

## A swimming deep-sea penaeoid shrimp photographed off California

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During a study of long-term cycles in deep benthic communities, the remotely operated vehicle (ROV) *Doc Ricketts* photographed a large deep-sea shrimp (Figure 1) west of Morro Bay (35° 10' N, 122° 59' W, 3,949 m, Monterey Bay Aquarium Research Institute (MBARI) station M, 24 May 2011). Further details of the study location, methods, and



FIGURE 1.—Penaeoid shrimp swimming across the sea floor at 3,949 m, 35° 10' N, 122° 59' W, on 24 May 2011 at Monterey Bay Aquarium Research Institute (MBARI) station M. Scale (distance between laser dots) = 29 cm, from which we estimated the total length of the shrimp to be 15 cm. Photograph by ROV *Doc Ricketts*, courtesy of Ken Smith, MBARI.

results are available in Kuhnz et al. (2014). Laser dots on the photograph are 29 cm apart, from which the total length of the shrimp can be estimated at 15 cm. During 2007–2012, this shrimp was seen in eight quantitative video transects but in low abundance—no more than one shrimp per 100 m<sup>2</sup>, and was not collected.

The shrimp is shown swimming above the surface of the sediment by means of laterally extended pleopods, characteristic of a penaeoid shrimp (order Decapoda, superfamily Penaeoidea; see Pequegnat 1983, plates XXXIVA and LD for photographs of similarly swimming penaeoid shrimps). The few other shrimp-shaped crustaceans that live at comparable depths in the northeastern Pacific (Superfamily Sergestoidea, four superfamilies within infraorder Caridea and order Lophogastrida) swim either by moving their pleopods up and down along the ventral surface of the abdomen, or hop for short distances by jerking the abdomen. Members of these taxa differ from the shrimp in the photograph by size, ridges on the carapace, color marks, or spinules. Midwater sergestoids or carideans are unlikely to swim close to the sea floor.

Although the photograph is blurred, the individual photographed is most likely *Plesiopenaeus armatus* (Bate, 1881; family Aristeidae). This deep-sea shrimp can be recognized by its large size, red color, reflective corneae of the eyes, dorsal carinae on the abdominal somites, and the characteristic laterally spread pleopods. In the Gulf of Mexico, *P. armatus*, matched to specimens, was photographed by ROV as it paddled with its pleopods in similar fashion to the shrimp in the photograph (M. Wicksten, unpublished data). Bracken-Grissom et al. (2012) noted that the larval stage known as *Cerataspis monstrosa* has taxonomic priority over the adult *P. armatus*, but applied to the International Commission on Zoological Nomenclature to use its plenary action to suppress *Cerataspis* in favor of *Plesiopenaeus*.

*Plesiopenaeus armatus* is among the largest deep-sea shrimps, reaching a total length of at least 22.5 cm (Texas A&M University Biodiversity and Research Collection catalog number 2-6444). The only other penaeoids known to live at a similar depth in the northeastern Pacific are benthic species of *Benthesicymus* (family Benthesicymidae), considerably smaller than the shrimp in the photograph and having extremely slender legs and a short rostrum. Definitive identification of the shrimp in the photograph would require a specimen and examination of the characteristic copulatory organs (Perez Farfante and Kensley 1997:figure 20).

Perez Farfante and Kensley (1997) provided records of *P. armatus* at 2,562–4,300 m from the North and South Atlantic, Gulf of Mexico, Indian Ocean, and Pacific Ocean from off the Philippines and Japan to the central North Pacific and Hawaii, as well as “off the north-west coast of U.S.A. [sic]” but did not provide a citation for the latter record. Pequegnat (1983) reported the shrimp at 1,800–3,740 m and included it in lists of shrimps from the upper to lower abyssal zones of the Gulf of Mexico. There are insufficient records to determine if the species occurs deeper in certain geographic locations than others. This species was not reported from the northeastern Pacific by McLaughlin and Camp (2005), and Wicksten (2012) did not include it in her recent monograph. Investigators working on the biota of the lower continental slope should look for this shrimp.

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