

Confirmation of Symbiotic Relationship between Liparid Fishes (*Careproctus* spp.) and Male King Crab (*Paralithodes camtschatica*)¹

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WHILE FISHING for king crab (*Paralithodes camtschatica*) in the Adak Island area of Alaska's Aleutian chain in 1963, Captain Mel Leonard, Master of the M/V "Bertha Ann," reported finding a cluster of eggs, about 2 by 4 by 10 cm, on the deck of a freezer-ship beneath the crab-processing line. He said that he placed a cluster in a bucket of seawater and within hours the eggs hatched into free-swimming fish. Because I wanted to identify these fish and to learn more about their relation to king crabs, I made arrangements with Captain Ben Gjerde, Master of the crab processor M/V "Deep Sea," to hatch some of the eggs and preserve the resultant fish larvae. Captain Gjerde found a cluster of eggs (Fig. 1) in February 1963 and placed one-half in a bucket of cold seawater and the other half in formalin. The eggs averaged about 5 mm in diameter, were light brown, and were eyed. Hatching began in 2 days. The larvae began dying after 2 more days when they were about 14 mm long; at this time all the larvae were preserved in formalin.

The larvae (Fig. 2) were identified in the laboratory as belonging to the family Liparidae, genus *Careproctus* (Burke, 1930). According to Burke (1930) and Clemens and Wilby (1961), fish of the genus *Careproctus* in the eastern Pacific Ocean range from southern California to northwestern Alaska and the Bering Sea. The fish, depending on species, live at depths of 55 to 3,300 meters, but the center of population is at about 550 meters.

The king crabs from which these eggs were obtained were taken on February 20, 1963, in crab pots at about 150 meters depth, east of Great Sitkin Island and about 48 km northeast

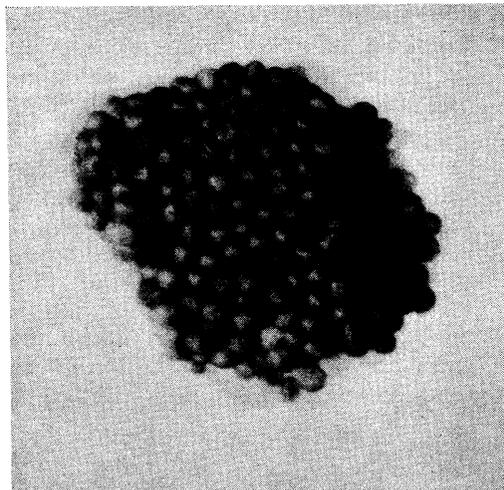


FIG. 1. Part of a cluster of *Careproctus* spp. eggs found during the processing of king crab at Adak Island, Alaska. Eggs averaged 5 mm in diameter.

of Adak Island. Because the king crab industry has a self-imposed regulation that all crabs must be alive when they enter the processing line, the males were held in a live tank until the catcher boat reached the processing ship, where they were transferred to another live tank. (All females are returned to the sea.)

The egg clusters were found on the deck of the processing vessel in the area where the crab leg sections were broken away from the



FIG. 2. Preserved *Careproctus* larva, 2 days old. Total length, 14 mm.

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body. It is unlikely that the eggs had been accidentally transported to the processing line, as each male crab was handled several times before processing. At no time were egg clusters observed on the exterior of the crabs.

The peribranchial cavity of the male crab (Fig. 3) is large enough to contain a cluster of eggs of the size found. Rass (1950) reported a cluster of eggs of similar size in the gill chamber of a king crab taken off the western shore of Kamchatka. The eggs were identified as being from fish of the genus *Careproctus*. He noted that the eggs would have ideal conditions for aeration and protection in the peribranchial cavity. Rass also captured a 38.5-cm female *C. sinensis*, with an ovipositor 8 cm long carrying ripe eggs about 5 mm in diameter. He speculated that the eggs found in the crab must be from *C. sinensis* because the ovipositor would make possible the deposition of eggs under the carapace. Vinogradov (1950) also reported finding eggs of *Careproctus* deposited in the gill chamber of the king crab.

My findings corroborate those of Rass and Vinogradov. The identification was carried one step further, however, by hatching the eggs and identifying the larvae as *Careproctus*. Positive identification of species was not possible because



FIG. 3. Gill chamber of king crab, as seen from the rear.

the teeth were inadequately developed, but the other characteristics corresponded with those of *C. sinensis*.

This symbiotic relationship between the king crab and *Careproctus* has been reported by the U.S. king crab fleet only in the Adak area—not from the eastern fishing grounds, such as Unalaska and Kodiak Islands. Further investigation is necessary to determine whether the range of this phenomenon is generally limited to the area between Kamchatka and Adak Island.

ACKNOWLEDGMENTS

Captain Mel Leonard alerted me to this biological phenomenon and Captain Ben Gjerde of Wakefield Fisheries, Port Wakefield, Alaska, provided the specimens. Dr. Arthur Welander assisted in identification and Mr. Paul T. Macy translated the Russian references.

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