

by Richard N. Uchida

Valid name *Panulirus marginatus* (Quoy and Gaimard 1825) (Fig. 42)
Synonymy *Palinurus marginatus* Quoy and Gaimard 1825; H. Milne Edwards 1837
Palinurus guttatus Pfeffer 1881
Panulirus japonocum Galtsoff 1933
Panulirus japonicus marginatus Chace and Dumont 1949
 (from McGinnis 1972)

Common and vernacular names Hawaiian spiny lobster; lobster; ula

Distribution

Distributed throughout the NWHI from Nihoa to Kure Atoll at depths of 4-174 m.

Distinguishing characteristics

Distinguished from the true lobster by lack of claws and presence of numerous, anteriorly directed spines of varying sizes on the carapace. Anterior dorsal border of carapace with two strong, prominent frontal horns above eyes; two diverging rows of a number of spinules behind the horns. Antennae long, round in cross section, covered with spinules. A pair of strong anterior spines, with several subsidiary spines proximally on antennal plate (anterodorsal surface of the carapace between the antennae). Fifth pereopods chelate in the female.

Easily distinguished from *P. penicillatus*, the only other species of spiny lobster of commercial importance in Hawaii, by the two pairs of strong anterior spines on the antennal plate (Tinker 1965). *Panulirus penicillatus* occurs very rarely in catches in the NWHI.

Color usually purplish marbled with white but sometimes light yellow, light brown, or dark brown; brownish specimens usually tinted with red (McGinnis 1972). Carapace sometimes pale bluish or greenish behind the cervical groove and pinkish forward (George and Holthuis 1965). Supraorbital horns dark purplish or black with a whitish tip.

Abdominal somites purple with transverse yellow bands along the posterior margins as well as over the transverse groove. Pereopods almost uniformly dark purple or black. Antennal peduncle pale purplish or pinkish. Telson and uropods purplish at base and bordered posteriorly by a thin yellowish-white stripe.

Life history

Panulirus marginatus is dioecious. Males have the genital orifices on the coxopodites of the fifth pair of pereopods; whereas the females have orifices on the coxopodites of the third pair. The species is sexually dimorphic. Males are slightly heavier than females at carapace lengths (CL) below 65 mm. At 65 mm CL, males and females have almost identical weights; from about 70 mm CL and larger, females are heavier when compared with males of equivalent length (Uchida, Uchiyama, Tagami, and Shiota 1980).

Lobsters are sexually promiscuous. At Necker Island, females reach maturity at 60.7 mm CL; males at 59.2 mm (Prescott⁴). Males

deposit a spermatophore or sperm packet on the sternum of females and a cementing material is extruded around the spermatophore which darkens and hardens (Chittleborough 1976). In NMFS sampling, the smallest female with a sperm packet (mated) was 48.3 mm CL.

Fertilization is external. The Hawaiian spiny lobster is believed to undergo the same ritual during spawning as the western rock lobster, *P. cygnus*. Eggs are extruded from genital orifices and the subchelate dactyls of the fifth pair of pereopods are used to break the protective coating of the spermatophoric mass. Exposed spermatophores fertilize the eggs which are swept back to adhere to elongated setae on the endopodites of the pleopods. The female is then technically termed ovigerous. The number of eggs extruded is positively correlated with body size (Honda 1980; Honda⁵). The smallest ovigerous female, caught at Necker Island, measured 49.5 mm CL (Uchida and Tagami 1984a).

The spawning season of *P. marginatus* apparently differs within the NWHI chain. Around Nihoa, Necker Island, and French Frigate Shoals, ovigerous females occur mostly in late summer and early winter; toward the northwestern end of the chain, ovigerous females are prevalent in early summer (Uchida, Uchiyama, Tagami, and Shiota 1980). Off Oahu spawning occurs throughout the year and peak activity is concentrated in May-August and low activity is apparent in November-January (McGinnis 1972).

The incubation period lasts about 30 days (McGinnis 1972). After hatching, the phyllosoma larvae float to the surface and become planktonic; the duration of this pelagic phase may be up to 1 year from hatching. Little is known about how larvae are retained around the various islands and atolls of the archipelago. Based on water type oscillations in the Hawaiian region, a hypothesis has been developed to explain the geographic pattern of larval recruitment within the archipelago (MacDonald 1983).

Phyllosoma larvae, which are widely dispersed throughout the chain, pass through 11 dissimilar stages (Johnson 1968). The most advanced stage metamorphoses into a postlarval puerulus (Cooke and MacDonald 1981), a transitional stage between the phyllosoma and the juvenile. A puerulus can swim horizontally allowing it to move shoreward for subsequent settling. Once settled, it assumes the adult coloration.

The NWHI population consists of a single stock (Shaklee and Samollow 1980). There is an excess of males among pre-hatch embryos. On the assumption that little or no sex-related mortality occurs

⁴Prescott, J. H. Size at maturity in the Hawaiian spiny lobster, *Panulirus marginatus*, at Oahu and Necker Islands. Fish. Res. Stn., P.O. Box 5, Daru, Western Province, Papua New Guinea (manuscr. in prep.).

⁵Honda, V. A. Fecundity of the spiny lobster, *Panulirus marginatus* (Quoy and Gaimard), in the Northwestern Hawaiian Islands. Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396 (manuscr. in prep.).

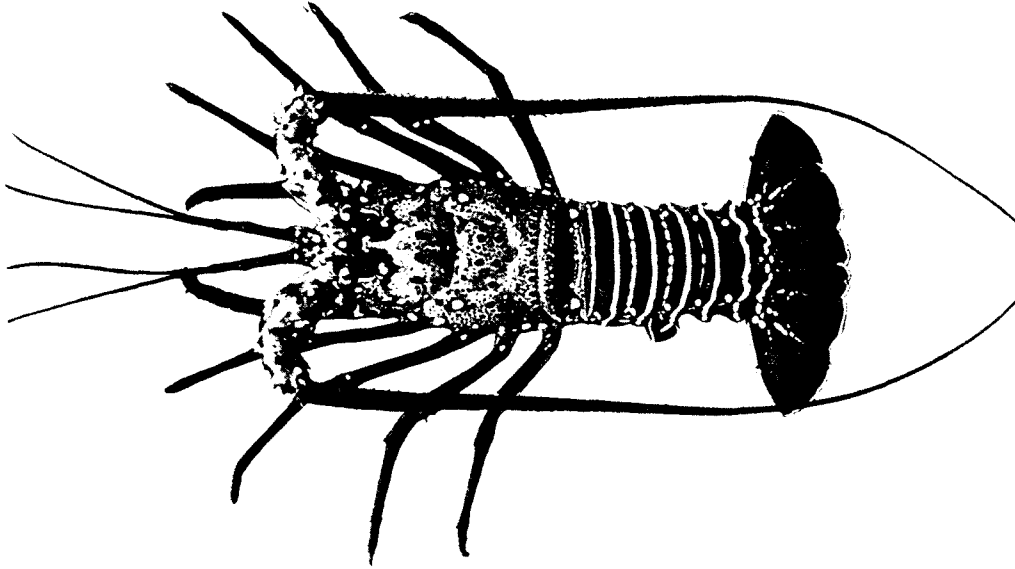


Figure 42.—*Panulirus marginatus*.

from fertilization to the embryo stage, it can be concluded that the sex ratio at fertilization is significantly different from 50:50. The excess of males at the embryonic stage is consistent with the results found in the adult population (Uchida, Uchiyama, Tagami, and Shiota 1980).

Preliminary NMFS study on age and growth for Necker Island lobsters shows that after settling to the bottom, males attain 3.7 cm CL in 1 year, 5.7 cm in 2 years, 7.3 cm in 3 years, 8.5 cm in 4 years, 9.4 cm in 5 years, and 10.1 cm in 6 years. The growth rate of females has not been calculated because of insufficient data. It is believed, however, that growth rates of sexually mature females may be somewhat slower than those of mature males (McGinnis 1972). Data on growth rates from Kure Atoll and French Frigate Shoals (MacDonald 1984) indicate that lobsters from those locations grow slightly faster than those around Necker and Oahu.

Unlike some continental shelf species of Palinuridae that are known to undertake long migrations, insular species like *P. marginatus* make rather short local movements. Tagging studies at Necker indicate that 91% had migrated <9.3 km (5 nmi) when recaptured (Uchida and Tagami 1984a), and a tagging study at Kure Atoll indicated that about 98% had moved <1 km when recaptured (MacDonald 1984). This species occasionally forms queues while moving between locations (MacDonald et al. 1984). Another interesting aspect of the NWHI spiny lobster population is that striking differences occur in average sizes among the various islands and banks surveyed. At Necker, where preexploitation catch rates were

the highest in the island chain, the average sizes of males and females were the smallest (Uchida, Uchiyama, Tagami, and Shiota 1980; Uchida and Tagami 1984a).

Gear and catch

The principal gears used in this fishery in the main islands are tangle nets and fish traps. Tangle nets are set mainly for spiny lobsters, and fish traps are primarily used for capturing fish, although lobsters are an incidental catch. In the NWHI fishery, lobster pots of various dimensions and configurations are used.

Until 1976, the spiny lobster catches in the main Hawaiian Islands were small and constituted only a small part of the total marine fish and shellfish landings in the State. During 1961-75, the annual reported catch varied from 1,880 to 5,734 kg and averaged 3,005 kg or <1% of the State's total marine production. Spiny lobsters are also taken in the main islands by recreational fishermen who are not required to report their catches; therefore, the magnitude of the recreational catch is unknown at the present time.

The spiny lobster fishery in the NWHI is relatively new and its short history has been characterized by uneven landings. Populations at Necker Island and Maro Reef, two areas that have commercial concentrations of lobsters, contribute the bulk of the landings in the State. In 1977-82, landings fluctuated between 15,294 (1978) and 354,200 kg per year (1981).