

by Richard N. Uchida

Valid name	<i>Heterocarpus laevigatus</i> Bate 1888 (Fig. 41)
Synonymy	<i>Heterocarpus laevigatus occidentalis</i> Sivertsen and Holthuis 1956 (from Crosnier and Forest 1973)
Common and vernacular names	Smooth nylon shrimp; red-tipped shrimp; ono shrimp

Distribution

Distributed in the NWHI from Middle Bank to Kure Atoll at depths from 497 to 867 m. In most areas, the shallower end of the depth range overlaps that of the deeper end of *H. ensifer*. In the main islands, *H. laevigatus* is most abundant between 440 and 684 m (Struhsaker and Aasted 1974); in the NWHI, the optimum depth range for trapping is 500-799 m (Gooding 1984).

Distinguishing characteristics

Two carinae, but no ocellus on either side of carapace. Postrostral crest and rostrum armed dorsally with 6-7 teeth; ventral margin of rostrum has 10 teeth. Overhanging spines on the abdominal somites lacking; dorsal ridge on third abdominal somite.

Translucent carapace; entire rostrum crimson; orbital region lighter; carapace crimson anteriorly and fading to a lighter shade near the posterior margin. The pereopods and pleopods crimson, abdomen lighter shade of red. Eggs blue.

Grows much larger (highly desirable commercial characteristic) than *H. ensifer*.

Life history

Male to female sex ratio of 46:54, based on 7,368 smooth nylon shrimp caught in Hawaiian waters departs significantly from equality.³ Temporal factors rather than geographic ones appear to account for most major population variations in Hawaii. The relationships of sex ratios and sampling depths of smooth nylon shrimp and time of sampling indicate a gradual recruitment of small females from deep (760 m) to shallow (440 m) water, and that adult males and females move between depths of 550 and 700 m in synchrony with the ovigerous cycle of females.

In Hawaiian waters, smooth nylon shrimp spawn primarily in the fall and winter; spawning peaks between October and January.

Less than 10% of the females are ovigerous in April-July. Females reach sexual maturity when the carapace length is 40 cm (4-year old). There is no evidence for protandrous hermaphroditism (see footnote 3).

Functional carapace length-weight relations of smooth nylon shrimp in Hawaii were examined separately for males, females without eggs, and females with eggs. These relationships are:

$$\text{Males: } \log_e W = -7.358 + 2.910 (\log_e CL)$$

$$\text{Nonovigerous females: } \log_e W = -6.757 + 2.745 (\log_e CL)$$

$$\text{Ovigerous females: } \log_e W = -5.498 + 2.470 (\log_e CL)$$

where W = weight (g) and CL = carapace length (mm). Slopes of the predictive regressions of males, nonovigerous females, and ovigerous females are significantly different (see footnote 3).

Growth rates were estimated by analysis of modal progression of length-frequency distributions. Von Bertalanffy growth equations are:

$$\text{Males: } L_t = 59.7 (1 - e^{-0.35t})$$

$$\text{Females: } L_t = 62.5 (1 - e^{-0.25t})$$

where L = carapace length (mm) expressed as a function of time t in years. From August 1983 through November 1984 mortality rates were $Z = 1.51 \text{ year}^{-1}$ for males and $Z = 0.73 \text{ year}^{-1}$ for female shrimps. Although male shrimps grow faster than females, they have a substantially higher mortality rate than females (see footnote 3).

Gear and catch

The gear used is identical to that for *H. ensifer* except that the float line (or drop line) must be considerably longer to reach the depths inhabited by this species.

Data on catch are not available, although commercial trapping for this species has begun in the NWHI.

³Dailey, M. D., and S. Ralston. Aspects of the reproductive biology, spatial distribution growth, and mortality of the deepwater caridean shrimp *Heterocarpus laevigatus* in Hawaii. Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396 (manuscr. in prep.).

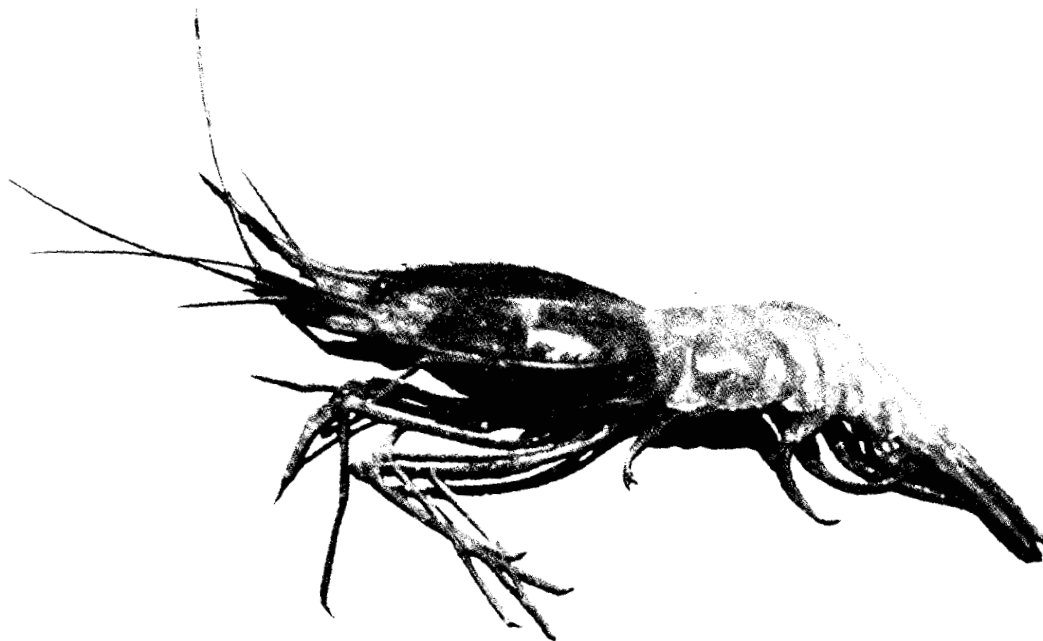


Figure 41.—*Heterocarpus laevigatus*.