

# AMERICAN MUSEUM *Novitates*

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY  
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, NY 10024

Number 3410, 7 pp., 2 figures

May 22, 2003

## A New Species of *Albunione* Markham & Boyko, 1999 (Crustacea: Isopoda: Bopyridae: Pseudioninae) from Taiwan

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### ABSTRACT

A third species in the bopyrid genus *Albunione* Markham and Boyko, 1999, is described: *Albunione yoda*, new species, infesting the sand crab *Albunea groeningi* Boyko, 2002 (Decapoda: Hippoidea: Albuneidae) on the western coast of Taiwan. *Albunione* includes all bopyrid species known from hosts in the genus *Albunea*, its subfamily, and family. Remarks are made about the morphological characters of the genus and, in light of a reconsideration of its characters, *Albunione* is transferred from the bopyrid subfamily Ioninae to the subfamily Pseudioninae. An emended diagnosis for the genus is presented. Comments on the phylogenetic relationships and possible coevolution between the parasites and hosts are provided.

### INTRODUCTION

While making a systematic revision of the anomuran family Albuneidae (Boyko, 2002), one of us (CBB) came across a specimen from Taiwan infested by a bopyrid parasite which represented an undescribed species of the genus *Albunione* Markham and Boyko, 1999. The material is in the collection of the National Taiwan Ocean University (NTOU),

Taipei, Taiwan, Republic of China. The two previously reported species of this genus, *A. indecora* (Markham, 1988) from the tropical western Atlantic Ocean, and *A. australiana* Markham and Boyko, 1999, from the coast of Queensland, Australia, are the only previously known bopyrid parasites of hosts in either the anomuran genus *Albunea* Weber, 1795, the family Albuneidae, or the superfamily Hippoidea. (For a discussion of all

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parasites of albuneids, see Boyko, 2002.) The abbreviation CL is used for the carapace length of the host crabs.

FAMILY BOPYRIDAE RAFINESQUE-SCHMALTZ,  
1815

SUBFAMILY PSEUDIONINAE CODREANU, 1967

*Albunione* Markham and Boyko, 1999

TYPE SPECIES: *Ione indecora* Markham, 1988, by original designation.

EMENDED DIAGNOSIS: *Female*. Body somewhat longer than broad, only slightly distorted, subquadrilateral in outline. Head greatly expanded into lateral flap; barbula with two processes on each side. Maxilliped with prominent palp and long slender plectron. Oostegite 1 with tuberculate internal ridge and broad, curved posterolateral projection. Brood pouch closed. Pereopods 1–4 all about same size, pereopods 5–7 progressively larger, pereopod 7 with very long basis. Pleon with six distinct pleomeres: pleomeres 1–5 produced into long slender biramous pleopods and uniramous lateral plates; pleomere 6 with uniramous or biramous uropods. *Male*. Body more than three times as long as broad. Head distinct from pereon, not abruptly narrower than pereon. Second antennae long and extended beyond margin of head. No midventral tubercles on pereon or pleon. Pereopods all about the same size, but dactyli smaller and bases larger from anterior to posterior. Pleon of six pleomeres, progressively narrower posteriorly, with final three either simple or greatly extended into complex lateral plates. Pleopods lacking or extremely reduced. Uropods present, elongate, or reduced. Host species in *Albunea* (Albuneidae).

DISCUSSION: Some of the characters of the male, particularly those of the head and first three pereomeres, are unknown for *A. yoda*.

*Albunione yoda*, new species

Figures 1, 2

“undescribed species of *Albunione*” Boyko, 2002: 303.

MATERIAL EXAMINED: Infesting right branchial chamber of paratype female *Albunea groeningi* Boyko, 2002 (11.2 mm CL). Kao-hsiung, Taiwan, Republic of China, 22°37'N,

120°15'E, 25 m, 07 June 1992, coll. T.-Y. Chan: 1 female, holotype (NTOU H-1992-6-7a); 1 damaged male, allotype (NTOU A-1992-6-7a).

DESCRIPTION OF HOLOTYPE FEMALE (fig. 1): Body length 8.6 mm, maximal width 5.6 mm, head length 1.8 mm, head width 3.7 mm, pleon length 2.3 mm, body distortion 10°, dextral. All body regions and segments distinct. Body outline ovoid, broadest anteriorly (fig. 1A, B); no pigmentation.

Head deeply set into pereon, nearly straight across anterior margin, pentagonal in outline exclusive of lateral extensions, lacking frontal lamina. Long, extended, blunt-ended anterolateral projections of head forming slightly convex anterior margin, nearly covering margins of pereomere 1. Eyes lacking. Antennules and antennae (fig. 1C) of three and five articles respectively, each article much smaller distally than the preceding one, terminal articles sparsely setose distally. Maxilliped (fig. 1D) with anterior article much larger than posterior one and offset laterally from it, anterior margin deeply notched and bearing sparse fringe of setae; palp (fig. 1E) distinctly articulating with maxilliped, arising from anterior margin near medial corner and curved anteromedially. Plectron of maxilliped (fig. 1F) long and slender, pointing straight forward. Barbula (fig. 1G) with two broad unornamented bluntly rounded projections on each side pointed straight backward, median region simple.

Pereomeres all of about same length, posterior margins of first two strongly undulate, others variable but only slightly convex anteriorly. Coxal plates completely covering both sides of each pereomere, those on longer side of body about twice as wide as those on shorter side. Tergal projections on anterolateral corners of pereomeres 2–4. Oostegites strongly overlapping each other and completely enclosing brood pouch. First oostegite (fig. 1H, I) approximately twice as long as broad, semicircular anteriorly, with broad, short, straight posterolateral projection; internal ridge crooked, deeply digitate. No setae on posterior margins of fifth oostegites. Pereopods (fig. 1J–L) all visible dorsally, none extending beyond body margins, all articles, especially carinate bases, larger posteriorly;

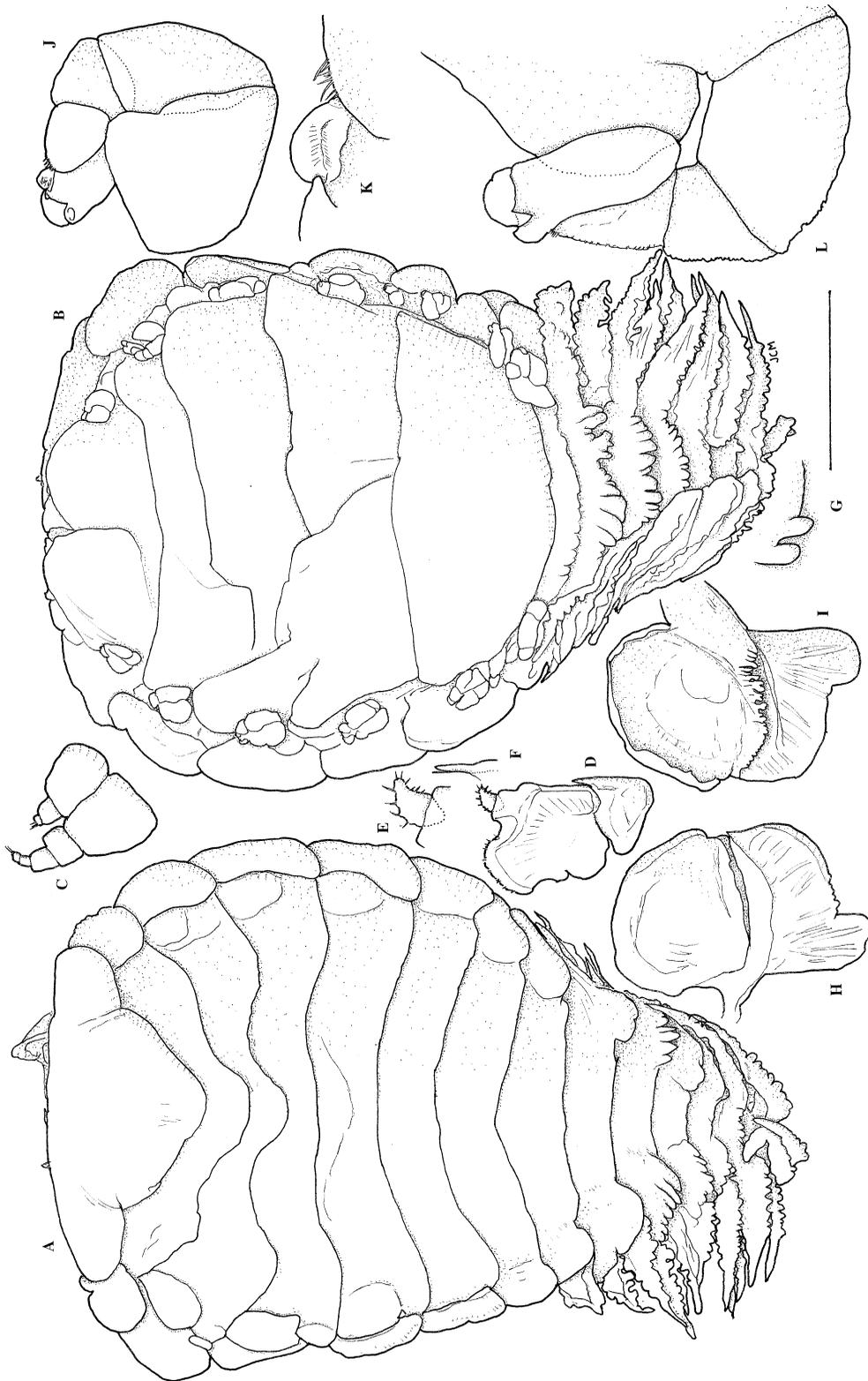


Fig. 1. *Albunione yoda*, new species, holotype female (NTOU H-1992-6-7a). **A.** Dorsal view. **B.** Ventral view. **C.** Right antenna. **D.** Right maxilliped. **E.** Palp of same. **F.** Plectron of same. **G.** Right side of barbula. **H.** Right oostegite 1, external. **I.** Same, internal. **J.** Right pereopod 1. **K.** Distal regions of carpus and dactylus of same. **L.** Right pereopod 7. Scale: 2.0 mm for A, B, D, H, I; 1.0 mm for C, E-G; 0.35 mm for J, L; 0.18 mm for K.

each propodus (fig. 1K) produced anteriorly into extended cuplike structure deeply grooved to receive distal part of dactylus.

Pleon of six pleomeres distinct both dorsally and ventrally; pleomeres 1–4 dorsally produced into dorsally extending lobe on each side, some lobes rounded and others variously divided; pleomeres 1–3 have deeply digitate crooked margins ventrally. Extended uniramous lateral plates on pleomeres 1–5, those on short side of body much more extended; lateral plates 1–4 with strongly serrated edges, lateral plate 5 appearing as simple stubby club. Five pairs of biramous pleopods, their rami all approximately the same size and structure as lateral plates, those on short side extended laterally, those opposite reflexed over ventral surface of pleon. Uniramous uropods of same size and structure as pleopodal rami.

DESCRIPTION OF ALLOTYPE MALE (specimen damaged, lacking head and pereomeres 1–3) (fig. 2): Total body length unknown; maximal width 0.87 mm, pleon length 1.27 mm. Body long and slender, sides nearly parallel. Pereomeres and pleomeres deeply divided laterally (fig. 2A, B). Small spots of pigmentation on dorsal surface of pereomere 5 and ventral surfaces of pleomeres 1–3.

Pereomeres connected only across median half of each, their sides bluntly rounded. No midventral tubercles. Pereopods long and slender, many extending well beyond margins of body. All pereopods with all articles distinct, size decreasing posteriorly (fig. 2C, D); carpi each with tuft of long setae distally.

Pleon of six pleomeres, first two similar in size and shape to pereomeres, third one with sharply angled sides, pleomeres 4–6 extended into long lanceolate lateral plates, those of pleomere 5 double, others single; pleomere 6 ending in narrow and slightly extended anal cone. Pleopods definitely present as ventral globose swellings on pleomere 4 with ambiguous structures (possibly pleopods) on pleomeres 5 and 6 (fig. 2E).

ETYMOLOGY: Specific name *yoda* after the Jedi Master Yoda of the Star Wars saga, in recognition that the slightly curved long lateral extensions of the female's head resemble the head shape of Yoda with his long drooping ears.

DISCUSSION: This is the first record of in-

festation of *Albunea groeningi*, which is currently known to range from southern Japan southward in a narrow band to Western Australia and Victoria, Australia, to a depth of 45.7 m (Boyko, 2002); the paratype host of *Albunione yoda* was collected at a depth of 25 m. To date three species of the genus *Albunea* have been recorded as hosts of bopyrids, all of which belong to the genus *Albunione*. *Albunione indecora* (Markham, 1988) infests *Albunea paretii* Guérin-Méneville, 1853, in the Caribbean Sea, and *Albunione australiana* Markham and Boyko, 1999, infests *Albunea microps* Miers, 1878, off the coast of Queensland, Australia. As with *A. yoda*, the other two parasites are known from only a small portion of their hosts' ranges. Characters that females of all three species share are: body nearly straight, broadest near anterior end; head greatly expanded into distinctive lateral flaps (a synapomorphy for this genus), eyes lacking; barbula with two simple projections on each side; maxilliped with extended palp and sharp slender plectron; both sides of all pereomeres completely covered by coxal plates, those on longer side much wider; first oostegite semicircular anteriorly, produced into short blunt point posterolaterally, with deeply divided internal ridge; pereopods much larger posteriorly, each with carpus produced into distal cup for receiving end of dactylus; all pleonal appendages tightly compacted and extending laterally, their rami with digitate margins.

Males of all three species are long and slender, with pereomeres and pleomeres deeply separated, all pereopods of nearly the same size, with six pleomeres having pleopods either absent or very reduced in number. *Albunione yoda* differs from the other two species in the lateral extensions of the female's head, which are relatively narrower than in the other species; its maxillipedal palp is uniquely articulating and forward, not medially projecting; the projections on the barbula are blunt rather than pointed; the inner margin of the first oostegite is deformed concavely; the proximal regions of some of its pleomeres are deeply divided; and its uropods are uniramous, not biramous. In many features of the female, *A. yoda* resembles *A. indecora* more than *A. australiana*, including the shapes of the head, maxilliped, and pe-

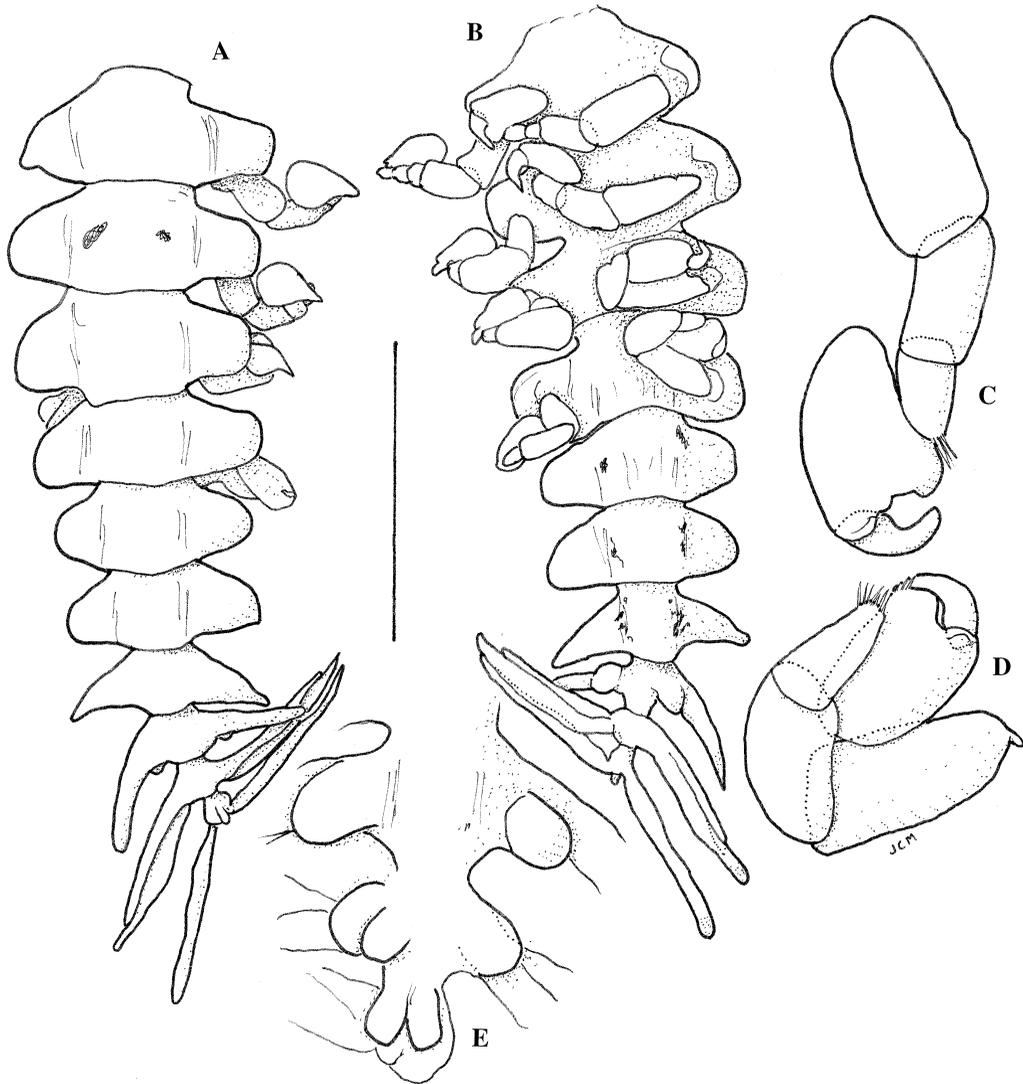


Fig. 2. *Albunione yoda*, new species, allotype male (NTOU A-1992-6-7a). **A.** Dorsal view. **B.** Ventral view. **C.** Left pereopod 4. **D.** Left pereopod 7. **E.** Pleomeres 4–6, ventral view. Scale: 1.00 mm for A, B; 0.35 mm for C–E.

reopod 7, although its first oostegite is much more like that of the female of *A. australiana*. The male of *A. yoda*, in having some of its pleomeres produced into distinctive long lateral projections, is much more like that of *A. indecora* rather than *A. australiana*, whose male completely lacks such projections. Also, like *A. indecora*, *A. yoda* possesses a reduced number of pleopods. The male of *A. yoda* differs from those of both previously described species in having some pereopodal

carpi and meri fused and in bearing a very prominent anal cone.

Comparison of males and females of all three species indicates that *A. indecora* and *A. yoda* more closely resemble each other than either does *A. australiana*, and should be regarded as sister species. Interestingly, the relationships among the species of *Albunione* parallel those of their hosts. Each of the three host species, *Albunea paretii*, *A. microps*, and *A. groeningi*, belong to different

species groups within the genus *Albunea* (Boyko, 2002). *A. microps* belongs to a group of three species (also including *A. elioti* Benedict, 1903, and *A. galapagensis* Boyko, 2002) which is the sister group to most other *Albunea* species (Boyko, in prep.). These similar phylogenetic patterns of relationship imply a strong degree of coevolution between the hosts and their parasites.

PLACEMENT OF *ALBUNIONE*: The type species, *A. indecora*, was originally described as a species of *Ione* Latreille, 1818, but showed anomalies of structure and host selection that prompted its being named *I. indecora* (Markham, 1988). Upon reconsideration of the species (Markham and Boyko, 1999), we decided that it could not be retained in *Ione*, but kept it in the subfamily Ioninae, of which *Ione* is the type genus. No other member of that subfamily is known to infest any anomuran host, most being parasites of brachyurans and several of thalassinideans, which were at one time placed in the Anomura, but are now excluded from that infraorder (e.g., Martin and Davis, 2001).

Codreanu (1967) erected the Pseudioninae, but did not give many characters useful in the separation of this subfamily from the Ioninae. In fact, the only invariable difference he cited was in the form of the male pleopods, which were present (i.e., not reduced) in the Ioninae, but reduced ("more or less") in the Pseudioninae. In his key to subfamilies of the Bopyridae, Bourdon (1968) distinguished between females of "Groupe *CEPON*" (= Ioninae) and "Groupe *PSEUDIONONE*" (= Pseudioninae) by stating that in the former the pleonal lateral plates are always very elongate, their margins digitate or strongly tuberculate, with at least the first ones directed toward the front of the body. In contrast, females of Pseudioninae have lateral plates with nearly smooth margins and all are directed laterally or posteriorly; further, their coxal plates are but little developed and all alike, and the frontal laminae of their heads are reduced (translated and slightly paraphrased from the French). By the criteria given by Codreanu (1967) and Bourdon (1968), it appears that *Albunione* should be considered a member of the Pseudioninae, even though the females of the genus have lateral plates with more or less digitate mar-

gins. As a member of the Pseudioninae, *Albunione* infests anomuran hosts as is typical of members of that subfamily. Females of *Albunione* are primarily distinguishable from all others in the Bopyridae by the unique lateral enlargements of their heads, and also by the posterior enlargements of the distal regions of their lateral plates. Males of *Albunione indecora* and *A. yoda* (but not *A. australiana*) have posterior pleomeres uniquely produced laterally.

Because the reduction and fusion of body regions and appendages are considered to reflect more advanced evolution in genera of the Bopyridae (Markham, 1986), it would appear that *Albunione*, with both sexes having distinctly separated pereomeres and six pleomeres, and the females of some species having biramous pleopods, is among the more primitive genera. Still, it is not the most primitive, because some females have non-articulating maxilliped palps and only five pairs of oostegites, and males show some fusion of pereopodal articles and lack nearly all pleopods.

#### ACKNOWLEDGMENTS

Dr. Tin-Yam Chan (NTOU) kindly made the material available for study and provided information about its collection. Dr. Iorgu Petrescu ("Grigore Antipa" National Museum of Natural History, Bucharest, Romania) provided a translation of portions of Codreanu (1967) from the original Romanian. Thanks to George Lucas and Frank Oz for much inspiration.

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