

by Richard N. Uchida

**Valid name** *Ranina ranina* (Linnaeus 1758) (Fig. 45)  
**Synonymy** *Cancer raninus* Linnaeus 1758  
*Ranina dentata* De Haan 1841  
*Ranina serrata* Lamarck 1892  
*Ranina scabra* Fabricius 1918  
 (from Sakai 1937)

**Common and vernacular names** Red frog crab; frog crab; spanner crab; kona crab; papaikualoa

### Distribution

Distributed in the NWHI from Nihoa (Edmondson 1946) to Kure Atoll at depths from 24 to 115 m; also found in the main Hawaiian Islands.

### Distinguishing characteristics

Carapace broad anteriorly, narrow posteriorly, strongly convex from side to side, and covered with numerous small rounded spines; anterolateral margins of carapace armed with dorsoventrally compressed sharp spines which occur either singly or in sets of three or four on protruding processes; anterolateral processes small in young of both sexes, but become prominent in large adult males.

Diocious and sexually dimorphic. Seven segments forming abdomen relatively narrower in the male than in a female of similar size. Male grows larger, has larger chelae; setae on the palmar surface of dactyli and propoda of chelae, genital openings on coxae of fifth pair of pereopods; larger, anterolateral carapace spines, giving carapace a square look (Onizuka 1972; Fielding and Haley 1976). Female has well-developed pleopods with numerous setae, oviducts that open on the coxae of third pair of pereopods, and in mature individuals an external, medially located spermatheca on the seventh sternite between the third and fourth pairs of pereopods (Gordon 1963).

Broad, flat chelae strong, equal in size, dorsal surface covered with small rounded spines similar to those found on carapace. Two sharp spines along the outer margin and five on the inner margin of flattened propodus. Remaining pereopods expanded, paddle-shaped dactyli. Abdomen not completely folded under cephalothorax so that at least four to five segments exposed in dorsal view.

Color along dorsal surface usually deep orange but some may be bluish. Immature individuals may be white (Fielding and Haley 1976). The ventral surface white.

### Life history

There are two separate studies on the reproduction of kona crab in the main islands. At Penguin Bank, the smallest mature male found was 43.6 mm CL, whereas, the smallest mature female was 54.3 mm CL (Fielding 1974). Mature individuals, however, may not necessarily be reproductively active. Off Oahu's north shore, females first became ovigerous at 63 mm CL (Onizuka 1972). Females smaller than 58 mm CL lacked developing ovaries. Among those averaging 60 mm CL (58-62 mm), 83% were mature whereas

at 65 mm CL (63-67 mm), about 87% were mature. At Penguin Bank, 50% of the females in the 70-76 mm size group were reproductively active (Fielding 1974). Among males, all crabs  $\geq 60$  mm CL had mature spermatozoa (Fielding and Haley 1976), but the exact size at which males copulate has not been determined.

Fertilization is external. Although no observations on fertilization have been made, it is believed that it is accomplished as the eggs pass the spermatheca (Onizuka 1972). The fertilized eggs are then swept back and adhere to the numerous elongated setae on the pleopods.

Around the main islands, ovigerous females occur in the catch only from May through September (Onizuka 1972; Fielding and Haley 1976). Data collected in the NWHI were insufficient to define the spawning season; however, at Maro Reef ovigerous females were collected in July and none in January.

Kona crabs spawn at least twice per season. The spherical eggs, which are orange when newly spawned, become brown when the eyed stage is reached in about 24 days and hatch 5 days later (Onizuka 1972). Females usually spawn a second batch of eggs about 9 days after the first spawns are hatched.

At the start of the spawning season in May, the number of eggs produced is positively correlated with carapace length (Fielding and Haley 1976). A 63-mm CL female can spawn an estimated 27,000 eggs; whereas, a 114-mm CL female can produce more than 145,000 eggs at a time (Onizuka 1972). At the end of the spawning season, however, the number of eggs produced apparently is unrelated to body size (Fielding and Haley 1976). The number of eggs produced also varies from season to season.

Little is known about the planktonic dispersal stages of kona crabs. The first molt occurs 7-8 days after hatching and the second molt occurs about 7 days later (Fielding and Haley 1976).

The species is carnivorous and apparently feeds at any time of the day (Onizuka 1972). The crab lies buried in the sand with only a few millimeters of the anterior portion of the carapace and eyes protruding above the sand, waiting for prey or food particles.

At sizes  $< 40$  mm CL, the increase in carapace length during each molt is about the same for both sexes; however, at larger sizes, the female growth rate is slower than males (Onizuka 1972). Molting frequency and growth increment also decrease with age. Furthermore, it has been reported that in January and March, a large percentage of the females bear new shells. This indicates recent molting and suggests that most females molt at least once during the early months of the year before the onset of the spawning season. The males, on the other hand, have a protracted molting period beginning in January and lasting through August. It is estimated that a 5-year-old male is 10.2 cm CL; a female of the same age averages about 8.9 cm ([Hawaii] 1970).

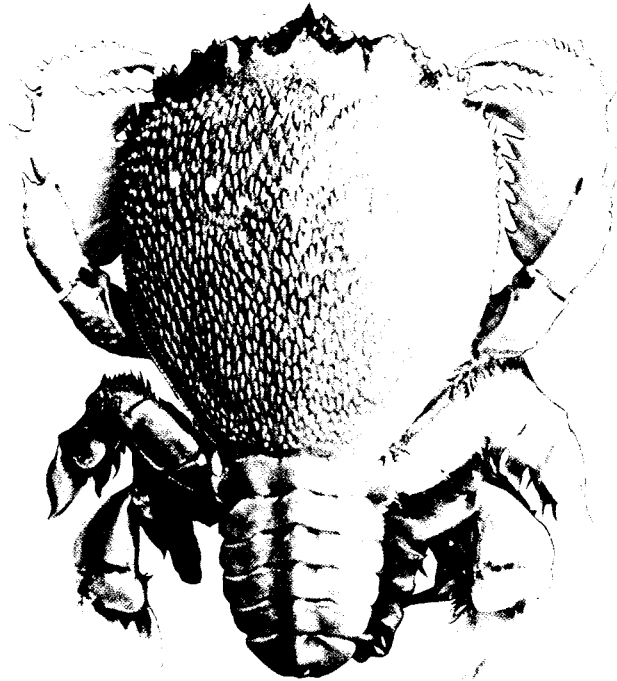


Figure 45.—Female *Ranina ranina*.

The male to female sex ratio deviates significantly from 50:50 (Onizuka 1972; Fielding and Haley 1976). At Oahu and Penguin Bank, stocks are roughly 55% males and 45% females. In the NWHI, male to female ratios were 66:34 at French Frigate Shoals, 62:38 at Maro Reef, and 75:25 at Pearl and Hermes Reef. Samples from elsewhere in the NWHI were too small to derive meaningful sex ratios.

Kona crab caught in the NWHI ranged from 70 to 167 mm CL. Carapace width-weight relationships of 501 males and 254 females were:

$$\begin{aligned} \text{Male: } W &= 5.689 \times 10^{-4} CW^{2.9478} \\ \text{Female: } W &= 7.719 \times 10^{-4} CW^{2.8070} \end{aligned}$$

where  $W$  = weight (kg) and  $CW$  = carapace width (cm).

#### Gear and catch

There is a small fishery for kona crab in the main islands. The principal gear used is the kona crab net, although one vessel fishing in NWHI waters has successfully used crab traps. Commercial vessels usually set, haul, and reset the strings of nets several times during the day from sunrise to sunset. Soaking time, usually 1 h, is necessarily kept short because longer soaking attracts predators such as sharks and rays which can inflict extensive damage by tearing off the bait and entangled crabs from the netting.

During 1961-79, the annual catches of kona crab around the main islands fluctuated between 4,215 and 32,835 kg and averaged 13,519 kg.

At present, there is no fishery for kona crab in the NWHI. Two boats previously fished for kona crab experimentally in the NWHI, but have since quit fishing.