine arising more anteriorly separates *M. crosnieri* from *M. agassizii*, *M. bellmarleyi* and *M. similis* (0.42-0.52 of the carapace length vs 0.60-0.70 of that) (cf. Figs 2B, 3B, 6B, 11B). In *M. jacqueti*, this spine arises from 0.56-0.60 of the carapace length (Fig. 7B), and therefore this character may not always be useful to separate *M. crosnieri* and *M. jacqueti*.

The present examination has shown that the number of articles of the outer antennular flagellum increases with growth. When comparing mature females, however, this character may be helpful to recognize *M. jacqueti*, which is the smallest species; the number of the articles is 6-10 in *M. jacqueti*, and 11-16 in the four close relatives.

The development of the median carina on the third and fourth abdominal somites is useful for species recognition. In *M. agassizii* and *M. similis*, tergites of the third and fourth somites have a clearly discernible median carina (Figs 2C, 11C), while in *M. bellmarleyi*, *M. crosnieri* and *M. jacqueti* the median carina is absent or appears only as a trace (Figs 3C, 6C, 7C). This feature, however, should be used with caution, since the third and fourth abdominal somites bear a distinct median carina in male *M. bellmarleyi*, as noted above.

The relative robustness of the ocular peduncle shows notable differences among the five species discussed. Ratios of ocular peduncle length/corneal width lie within a range of 1.7 to 2.1 in *M. bellmarleyi* and *M. crosnieri* and of 1.2 to 1.5 in *M. agassizii*, *M. jacqueti* and *M. similis*. The cornea of *M. similis* seems to be the largest among those of the five species discussed. Furthermore, it may be interesting to note that the cornea is always poorly or lightly pigmented in *M. bellmarleyi* and *M. crosnieri*, while the pigmentation is usually dark in *M. agassizii*, *M. jacqueti* and *M. similis*. The pigmentation of the eye, however, is not always useful as a diagnostic feature, as it may be affected by the state of preservation (see "Remarks" under *M. agassizii*).

Metacrangon bellmarleyi and *M. crosnieri* share a

relatively slender stylocerite of the antennular peduncle, with less developed and more proximally situated mesial lobes than *M. agassizii*, *M. jacqueti* and *M. similis*. This character, however, is rather subjective, and thus less reliable.

The relative stoutness of the intermediate segment of the antennular peduncle is of a diagnostic significance. The length/width ratios for each species are as follows (measurements of the length of the segment excludes the disto-lateral process; the width is measured at the distal margin): 1.09-1.25 in *M. similis*; 1.18-1.28 in *M. agassizii*; 1.20-1.40 in *M. jacqueti*; 1.40-1.86 in *M. bellmarleyi*; and 2.0 in *M. crosnieri*.

The proportion of the scaphocerite are useful for separation of the species (see Fig. 1). The length/width ratios of the scaphocerite for each species are as follows: 2.1-2.4 in *M. agassizii*; 2.5-2.7 in *M. jacqueti*; 2.5-2.9 in *M. similis*; 2.9-3.5 in *M. bellmarleyi*; and 2.9-3.0 in *M. crosnieri*. The ratio of *M. crosnieri* lies within the range for *M. bellmarleyi*.

The degree of extension of the distolateral tooth of the scaphocerite may be useful to separate *M. bellmarleyi* from *M. agassizii* and *M. crosnieri*. In *M. bellmarleyi*, the distolateral tooth usually falls short of (rarely just reaches) the distal margin of the blade (Fig. 1B), rather than constantly overreaching it in the two other species (Fig. 1A, C). In *M. jacqueti* and *M. similis*, the distolateral tooth just reaches or overreaches the distal margin of the blade, thus this feature seems to be less reliable for distinguishing *M. bellmarleyi* from these two species.

Male

Except for development of the median carina on the third and fourth abdominal somite, the features discussed above seem to be useful for distinguishing males of *M. agassizii*, *M. bellmarleyi*, *M. jacqueti* and *M. similis*, though no male specimen has been available for *M. crosnieri*. In addition, the complete absence of a median carina on the third and fourth abdominal somites separates *M. jacqueti* from the other three species.

From the above comparisons, it can be said that *M. crosnieri* and *M. similis* appear to be closest to *M. bellmarleyi* and *M. agassizii* respectively.

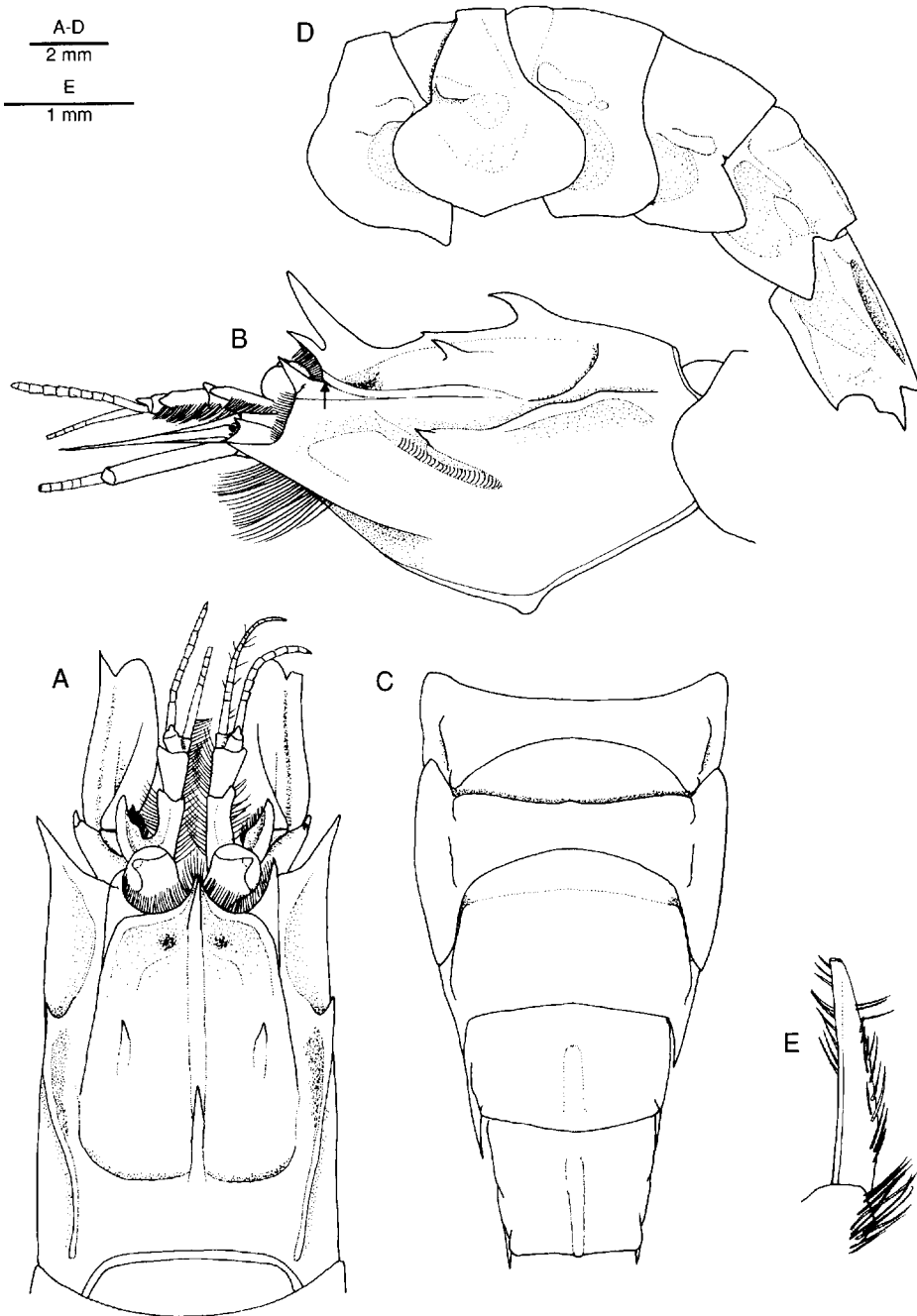


FIG. 7. — *Metacrangon jacqueti* (A. Milne Edwards, 1881). **A-D**, ovigerous ♀, CL 9.0 mm, Ireland, NHM 1911.11.8:1246-1249; **E**, ovigerous ♀, CL 8.9 mm, same lot. **A**, carapace and cephalic appendages, dorsal, inner flagellum of left antennule and distolateral tooth of right scaphocerite damaged; **B**, same, lateral; **C**, anterior five abdominal somites, dorsal; **D**, abdomen, lateral; **E**, dactyl of right fourth pereopod, lateral, distal unguis broken off.

Metacrangon jacqueti
(A. Milne Edwards, 1881)
(Figs 1D, 7)

Pontophilus Jacqueti A. Milne Edwards, 1881: 933 [type locality: eastern Atlantic]; 1883: pl. 38.

Pontophilus jacqueti – Faxon 1895: 143, 136.

Sclerocrangon Jacqueti – Kemp 1910: 140 (in part), pl. 22, figs 7-10. – De Man 1920: 252.

Sclerocrangon jacqueti – Holthuis 1955: fig. 99a. – Sivertsen & Holthuis 1956: 40. – Allen 1967: 32, 53, 82. – Lagardère 1970: 1040.

Metacrangon jacqueti – Zarenkov 1965: 1764. – Crosnier & Forest 1973: 233, fig. 77a, c.

Not *Sclerocrangon jacqueti* – Crosnier & Forest 1968: 1144 [= *Metacrangon bellmarleyi* (Stebbing, 1914)].

Not *Metacrangon jacqueti* – Crosnier & Forest 1973: fig. 77b [= *Metacrangon agassizii* (Smith, 1882)].

MATERIAL EXAMINED. — **Northeastern Atlantic.** West of Ireland, 450-976 m, 1 ♀ CL 8.9 mm, NHM 1908.10.24: 379. — Outer Hebrides, 59°34'N - 7°18'W, 976 m, Norman collection, 1 ♀ CL 5.2 mm, NHM 1911.11.8: 1245. — Outer Hebrides, 59°40'N - 7°21'W, Norman collection; 4 ovig. ♀♀ CL 7.9-9.0 mm, NHM 1911.11.8: 1246-1249. — West of Ireland, 464-976 m, Norman collection, 1 ♀ CL 4.6 mm, NHM 1911.11.8: 1320. — Bay of Biscay, 43°43.5'N - 4°27.4'W, 950-1000 m, *Thalassa-Roscoff* 1970, stn W377, 7.X.1970, 1 ♂ CL 6.0 mm, MNHN Na 4297. — Bay of Biscay, 43°35.6'N - 3°33.8'W, 330-350 m, *Thalassa-Roscoff* 1970, stn W365, 5.X.1970, 1 ♀ CL 7.2 mm, MNHN Na 4298. — Bay of Biscay, 43°41.1'N - 03°49.8'W, 320-1050 m, *Thalassa-Roscoff* 1970, stn W371, 1 ♀ CL 9.0 mm, MNHN Na 4299.

Type material could not be located.

SIZE. — Largest ♀: 9.0 mm in CL; ovigerous ♀♀: 7.9-9.0 mm in CL; ♂: 6.0 mm in CL.

DISTRIBUTION. — British Isles, at depths of 450-1260 m (Kemp 1910); Bay of Biscay, at depths of 300-1050 m.

DIAGNOSIS

Rostrum falling short of tips of branchiostegal spines. Carapace with median carina distinct between two median spines; anterior median spine arising at or slightly anterior to level of posterior margin of orbit, extending as far as or slightly beyond tip of rostrum, forming angle of about

60° to 70° to line joining base of rostrum and posterodorsal margin of carapace; posterior median spine moderately strong in females, strong in male, arising from 0.56-0.63 of carapace length, weakly curved in females, more strongly curved in male; gastric submedian spines moderately strong, bluntly buttressed; branchiostegal spines slightly divergent anteriorly or directed forward. First to third abdominal somites with no trace of median carina in both sexes, fourth with trace of median carina. Fifth abdominal somite with posterodorsal margin at most weakly produced. Ocular peduncle stout, 1.2-1.4 times longer than corneal width; cornea relatively large, weakly inflated, darkly pigmented. Antennule with peduncle slightly overreaching level of midlength of scaphocerite; intermediate segment stout, 1.20-1.40 times longer than distal width; stylocerite nearly reaching distal margin of proximal peduncular segment, relatively broad, mesially with prominent convexity; outer flagellum composed of 6-10 articles in females, 16 in male. Scaphocerite 0.45-0.52 times as long as carapace and 2.5-2.7 times longer than wide; lateral margin slightly sinuous, with convexity posteriorly; distolateral tooth separated from blade by moderately deep notch, reaching or slightly overreaching moderately broad distal margin of blade. Dactyls of fourth and fifth pereopods moderately long, setose, with dorsal and ventral margins not sharply edged.

REMARKS

As discussed above, *M. jacqueti* is very similar to *M. agassizii*, *M. bellmarleyi*, *M. crosnieri* n.sp. and *M. similis* n.sp., but it is characterized by smaller body size and the completely absence of a median carina on the third and fourth abdominal somites in males (see "Remarks" under *M. crosnieri*). Further, it differs from *M. agassizii* and *M. similis* in the absence of a median carina on the third and fourth abdominal somites in females. The stouter ocular peduncle and intermediate segment of the antennular peduncle, broader scaphocerite, and darkly pigmented cornea of the eye distinguish *M. jacqueti* from *M. bellmarleyi* and *M. crosnieri*.

The specimen figured as *Metacrangon jacqueti* by Crosnier & Forest (1973: fig. 72b), from North

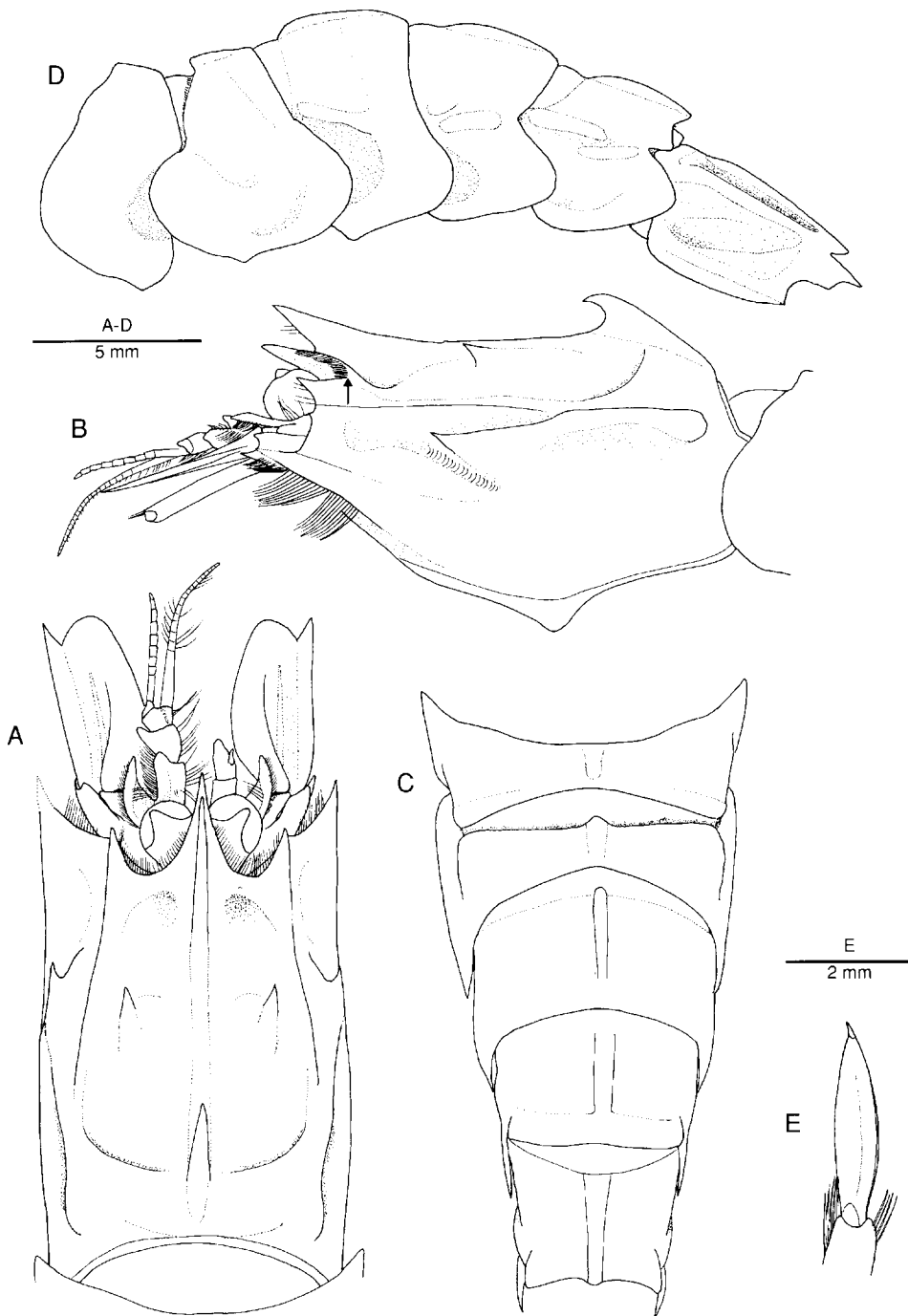


FIG. 8. — *Metacrangon knoxi* (Yaldwyn, 1860), paratype ♀, CL 10.8 mm, Chatham Rise, New Zealand, CM AQ1228. **A**, carapace and cephalic appendages, dorsal, setae on anterior and mesial margins of scaphocerite omitted, right antennular peduncle abnormal; **B**, same, lateral, minute pits on lateral surface not depicted, arrow indicates level of posterior margin of orbit; **C**, anterior five abdominal somites, dorsal, setae omitted; **D**, abdomen, lateral, setae omitted; **E**, dactyl of left fourth pereopod, lateral.

America, is here interpreted as *M. agassizii* (see "Remarks" under *M. agassizii*).

Metacrangon knoxi (Yaldwyn, 1960)
(Figs 1E, 8)

Sclerocrangon knoxi Yaldwyn, 1960: 35, fig. 7.

Metacrangon knoxi – Zarenkov 1965: 1764. – Crosnier & Forest 1973: 238.

MATERIAL EXAMINED. — **New Zealand.** Holotype: Chatham Rise, 43°40'N - 179°28'E, 396 m, Chatham Islands 1954 Expedition, stn 6, 24.I.1954, 1 ♀ CL 9.0 mm, CMAQ946.

Paratypes: Chatham Rise, 44°04'S - 178°04'W, 468 m, Chatham Islands 1954 Expedition, stn 52, 10.II.1954, 7 ♀♀ CL 6.8-10.8 mm and 2 ♂♂ CL 7.0, 8.3 mm, CMAQ 1228.

SIZE. — ♂♂: 5-8 mm in CL; ♀♀: 5.5-12 mm in CL; ovigerous ♀♀: 10-12 mm in CL (Yaldwyn 1960).

DISTRIBUTION. — Known only from the Chatham Rise; 396-522 m (Yaldwyn 1960).

DIAGNOSIS

Rostrum directed forward or somewhat ascending, extending as far as branchiostegal spines. Carapace with median carina distinct between two median spines; anterior median spine arising from one-third or half length of rostrum, slightly falling short of, or overreaching, tip of rostrum, directed forward or only slightly ascending; posterior median spine strong, arising from 0.60-0.67 of carapace length, noticeably curved; gastric submedian spines moderately strong, bluntly buttressed; branchiostegal spines directed forward. First and second abdominal somites with obtuse median carina, third and fourth abdominal somites with conspicuous median carina, that on third somite narrow. Fifth abdominal somite with posterodorsal margin always noticeably produced. Ocular peduncles stout, 1.08-1.23 times longer than corneal width; corneal region relatively large, slightly inflated, darkly pigmented. Antennule with peduncle reaching level of midlength of scaphocerite; intermediate segment stout, 0.78-0.94 times as long as distal width; stylocerite reaching distal margin of proximal peduncular segment, relatively broad,

but without prominent convexity; outer flagellum composed of 7-10 articles in females, 16-18 in males. Scaphocerite about 0.5 times as long as carapace, 2.1-2.2 times as long as wide; lateral margin slightly concave or straight; distolateral tooth separated from blade by moderately deep notch, extending as far as distal margin of broadly rounded blade. Dactyls of fourth and fifth pereopods not setose, with dorsal and ventral margins sharply edged.

REMARKS

The rostrum extending as far as the branchiostegal spines and the anterior median spine on the carapace arising from the one-third to half the length of the rostrum make *M. knoxi* very distinct. Further, the absence of setae on the dactyls of the fourth and fifth pereopods is also unique in the group. Regarding the morphology of the ambulatory dactyls, *M. knoxi* approaches species of *Metacrangon* other than the *jacqueti* group (see Komai 1995; personal data).

As Yaldwyn (1960) mentioned, there is considerable variation, within strict limits, in the shape and angle of elevation of the rostrum and anterior median spine on the carapace.

Metacrangon ochotensis (Kobjakova, 1955)
(Figs 1F, 9)

? *Sclerocrangon lomae* – Birshtein & Vinogradov 1951: 359.

Sclerocrangon ochotensis Kobjakova, 1955: 236, fig. 1 [type locality: Ekateriny Strait, southern Kurile Islands, 2850 m]. – Yaldwyn 1960: 38.

Metacrangon ochotensis – Zarenkov 1965: 1764. – Crosnier & Forest 1973: 238.

MATERIAL EXAMINED. — **Southern Kurile Islands.** Holotype: Ekateriny Strait, 2850 m, 28.VIII.1948, 1 ♀ CL 11.5 mm, ZI No. 48793.

SIZE. — ♀ holotype: CL 11.5 mm.

DISTRIBUTION. — Known with certainty only from the type locality in the Okhotsk Sea; 2850 m. This species has a much deeper vertical distribution than other species of the group.

DIAGNOSIS (female)

Rostrum weakly ascending, falling short of tips

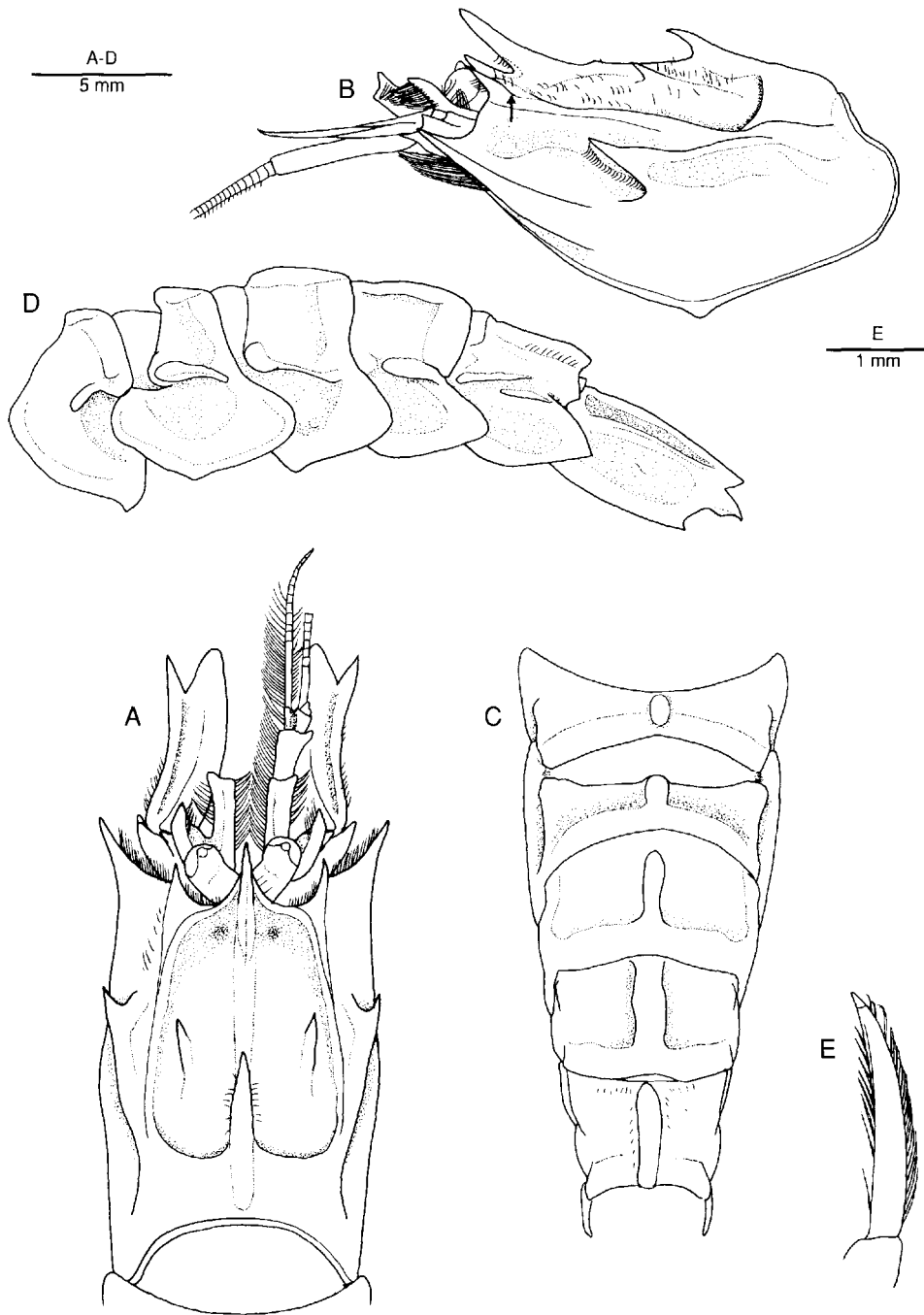


FIG. 9. — *Metacrangon ochotensis* (Kobjakova, 1955), holotype ♀, CL 11.5 mm, Ekateriny Strait, southern Kurile Islands, ZI No. 48793. **A**, carapace and cephalic appendages, dorsal, setae on anterior and mesial margins of scaphocerite omitted, distal two peduncular segments and flagella of left antennule removed; **B**, same, lateral, minute pits on lateral surface not depicted, arrow indicates level of posterior margin of orbit; **C**, anterior five abdominal somites, dorsal, setae omitted; **D**, abdomen, lateral, setae omitted; **E**, dactyl of left fourth pereopod, lateral.

of branchiostegal spines. Carapace with median carina distinct between two median spines; anterior median spine arising from level of posterior margin of orbit, reaching slightly beyond tip of rostrum, at about 30° to line joining base of rostrum and posterodorsal margin of carapace; posterior median spine moderately strong, arising from 0.56 of carapace length, slightly curved; gastric submedian spines strong, bluntly buttressed; branchiostegal spines somewhat divergent anteriorly; hepatic spine moderately strong. First to fourth abdominal somites with prominent, broad, median carina. Fifth abdominal somite with posterodorsal margin weakly produced. Ocular peduncle rather long, about 2.0 times longer than corneal width; cornea not inflated, poorly pigmented. Antennule with peduncle reaching two-thirds length of scaphocerite; intermediate segment 1.5 times longer than distal width; stylocerite falling far short of distal margin of proximal peduncular segment, relatively stout, mesially with prominent convexity; outer flagellum broken off. Scaphocerite 0.58 times as long as carapace and 3.4 times as long as wide; lateral margin noticeably concave; distolateral tooth separated from blade by deep notch, not reaching distal margin of produced and tapered blade. Dactyls of fourth and fifth pereopods setose, with dorsal and ventral margins bluntly edged.

REMARKS

The holotype from the Okhotsk Sea is in very good condition, except that the distal two segments and flagella of the left antennule, the distal part of the outer flagellum of the right antennule and both first pereopods are missing. The following discrepancies are noted between the original description by Kobjakova (1955) and the holotype: the prominent median denticle on the carapace as illustrated by Kobjakova is very small in the holotype; the anterior median spine on the carapace is not slender and is not slightly curved ventrad as indicated by Kobjakova's figure; the branchiostegal spines of the carapace are illustrated as being directed forward by Kobjakova, but they are clearly divergent in the holotype; the blunt ventral tooth of the third abdominal pleuron as

illustrated by Kobjakova is more prominent in the holotype.

The species was originally compared with only *Metacrangon acclivis* (Rathbun, 1902) by Kobjakova (1955), to which it is not closely related. *Metacrangon acclivis* differs from all species of the *jacqueti* group in the absence of a ventral tooth or projection on the first to third abdominal pleuron. The holotype of *M. ochotensis* is characterized by a less ascending anterior median spine on the carapace, well defined, broad median carina on the anterior four abdominal somites, the shortest antennular stylocerite among the *jacqueti* group, which reaches the level of two-thirds length of the proximal peduncular segment, and the distolateral tooth of the scaphocerite separated by a deep notch but not reaching the distal margin of the relatively well produced and tapered blade. The anterior median spine of the carapace, which slightly overreaches the rostral tip, and the conspicuous median carinae on the second to the fourth abdominal somites may link *M. ochotensis* to *M. agassizii*.

Birshtein & Vinogradov (1951) recorded *Sclerocrangon lomae* from the Okhotsk Sea at depths of 1229-1240 m, but they did not give sufficient information on morphology of their material. From the geographical distribution, it is possible that their specimen might actually represent *M. ochotensis* instead.

Metacrangon procax (Faxon, 1893) (Figs 1G, 10)

Sclerocrangon procax Faxon, 1893: 199 [type locality: the type series consists of specimens from four different *Albatross* stations: off Malpero Island, 4°03.0'N - 81°31.0'W, 1618 m; off Acapulco, 16°33'N - 99°52.3'W, 1188 m; Gulf of California, 26°48'N - 110°45.2'W, 1546 m; Gulf of California, 27°34'N - 110°53.4'W, 1629 m]; 1895: 133, pl. 34. - Yaldwyn 1960: 38.

Crago lomae Schmitt, 1921: 100, pl. 12, figs 3, 4 [type locality: off Point Loma, California, 525-974 m].

Metacrangon procax - Zarenkov 1965: 1764. - Méndez 1981: 122, figs 357, 358, pl. 67. - Wicksten 1989: 303, 304, 313. - Wicksten & Hendrickx 1992: 6.

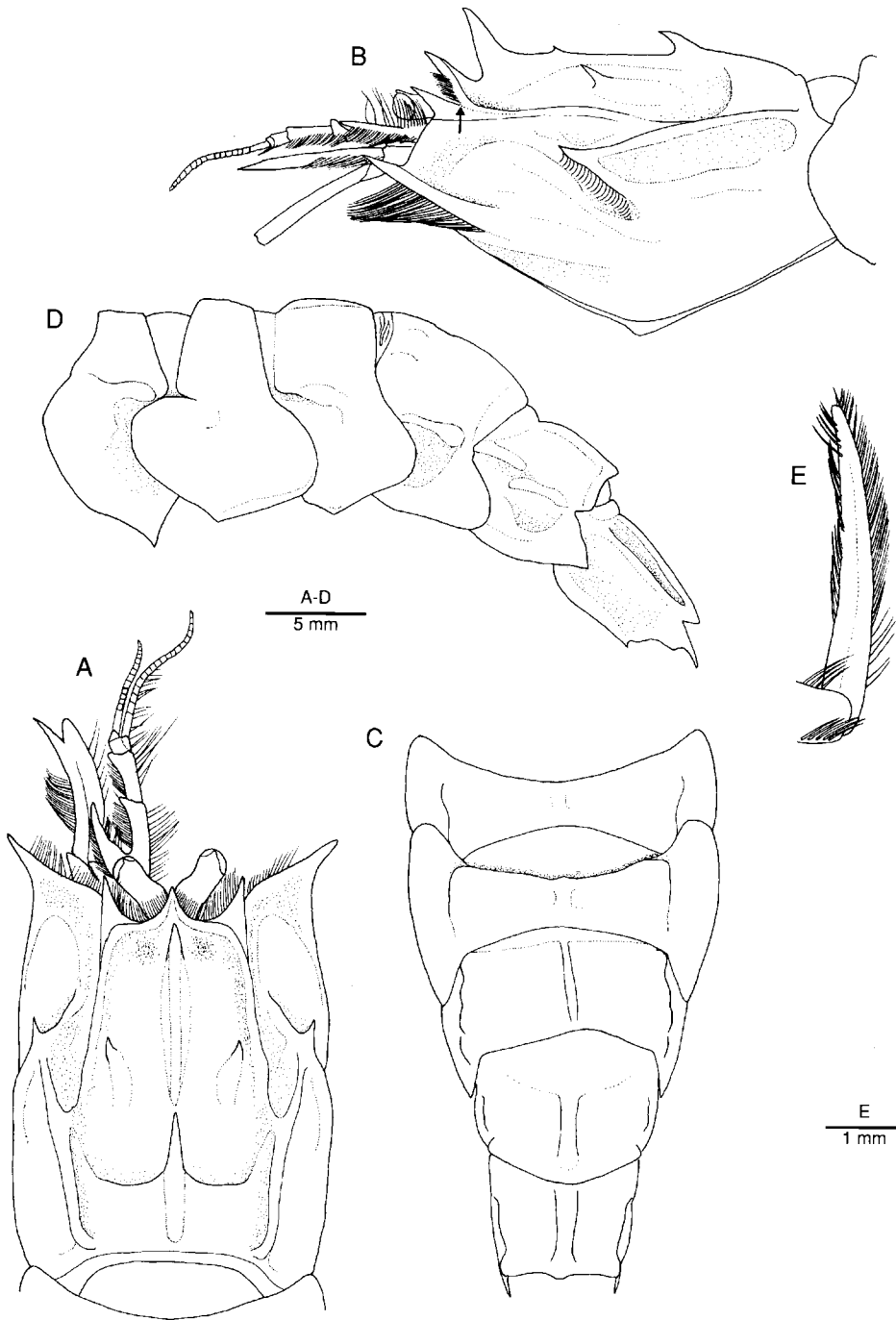


FIG. 10. — *Metacrangon procax* (Faxon, 1893), syntype ♀, CL 16.6 mm, Gulf of California, USNM 21093. **A**, carapace and cephalic appendages, dorsal, right antennule and antenna removed; **B**, same, lateral, minute pits on lateral surface not depicted, arrow indicates level of posterior margin of orbit; **C**, anterior five abdominal somites, dorsal, setae omitted; **D**, abdomen, lateral, setae omitted; **E**, dactyl of left fourth pereopod, lateral.

Metacrangon lomae – Zarenkov 1965: 1764.

? *Crangon lomae* – Wicksten 1989: 303, 313.

Not *Sclerocrangon lomae* – Birshstein & Vinogradov 1951: 359 [= ? *Metacrangon ochotensis* Kobjakova, 1955].

MATERIAL EXAMINED. — **Eastern Pacific.** Syntype of *Sclerocrangon procax*: gulf of California, 26°48'N - 110°45.20'W, 1546 m, *Albatross*, stn 3435, 22.IV.1891, 1 ♀ CL 16.6 mm, USNM 21093.

Paratype of *Crango lomae*: off Point Loma, California, 1150 m, *Albatross*, stn 4353, 14.III.1904, 1 ♀ CL 11.3 mm, USNM 52715.

SIZE. — Largest ♀: 16.6 mm; largest ♂: 9.6 mm (present study; Méndez 1981).

DISTRIBUTION. — California to off Atico, Peru; 800-1629 m (Méndez 1981).

DIAGNOSIS (female)

Rostrum falling short of tips of branchiostegal spines. Carapace with median carina distinct between two median spines; anterior median spine arising from posterior to level of posterior margin of orbit, not reaching tip of rostrum, forming angle of more than 70° with line joining base of rostrum and posterodorsal margin of carapace; posterior median spine moderately strong, arising from 0.62 of carapace length, weakly curved; gastric submedian spines moderately strong, weakly buttressed; branchiostegal spines weakly or strongly divergent. First and second abdominal somites with obsolete median carina, third and fourth somites with conspicuous median carina, carina on third somite narrow. Fifth abdominal somite with posterodorsal margin weakly produced. Ocular peduncles slender, 2.3 times longer than corneal width; cornea small, not inflated, poorly pigmented. Antennule with peduncle reaching three-fourths length of scaphocerite; stylocerite narrow, reaching distal margin of proximal segment, without prominent mesial convexity; intermediate segment slender, 2.0 times longer than distal width; outer flagellum composed of 15 articles. Scaphocerite 0.37 times as long as carapace and 8.4 times as long as wide; lateral margin deeply concave; distolateral tooth separated from blade by moderately deep notch, distinctly overreaching distal margin of relatively narrow blade. Dactyls of fourth and

fifth pereopods relatively long and slender, setose, with dorsal and ventral margins bluntly edged.

REMARKS

One of the six syntypes of *Sclerocrangon procax*, which came from the *Albatross* station 3435, has been available to me. The specimen is still in good condition, except that the right antennule and antenna had been removed, probably for detailed observation. Although Faxon (1895) did not mention or illustrate setae on the ambulatory dactyls, the present examination reveals that they are present.

Metacrangon procax is readily separated from other members of the *jacqueti* group by the considerably reduced scaphocerite.

Schmitt (1921) described a new species of crangonid shrimp, *Crango lomae*, from off Point Loma, California, on the basis of two specimens, one male and one female (the male was designated as holotype). I was able to examine the paratype female of *Crango lomae*, and confirmed that it was referable to the *jacqueti* group of *Metacrangon*. The specimen is considerably damaged: the abdomen is detached from the cephalothorax and is fragmented. I checked the specimen carefully, but could not find any specific difference between it and the syntype of *M. procax*. The scaphocerite of the paratype of *C. lomae* is similar to that of *M. procax* in being greatly reduced. Additionally, the type locality of *C. lomae*, off Cape Loma, California, lies within the known geographical range of *M. procax*. One notable difference is observed in the direction of the branchiostegal spines of the carapace. In the paratype of *C. lomae*, the branchiostegal spines are less divergent than in the syntype of *M. procax*. This difference can be attributed to individual variation, since similar variation is found in other species of *Metacrangon*. There is little doubt that Schmitt's taxon is synonymous with *M. procax*, and the name *Metacrangon procax* has priority over *Metacrangon lomae*. Although Schmitt (1921) mentioned that the fourth abdominal pleuron has an acute posterolateral angle, the posterolateral angle of the fourth abdominal pleuron is rounded in the paratype specimen. *Metacrangon procax* appears to be restricted to

the eastern Pacific from California to Peru. Only a few subsequent records have been made for *Metacrangon lomae* from the Okhotsk Sea (as *Sclerocrangon lomae*; Birshtein & Vinogradov 1951) and San Miquel Island to San Diego, California (as *Crangon lomae*; Wicksten 1989). From the geographical range of the species, Birshtein & Vinogradov's (1951) specimen is probably not *Metacrangon procax*, but might represent *Metacrangon ochotensis* (Kobjakova, 1955).

***Metacrangon similis* n.sp.**
(Figs 1H, 11, 12)

Metacrangon sp. — Toriyama *et al.* 1990: 19, pl. 4a.

MATERIAL EXAMINED. — **Japan.** Holotype: off Owase, Kumano-nada, 34°05.8'N - 136°35.9'E, 369-412 m, baited trap, 6.XII.1995, coll. H. Sekiguchi, 1 ♀, CL 12.6 mm, CBM-ZC 3250.

Paratypes: off Wabuka, Kushimoto, Kumano-nada, 450-500 m, dredge, 27.XII.1990, coll. S. Nagai, 1 ♂ CL 9.1 mm, CBM-ZC 3251. — Off Shionomisaki, Kumano-nada, 1 ♂ CL 12.1 mm, CBM-ZC 3252. — Off Shionomisaki, 450 m, dredge, 25.VII.1991, coll. S. Nagai, 1 ♀ CL 11.4 mm, CBM-ZC 3253. — Off Shionomisaki, dredge, 16.X.1991, coll. S. Nagai, 1 ♂ CL 9.5 mm, CBM-ZC 3254. — Off Shionomisaki, 750 m, dredge, 27.II.1993, coll. S. Nagai, 1 juv. CL 5.3 mm, CBM-ZC 3255. — Off Wabuka, Kushimoto, 550 m, dredge, 20.X.1994, coll. S. Nagai, 1 ♂ CL 8.8 mm, CBM-ZC 3256. — Off Shionomisaki, 600 m, dredge, 15.V.1994, coll. S. Nagai, 1 ovig. ♀ CL 13.3 mm, CBM-ZC 3257. — Off Choshi, Chiba, 400-500 m, commercial trawler, 20.II.1995, coll. T. Komai, 1 ovig. ♀ CL 20.0 mm, CBM-ZC 3258. — Same location as holotype, 2 ♀♀ CL 12.9 and 13.0 mm, 1 ovig. ♀ CL 14.3 mm, CBM-ZC 3259. — Off Shionomisaki, 300 m, dredge, 2.III.1991, coll. S. Nagai, 1 ♂ CL 10.0 mm, 1 ovig. ♀ CL 14.1 mm, MNHN. — Tosa Bay, 33°00'N - 133°35.0'E, 700 m, trawl (RV *Kotaka-Maru*), 24.V.1987, 1 ♂ CL 7.3 mm, 1 ♀ CL 10.0 mm, NNFRI. — Tosa Bay, 660-700 m, trawl (RV *Kotaka-Maru*), 23.V.1989, 1 ♀ CL 10.1 mm, NNFRI. — Off Shionomisaki, 700 m, dredge, 16.VI.1992, coll. S. Nagai, 1 ♂ CL 7.5 mm, 1 ♀ CL 10.6 mm, USNM 278139.

SIZE. — Largest ♀: 20.0 mm; largest ♂: 10.0 mm.

DISTRIBUTION. — Probably endemic to Japan; Pacific coast of Honshu mainland from off Choshi, Chiba, to Tosa Bay; at depths of 450-1000 m.

ETYMOLOGY. — The species is named from the Latin *similis* (similar), referring to the close similarity to some species of the group, particularly to *M. agassizii*.

DIAGNOSIS

Rostrum falling short of tips of branchiostegal spines. Carapace with median carina distinct between two median spines; anterior median spine arising posterior to level of posterior margin of orbit, usually reaching tip of rostrum, forming angle of 60° to over 80° with line joining base of rostrum and posterodorsal margin of carapace, sometimes elongate and slightly overreaching tip of rostrum in males; posterior median spine arising from 0.60-0.69 of carapace length, strong, noticeably curved; gastric submedian spines relatively small, weakly buttressed, sometimes obtuse in males; branchiostegal spines weakly or noticeably divergent. First and second abdominal somites with obsolete median carina, third and fourth somites with conspicuous median carina, carina on third somite relatively broad. Fifth abdominal somite with posterodorsal margin not or noticeably produced. Ocular peduncles stout, 1.12-1.40 times longer than corneal width; corneal region relatively large, weakly inflated, darkly pigmented. Antennule with peduncle reaching two-thirds length of scaphocerite; stylocerite nearly reaching distal margin of proximal peduncular segment, relatively broad, without mesial convexity; intermediate segment stout, 1.09-1.25 times longer than distal width; outer flagellum composed of 10-16 articles in females, 20-30 articles in males. Scaphocerite 0.46-0.51 times as long as carapace and 2.5-2.9 times longer than wide in females, 3.0-3.1 times in males; lateral margin weakly sinuous, proximally with convexity in females, more strongly concave in males; distolateral tooth separated from blade by moderately deep notch, reaching or overreaching distal margin of slightly tapered blade. Dactyls of fourth and fifth pereopods moderately long, setose, with dorsal and ventral margins bluntly edged.

Coloration

In fresh specimen: body entirely dull violet; cornea of eye with dark pigmentation.

In preservative: entirely faded to straw color; cornea of eye with dark pigmentation.

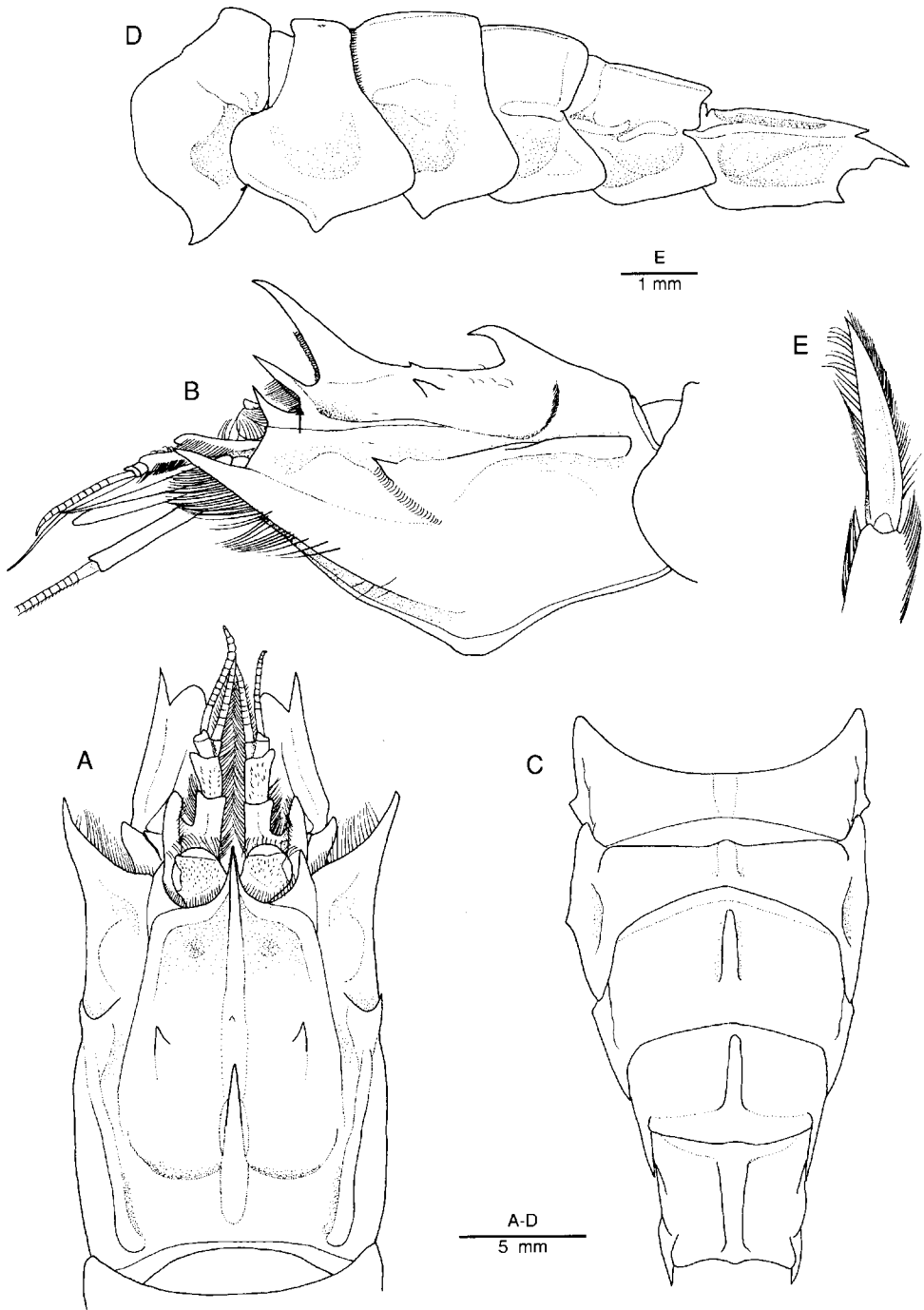


FIG. 11. — *Metacrangon similis* n.sp., holotype ♀, CL 12.6 mm, off Owase, Japan, CBM-ZC 3250. **A**, carapace and cephalic appendages, dorsal, setae on anterior and mesial margins of scaphocerite omitted; **B**, same, lateral, minute pits on lateral surface not depicted, arrow indicates level of posterior margin of orbit; **C**, anterior five abdominal somites, dorsal, setae omitted; **D**, abdomen, lateral, setae omitted; **E**, dactyl of fourth pereopod, lateral.

REMARKS

Like other species of the *jacqueti* group, there are considerable individual variations in the shape and angle of elevation of the rostrum and of the anterior median spine on the carapace. Figures 12A and 12B show extreme examples of the narrowness and broadness of the anterior median spine and the elevation of the rostrum. The development of the pleural ventral tooth on each first to third abdominal somite seems to be subject to a growth change. In all but one speci-

men, the ventral teeth on these abdominal somites are conspicuous, particularly that on the first somite which is strongly produced with an acute or subacute apex. However, in the largest specimen from off Choshi, the pleural teeth are less conspicuous and obtuse. The posterolateral angle of the fifth abdominal pleuron is individually variable from acute to round. Particularly, in the holotype, the left pleuron is rounded posteriorly, but the right one bears an acute posteroventral tooth.

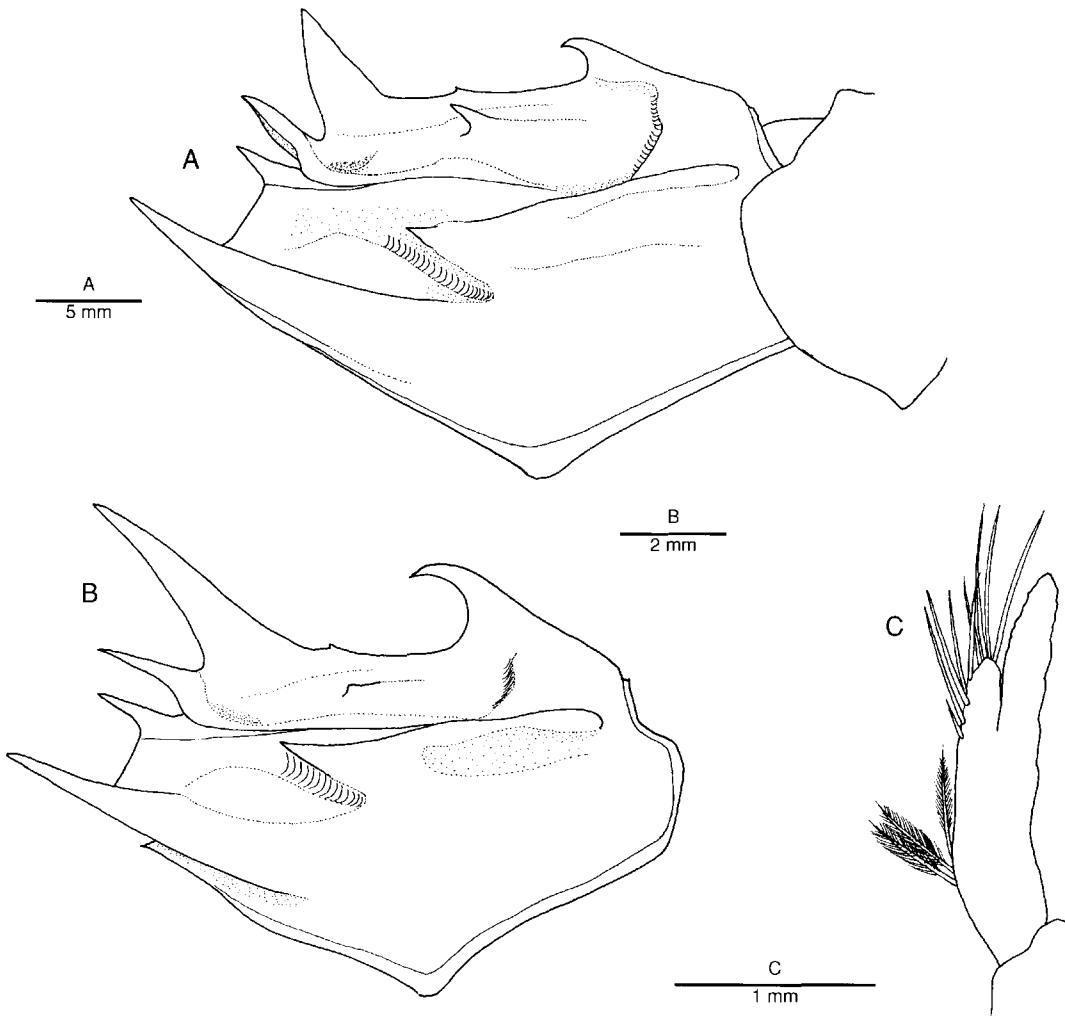


FIG. 12. — *Metacrangon similis* n.sp., paratypes. A, ♀, CL 20.0 mm, off Choshi, CBM-ZC 3258; B, C, ♂, CL 8.8 mm, off Wabuka, Kushimoto, CBM-ZC 3256. A, B, carapace, lateral, setae omitted; C, endopod and appendix masculina of left second pleopod, ventromesial.

Metacrangon similis appears to be very close to *M. agassizii* (see "Remarks" under *M. crosnieri* n.sp.). Nevertheless, the new species is distinguished from *M. agassizii* in the following points. The anterior median spine on the carapace arises posterior to the level of the posterior margin of orbit in the new species; in *M. agassizii*, it arises anterior to or just the level of the posterior margin of orbit. The scaphocerite is more slender in *M. similis* than in *M. agassizii* (for example, in females, 2.5-2.9 times longer than wide vs 2.2-2.4 times). The cornea of the eye is larger in *M. similis* than in *M. agassizii*.

The present material contains the specimens from Tosa Bay, Shikoku, reported by Toriyama *et al.* (1990) as *Metacrangon* sp.

BIOGEOGRAPHY

GEOGRAPHICAL DISTRIBUTION

Widely separated or scattered occurrences of the eight recognized species of this species group in the world's oceans (Fig. 13) are of particular interest from both zoogeographical and evolutionary perspectives. Of the eight known species of the group, three show wide longitudinal distribution: *M. agassizii* ranges from off New Foundland to French Guiana; *M. bellmarleyi* from West African coast off Congo to South Africa, including the Indian Ocean coast; and *M. procax* from California to Peru. On the other hand, the remaining five species apparently have very restricted distributions: *M. jacqueti* occurs only in European waters; *M. ochotensis* only in the southern part of the Okhotsk Sea; *M. knoxi* in Chatham Rise, New Zealand; *M. crosnieri* in Madagascar; and *M. similis* in the Pacific coast of Southwest Honshu, Japan. It is remarkable that no representative of the group has been recorded from the tropical western Pacific region, which is considered to be a species center. It is also noteworthy that they are distributed in the Atlantic, Pacific and Indian Oceans, while other members of the genus are mostly restricted to the North Pacific Ocean; only *M. richardsoni* (Yaldwyn, 1960) has been known from the southern hemisphere, Chatham Rise, New Zealand (Yaldwyn 1960; Zarenkov 1965; Butler 1980). As noted

before, it is very possible that the eight species belonging to the *jacqueti* group form a monophyletic assemblage since the characteristics shared by the species, such as the anterior median spine on the carapace strongly developed and at least partially overhanging the rostrum, and the presence of a single tooth or projection on each ventral margin of the first to the third abdominal pleura, are absent not only in other *Metacrangon* but in other phylogenetically related genera, such as *Argis* Krøyer, 1842, *Sclerocrangon* G. O. Sars, 1883, *Rhynocrangon* Zarenkov, 1965, and *Mesocrangon* Zarenkov, 1965 (Christoffersen 1988; personal data). The present distributional pattern of the species of this group suggests that they are relict species from an originally wider Tethyan distribution. Subsequent geological changes have left isolated populations on continental slopes. The species of *Metacrangon* have been known to produce large and few eggs (Zarenkov 1965; Fujino & Miyake 1970; Butler 1980; Komai 1995), and *M. sinensis* Fujino *et* Miyake, 1970, has been documented to have a highly abbreviated larval development (Fujino & Miyake 1970). This developmental pattern may limit each species from gaining a wide distribution during the larval stages, and is thus assumed to have contributed to the isolation between the geographically separated populations.

VERTICAL DISTRIBUTION

All species of the *jacqueti* group of *Metacrangon* are bathyal, and most of them occur on the continental slope extending beyond 450 m to depths as great as 1629 m. *Metacrangon ochotensis*, which is represented with certainty only by the holotype collected at a depth of 2850 m, seems to have a much deeper vertical distribution than the other species of the group. It is noteworthy that the species extending their vertical distribution to depths shallower than 500 m (i.e., *M. agassizii*, *M. jacqueti*, *M. knoxi* and *M. similis*) have more darkly pigmented eyes than the species confined to depths greater than 595 m (i.e., *M. bellmarleyi*, *M. crosnieri*, *M. ochotensis*, and *M. procax*). It can be assumed that the reduction of pigmentation of the eyes is the result of adaptation to a bathyal life.

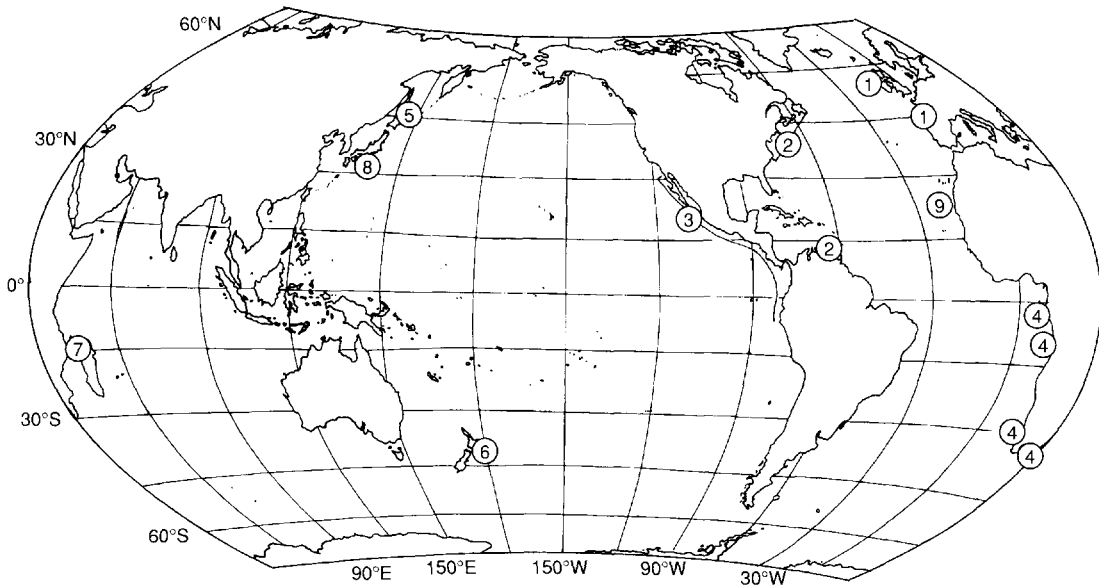


FIG. 13. — Map showing geographical distribution of the *jacqueti* group of *Metacrangon*. 1, *M. jacqueti*; 2, *M. agassizii*; 3, *M. procax*; 4, *M. bellmarleyi*; 5, *M. ochotensis*; 6, *M. knoxi*; 7, *M. crosnieri* n.sp.; 8, *M. similis* n.sp.; 9, *M. aff. bellmarleyi*.

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