FERRARI, F. D. & J. ORSI, 1984. Oithona davisae, new species, and Limnoithona sinensis (Burckhardt, 1912) (Copepoda: Oithonidae) from the Sacramento-San Joaquin Estuary, California. Journ. Crust. Biol., **4**: 106-126.

FLEMINGER, A., 1975. Geographical distribution and morphological divergence in American coastal-zone planktonic copepods of the genus Labidocera. Estuarine Res., **1**: 392-419.

GRINDLEY, J. R. & G. D. GRICE, 1969. A redescription of Pseudodiaptomus marinus Sato (Copepoda, Calanoida) and its occurrence at the Island of Mauritius. Crustaceana, **16**: 125-134.

JOHNSON, M. W., 1958. Observations on inshore plankton collected during summer 1957 at Point Barrow, Alaska. Journ. Mar. Res. Board Canada, **17**: 272-281.

JONES, E. C., 1966. A new record of Pseudodiaptomus marinus Sato (Copepoda, Calanoida) from brackish waters of Hawaii. Crustaceana, **10**: 316-317.

ORSI, J. J., T. E. BOWMAN, D. C. MARELLI & A. HUTCHINSON, 1983. Recent introduction of the planktonic calanoid copepod Sinocalanus doerrii (Centropagidae) from mainland China to the Sacramento-San Joaquin Estuary of California. Journ. Plankton Res., **5**: 357-375.

SATO, T., 1913. Pelagic Copepoda, 1. Rep. Fish. Invest. Hokkaido Fish. exp. Sta., **1**: 1-79. (In Japanese).

SHEN, C. & S. BAI, 1956. The marine Copepoda from the spawning ground of Pneumatophorus japonicus (Houttuyn) off Chefoo, China. Acta Zoologica Sinica, **8**: 177-234.

WILLEY, A., 1920. Report on the marine Copepoda collected during the Canadian Arctic Expedition. Report of the Canadian Arctic Expedition, 1913-18, **7** (Crustacea, Part K. Marine Copepoda): 1-46.

WYLIE, F. V. H., 1983. South America ports handbook: 1-658. (Agencia Maritima Internacional S.A., Buenos Aires).

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A LATE EMBRYO OF THE DEEP WATER SHRIMP *PSALIDOPUS BARBOURI* CHACE, 1939 (DECAPODA, CARIDEA)

BY

JOEL W. MARTIN

Department of Biological Science, Florida State University, Tallahassee, Florida, 32306, U.S.A.

The phylogenetic relationships of the deep-sea genus *Psalidopus* Wood-Mason & Alcock, 1892, are not known. Shrimps of this genus differ sufficiently from those of other caridean genera to warrant their placement in a separate family, the Psalidopodidae Wood-Mason & Alcock. Alcock (1901) elevated this family to superfamily rank, thereby creating a superfamily (Psalidopoida, now Psalidopoidea) consisting of a single family (Psalidopodidae) which contains one genus, *Psalidopus*. The genus currently contains two species, *P. barbouri* Chace, 1939, and *P. huxleyi* Wood-Mason & Alcock, 1892 (see review by Chace & Holthuis, 1978).

Although larval characters of the Decapoda may not always accurately reflect phylogenetic lineages (Martin et al., 1984; Williamson, 1982a, b; Rice, 1981; Felder et al., 1985), zoeal characters often have been of great assistance

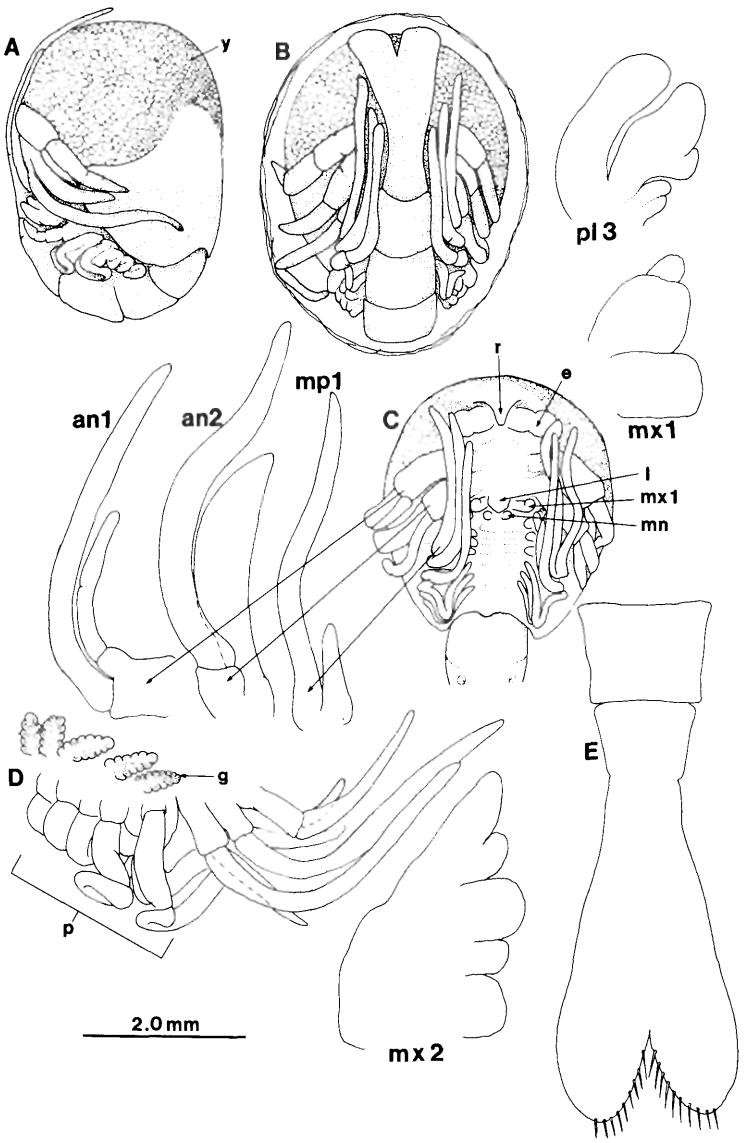

Fig. 1. *Psalidopus barbouri* Chace. A, lateral view of embryo removed from egg membrane; B, ventral view of embryo within egg membrane; C, ventral view of embryo with abdomen deflected to show developing mouthparts; D, maxillipeds 1, 2, and 3 and thoracic pereiopods (p) with associated arthrobranch gills (g); E, dorsal view of telson and penultimate abdominal segment. an1 = first antenna; an2 = second antenna; e = eye; g = arthrobranch gill; l = labrum; mn = mandible; mp1 = first maxilliped; mx1 = first maxilla; mx2 = second maxilla; p = pereiopods; pl3 = pleopod of third abdominal somite; r = rostrum; y = yolk. Scale bar refers to A-C only.

in elucidating decapod relationships. Of the 11 recognized superfamilies of the Caridea (from Bowman & Abele, 1982), larval evidence is now available only for the Atyoidea, Palaemonoidea, Alpheoidea, Pasiphaeoidea, Pandaloidea, Rhynchocinetoidea, and Crangonoidea. I therefore welcomed the opportunity to remove some late embryos from an ovigerous *Psalidopus barbouri* in the collections of Lawrence G. Abele with the intent of describing the incompletely developed larvae and commenting on their phyletic affinities.

The ovigerous female (carapace length 23.4 mm) was carrying 18 large ($4.3 \pm 0.3 \times 3.4 \pm 0.2$ mm)orange eggs, loosely attached to her pleopods. Developing zoeae appeared white. Embryos were cleared in 5% lactic acid and in toluene, returned to 70% ethanol, and dissected from the egg membrane when this had not already been shed.

The zoeal carapace is broad and ovate without spines. The rostrum is poorly developed and exists as a small medial protuberance between the larger eyestalks. The eyes are unpigmented and immovable. The first and second antennae are large and flat, the second with a relatively well developed scaphocerite. The mandible is visible only as a small bump just posterior to the wide labrum, and both pairs of maxillae are indistinctly lobed. The maxillipeds are elongate and cylindrical, with the exopod shortest in the first and longest in the third. All pereiopods are biramous, but the last 3 pairs are poorly developed. No setation is visible on any of the appendages. The abdomen is cylindrical and bears distinct pleopods on the first five segments. The telson is long and wide, with a deep medial cleft and 10-11 short setae on the posteromedial margin of each branch of the furca.

Chace & Holthuis (1978) removed a "presumably late embryo" from the egg membrane of *P. barbouri*, commented on the well developed pleopods and deeply incised telson, and tentatively referred it to an "advanced mysis stage". Their specimen was therefore at an equivalent stage of development. Chace & Holthuis noted that even "if this stage represents the larval stage at the time of hatching (and there is no certainty that it does), the species must be considered to be only slightly metamorphic, and development to the adult form is probably brief". As almost all carideans emerge from the egg without well developed pleopods, development in *Psalidopus* is undoubtedly abbreviated.

Unfortunately, the lack of setae on these embryos makes it impossible to comment on the phylogenetic affinities of psalidopodid larvae. The reduced eyes, large amount of yolk, and tremendous size of the embryos are similar to early zoeal stages of other deep-water caridean shrimp (e.g. *Hymenodora*, see Gurney, 1942).

LITERATURE CITED

Alcock, A., 1901. A descriptive catalogue of the Indian deep-sea Crustacea Decapoda Macrura and Anomala, in the Indian Museum: being a revised account of the deep-sea species collected by the Royal Indian Marine Survey Ship Investigator. (Calcutta, Indian Museum).

BOWMAN, T. E. & L. G. ABELE, 1982. Classification of the Recent Crustacea. In: L. G. ABELE (ed.), Systematics, the fossil record, and biogeography. The biology of Crustacea, **1**. (New York, Academic Press).

CHACE, F. A. & L. B. HOLTHUIS, 1978. Psalidopus: the scissorfoot shrimps (Crustacea: Decapoda: Caridea). Smithson. contr. Zool., **277**: 1-22.

FELDER, D. L., J. W. MARTIN & J. W. GOY, 1985. Patterns in early postlarval development of decapods. In: A. D. WENNER (ed.), Crustacean growth, Crustacean issues, **2**. (Rotterdam, Balkema Press).

GURNEY, R., 1942. Larvae of decapod Crustacea. (London, Ray Society).

MARTIN, J. W., D. L. FELDER & F. M. TRUESDALE, 1984. A comparative study of morphology and ontogeny in juvenile stages of four western Atlantic xanthoid crabs. Phil. Trans. Roy. Soc. London, (B) **303**: 537-604.

RICE, A. L., 1981. Crab zoeae and brachyuran classification: a re-appraisal. Bull. British Mus. nat. Hist., (Zool.) **40**: 287-296.

WILLIAMSON, D. I., 1982a. Larval morphology and diversity. In: L. G. ABELE (ed.), Embryology, morphology, and genetics. The biology of Crustacea, **2**. (New York, Academic Press).

——, 1982b. The larval characters of Dorhynchus thomsoni Thomson (Crustacea, Brachyura, Majoidea) and their evolution. Journ. Nat. Hist. London, **16**: 727-744.

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CYCLESTHERIA HISLOPI (CONCHOSTRACA) IN AUSTRALIA

BY

B. V. TIMMS

Sciences Department, Avondale College of Advanced Education, Cooranbong, N.S.W., Australia, 2265

Cyclestheria hislopi was first described as *Estheria hislopi* by Baird (1859), from Nagpur, India and has since been found circumtropically. There are only two records for Australia (Sars, 1887; Timms, 1979) suggesting a limited distribution there, but this conchostracan occurred commonly in collections made recently in tropical Australia to study cladocerans. The purpose of this note is to report on the taxonomic characteristics of these specimens and to document the distribution and habitat preferences of *C. hislopi* in Australia.

Of the 483 sites visited north of 30°S, *C. hislopi* occurred in 79, almost all of these being north of 20°S. Fifteen of these collections and a further five slides of individuals have been deposited in the Australian Museum (Registration numbers P35158-P35172 and P35153-P35157, respectively). All animals examined easily fit the characteristics as described briefly by Baird (1859) and in detail by Sars (1887). Thus the shell (fig. 1a) is compressed and subcircular with a short hinge, but prominent umbone; there are few (<8) growth lines and the shell is pellucid. The head (fig. 1b) lacks a dorsal frontal organ but a deep occipital incision is present posteriorly. The eye is singular with a large rhomboidal ocellus below it. The antennules are simple and the antennae