

NOTE

PREDATION ON JUVENILE PACIFIC SALMON BY A MARINE ISOPOD

Rocinela belliceps pugettensis
(CRUSTACEA, ISOPODA)

Observations were made of predation by a marine isopod on both captive and wild Pacific salmon. Pacific salmon are known to be hosts to a number of ectoparasites, especially the Copepoda. However, we have been unable to find any reported incidents of predation or parasitism of Pacific salmon by the Isopoda.

In July 1969, we began a series of experiments in Puget Sound to evaluate the feasibility of saltwater rearing of Pacific salmon within floating pens. Stocks of young salmon were weighed and measured several times during the year at the Manchester, Wash., experimental station of the National Marine Fisheries Service and routinely examined for ectoparasites visible to the naked eye. A large Branchiuran parasite, *Argulus* sp., was found on a 600-g chinook salmon (*Oncorhynchus tshawytscha*); the Branchiuran was removed from the fish and kept for study. Later, another Branchiuran was found in the same body position on this fish. There were no other visible ectoparasites.

In March 1970, we began collecting zooplankton to provide live food for both salmon fry and newly metamorphosed flatfish. Collections were made during the night; a surface light was used to attract the plankton and an airlift pump to draw them into a net suspended at the sea surface.

The collected organisms were poured into a tank containing over 1000 young pink salmon (*O. gorbuscha*), 30 to 45 mm long. Among the unsorted plankton were 8 or 10 isopods of the same species. The pink salmon fed vigorously on large numbers of amphipods in the tank, whereas the isopods alternately rested on the sides of the tank and swam about in random patterns. One isopod quickly attached itself to a young pink

salmon. Within minutes, two more of the young salmon were similarly attacked. The fish became distressed, swam erratically about the tank, and drifted listlessly to the bottom, where they died within a few minutes after settling. The point of attack by the isopod on each young salmon was lateral, just above or slightly posterior to the pelvic fin. Small, but deep wounds that penetrated the body wall were found on each affected fish. The gut of each of the isopods removed from the dead fish contained blood.

One of the isopods was placed in another tank containing several dozen coho salmon (*O. kisutch*), slightly larger than the pinks (100-140 mm long). An hour later, the isopod was found firmly attached to the head of one fish, immediately posterior to and between the eyes.

Isopods are now removed before any plankton are fed to our fish. If we should overlook even the smallest of these isopods, we can expect either death or injury to some fish.

We examined several specimens of the hundreds of isopods we have collected and have identified them as *Rocinela belliceps pugettensis* (Stimpson), a subspecies of *Rocinela belliceps*. *R. belliceps* is widespread in northern coastal areas of the North Pacific Ocean, from the Bering Strait southward along the North American coast to California and southward along the Asian coast to Korea (Pavlovskii, 1955). Hatch (1947) feels that most of the specimens in Puget Sound are the subspecies, *pugettensis*. He assigns subspecific rank on the basis of the number of spines on the propodite of the prehensile legs—six spines on the propodite of *pugettensis*, whereas *belliceps* has three to four. A zone of mixed populations of *R. belliceps belliceps* and *R. belliceps pugettensis* exists near the entrance to Hood Canal, just inside the Strait of Juan de Fuca. All of the specimens we examined from our collections at the Manchester station (which is on the western side of central Puget Sound) had six spines on the propodite of the prehensile legs.

Rocinela sp. belongs to the family Aegidae. Members of this family are widely recorded ectoparasites of fishes. The first three pairs of walking legs are prehensile and are used effectively for attachment.

We originally felt that the attacks on our salmon fry and fingerlings by *R. belliceps pugettensis* might have been the result of confinement and would not be likely to occur with such frequency in open waters. However, on at least three occasions, we have observed wild chum salmon (*O. keta*) and pink salmon fry and fingerlings attacked by *R. belliceps pugettensis*. These attacks occurred at night, under a light, that probably attracted larger numbers of fish and isopods than would normally occur in open waters. In each instance, an isopod attached itself at a point just posterior to the dorsal fin and on, or slightly below, the lateral line. Afflicted fish could not maintain a normal swimming position in a school and darted about in erratic patterns. On one occasion, an afflicted fish was seen to leave the school and disappear. Even if a wound inflicted by an isopod were not fatal, it is possible that the erratic behavior of a fish trying to dislodge the parasite might attract predators.

On another occasion, in one of our large floating pens, we found a juvenile coho salmon with *R. belliceps pugettensis* attached anterior to the dorsal fin and just above the lateral line (Figure 1). This pen was not near our night light and there was a large amount of free space compared with our tanks or cages.

Also, in a cage that had a submerged light to attract plankton, we found *R. belliceps pugettensis* on an immature coho salmon weighing about 200 g. The fish appeared to be in some distress, but perhaps because of its size, the wound was not fatal.

Arai (1969) reported on 68 taxa of parasites recovered from 61 species of fish in British Columbia, but these did not include *R. belliceps belliceps*. Arai's collections were made by seine and trawl; we found that *R. belliceps pugettensis* will release its grasp if the host is forced into

a restrictive net. Hatch (1947) states that *R. belliceps belliceps* is found in 9 to 1250 m of water and that it is an ectoparasite of cod, sculpin, halibut, skate, and other bottom fish. At Manchester, where our observations were made, the water depth is 9 to 13 m. The abundance of *R. belliceps pugettensis* varies between seasons, with the greatest abundance from April through August.

Although we have no way to judge the extent of natural predation of Pacific salmon by *R. belliceps belliceps* or *R. belliceps pugettensis* in the wild, we think that, especially under the confined conditions of pen rearing, the fry and juveniles of Pacific salmon should be included as possible prey of *R. belliceps pugettensis* and probably *R. belliceps belliceps*.

The present instance clearly points up the possible misapplication of the term "parasitism" in certain cases of specialized predation. The isopod *R. belliceps pugettensis* is not a permanent symbiont of a fish and is thus not properly referred to as a parasite.



FIGURE 1.—*Rocinela belliceps pugettensis* on a juvenile coho salmon in one of the large growing pens. This specimen was anterior to the dorsal fin, whereas most of the others were attached in a posterior position. Note the blood-filled gut of the isopod.

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