

Fig. 5. *Austinograea yunohana* sp. nov., both chelae of ♂ (paratype, NSMT-Cr 13657; cb 20.6 mm) from Kaikata Seamount, in outer and upper views, respectively. Scale=1 cm.

at posterior one third, but this is not indicative of the vestigial tooth.

Chelipeds heavy, slightly dimorphic just like and not much different from those of holotype male; merus shorter, main part disguised under anterolateral margin of carapace; fingers of larger (right) chela leave a narrow gape, with some conical teeth along cutting edges; two teeth of movable finger and one of immovable finger corresponding to those of the holotype male are more prominent than the others; colored part of fingers weakly swollen and raised.

Abdomen seven-segmented, covering whole sternal surface, but not circular in outline, with lateral margins from fourth to median part of sixth segments being parallel to each other. Genital opening big, with an overhanging knobbed tubercle from anterior edge.

*Notes on paratypes* (Adult males and females: Figs. 3, 4A, B, D, E, 5, 6). Eleven specimens in all, 6♂♂ (20.6×13.6 mm–38.0×24.9 mm), 5♀♀ (31.5×20.5 mm–38.3×25.2 mm), cl/cb ratio being 0.65–0.67 in both sexes. The general formation of the carapace, chelipeds and ambulatory legs agrees well with those of the male holotype and female allotype; the proportion of the carapace is quite constant, with the evenly convex and weakly granulated dorsal surface; each anterolateral border of the carapace is regularly convex, without indication of teeth or lobes. The orbit and eyestalk are typical for this species; the orbit is a transverse cavity, with the flattened anterior and posterior floors, just like in the holotype and allotype; the eyestalks are somewhat variable in size, growing thicker distally, and convex ventrally in some specimens, although the eyestalks are completely fixed and immovable in all the paratype specimens.

Both chelipeds are dimorphic distinctly in male and slightly in females, longer and heavier in male like in the holotype and allotype; four of six males and four of five females are right-handed; dentition of the fingers is fairly constant, although the fingers are heavily worn down in some specimens, with the blunt cutting or grasping edges and tips.

*Notes on additional specimens* (Small specimens: Fig. 4C, F). Twelve specimens in all, 11 ♂♂ (5.4×4.0 mm, 6.4×4.6 mm–16.3×11.0 mm, 17.3×11.7 mm), 1 ♀ (12.4×8.6 mm), cl/cb ratio being 0.68–0.69 except for the smallest two specimens in which the ratio is 0.72 and 0.74. In the biggest male, the first and second pleopods seem to be fully grown, but the second biggest male has the flexible pleopods in spite of their enough lengths, with their tips only rounded. There may be a critical size for the sexual maturity around this size. In general, these specimens have the carapaces narrower than in the adult specimens, as shown by the difference in the cl/cb ratio (0.68–0.69 in the small specimens versus 0.64 in the holotype and allotype, and 0.65–0.67 in the paratypes). In the smallest two males in which the first and second pleopods are very short, the carapaces are apparently narrower, with frontorbital and anterolateral margins fringed with minute, sharp granules.

In these specimens the carapace appears to be very close to that of the adult specimens except for the proportional differences; in some specimens the anterolateral margins are narrowly rimmed with sharp granules. In most of the specimens the orbit is shallower than in the adult specimens, and distinctly edged and delimited from the orbital floor along the lower margin of the eyestalk; the eyestalk is thicker than in the adult specimens, with the truncated cornea, and sometimes seen partly from above, although fixed and immovable even in the smaller specimens.

Even in the 7.4 mm young male in which the first pleopod is still very short, ca. 1/3 as long as the abdominal trench, both chelipeds are different in size and shape, but covered with small, somewhat scaly granules and scant short hairs. The proximal part of inner surface of the palm is convex, but not so sharply angulated as in the adult chelae. The male abdomens of these young specimens are not much different from those of the adult specimens, having a pair of buttons at sixth sternite.

*Remarks.* In establishing a new genus *Austinograea* based on a new species *A. williamsi*, Hessler and Martin (1980) mentioned the characters of generic importance in the family Bythograeidae, and referred three characters to the new genus, viz., 1) eyestalk is absent or merely fused portion of the orbital wall, 2) posterolateral extension of the coxa of the third maxilliped is entirely inserted to the gill chamber so as to be not seen in ventral view, and 3) male first pleopod is relatively straight and not twisted, and the second pleopod is distinctly shorter than the first. Additional one more character, the movable finger with the recessed ventral border bearing dense setae, was also put into the key to distinguish the new genus from three known genera, *Bythograea*, *Cyanograea* and *Segonzacia*.

In *A. alayseae* described by Guinot (1990) as the second species of *Austino-*

*graea*, the eyestalk is firmly fixed to orbital floor, but its distal part is more or less thickened and raised, distinctly different from the condition seen in the type species, *A. williamsi*, and very close to the case of the new species just described, *A. yunohana*. In *A. alayseae* as well as *A. yunohana*, the smaller chela (the so-called cutter) is, even in the smaller males, not so sharply toothed, on the cutting edges as in *A. williamsi*, without setae on the inner surface of the movable finger. Accordingly the presence or absence of the setae on the movable finger is subjected to the specific level.

In both of *A. williamsi* and *A. alayseae*, the male second pleopods are about half the length of the first, having a small, oval field fringed with wrinkled setae at one third distinct from the whippy tip (Hessler & Martin, 1989; Guinot, 1990; Tsuchida & Fujikura, 2000). In *A. yunohana*, however, the male second pleopod is apparently longer than those of these two species, and nearly as long as, or only slightly shorter than, the first, with the whip being as long as the grip (Figs. 4a, 5b). In general, as already mentioned by Guinot (1990), the length of the male second pleopods are of phylogenetic importance at the generic or even familial ranks, as in the cases of the genera *Globopilumnus* Balss of the Menippidae and *Pilumnoides* Lucas of the family Xanthidae (Guinot-Dumortier, 1960; Guinot & Macpherson, 1987). At least, regarding the length of the male second pleopod, it is definitely said that the new species described in this paper, in which the male second pleopod is distinctly longer than half the length of the first, but does not exceed the tip of the first, is within the range of a same genus with the two species described previously, in which the male second pleopod of each species is about half the length of the first. *Austinograea williamsi* Hessler et Martin is specifically quite distinctive in the depressed body, the completely degenerated eyes and eyestalks, the dimorphic male chelipeds having the merus armed with a series of spines on the anterior margin, the deep immovable finger, two or three prominent spiniform teeth interspersed by some smaller teeth on the cutting edges of the immovable finger, and the dense setae on the inner side of the chela.

The new species, *A. yunohana*, is without doubt close to *A. alayseae* than to *A. williamsi* in the general formation of the carapace, the degenerate condition of the eyestalk, and the shape of the chelipeds. The proportional ratio of length and width of the carapace is nearly the same in the new species and *A. alayseae*, but in the new species the posterolateral margin of the carapace is more strongly convergent toward the posterior margin of the carapace and rather concave at its median part, with the posterolateral surface being rather strongly concave. In *A. alayseae* the sixth segment of the male abdomen is one and half as long as the fifth segment, and there is a cavity at distal part of the abdominal trench, while in the new species the sixth segment is equal in length to the fifth segment, and there is no cavity in the abdominal trench at the place corresponding to the cavity of *A. alayseae*. The male first pleopod is almost unarmed in the new species, but strongly armed with spiniform setae along the margins for whole length in *A. alayseae*. Otherwise, as mentioned above, in the new

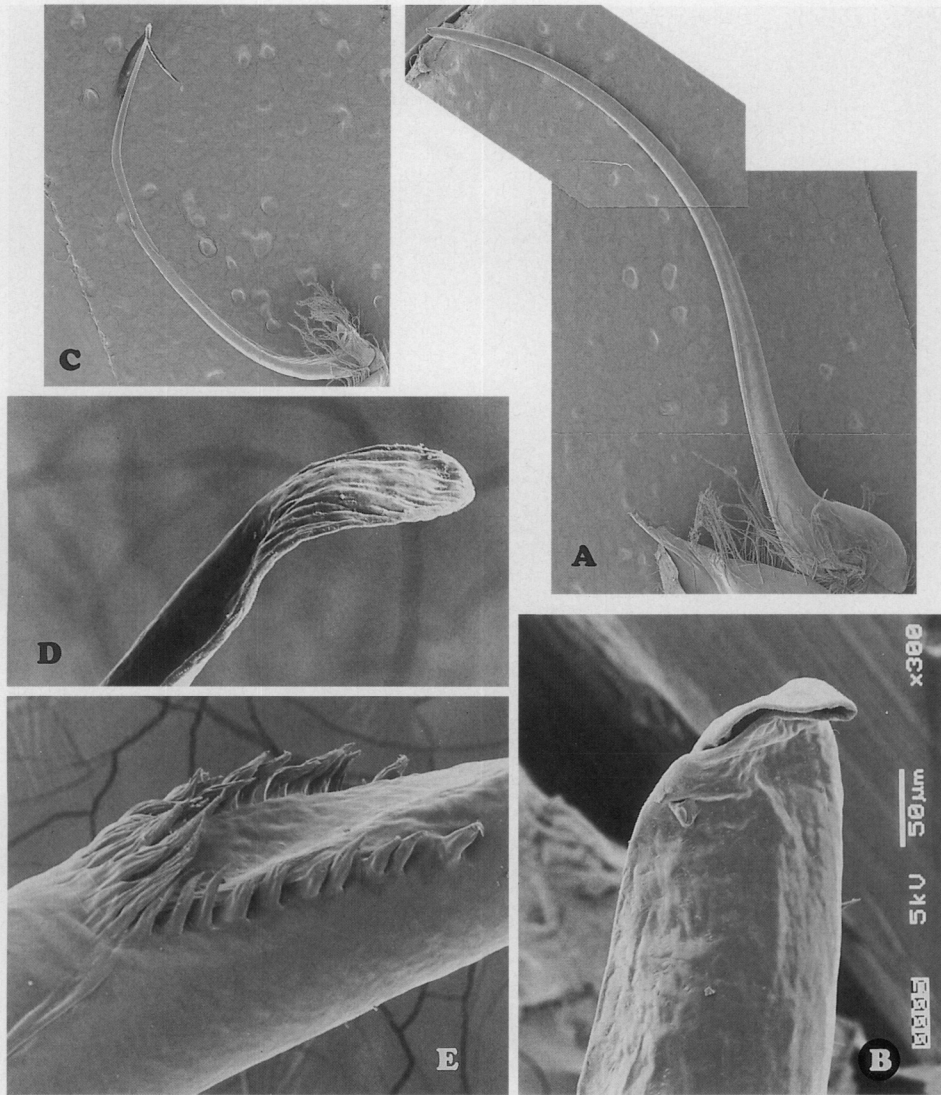


Fig. 6. *Austinograea yunohana* sp. nov. SEM photograph of left first (A, B) and second (C–E) pleopods of ♂ (cb 33.8 mm) from Kaikata Seamount. Scale for B is also applied to D and E.

species the male second pleopod is filiform and nearly as long as the first, differing from that of *A. alayseae* in which the second pleopod is nearly half the length of the first. It is apparent that this difference in the comparative length of the male second pleopod is quite distinctive and not dependent on the individual or developmental variations. The holotype male and allotype female of *A. alayseae* are 16×24 mm and 21×32 mm in size, respectively, although the original author designated many, much