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CRAYFISH

By
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[With three photographs by the author]

The fresh water crayfish is a crustacean, having as its nearest relations the salt water crayfish or "spiny lobster," and the true lobster. Fresh water crayfish are found in all parts of the United States; in Mexico, Central America, Europe and Asia. In the United States the crayfish are divided into two genera. These are geographically separated by the Continental Divide. To the east of the Rocky Mountains are sixty-four species which belong to the genus *Cambarus*. On the western side of the mountains there are five species of the genus *Astacus* (*Potambius*). It is a curious fact that the common European crayfish is also an *Astacus*. Two of the five western species, *A. klamathensis* and *A. nigrescens*, are native to California waters. *A. leniusculus* is a naturalized species, imported from Oregon in times past for culinary purposes and as biological material. The eastern crayfish has been introduced at several different places in California. In the January, 1925, issue of CALIFORNIA FISH AND GAME there is a note to the effect that Professor S. J. Holmes of the University of California took several specimens of *Cambarus clarkii* near Pasadena, California. The western limit of the natural range of this species is western Texas. In Vol. 13 of CALIFORNIA FISH AND GAME is another note bearing the date of August 13, 1926. This states that 15 specimens of *Cambarus blandingii acutus* were taken from the Escondido River in northern San Diego County. It is not generally known that the California law definitely prohibits the importation and planting of certain species of animals. Section 628*h* of the Penal Code reads as follows: "Every person who places, plants, or causes to be placed or planted,

in any of the waters of this state, any live fish or the eggs of any fish, any shellfish, crustacean or mollusk (except oysters), or any other fresh or salt water animal, whether taken within or without the state without first having submitted the same for inspection to and securing written permission from the Board of Fish and Game Commissioners, is guilty of a misdemeanor * * *.

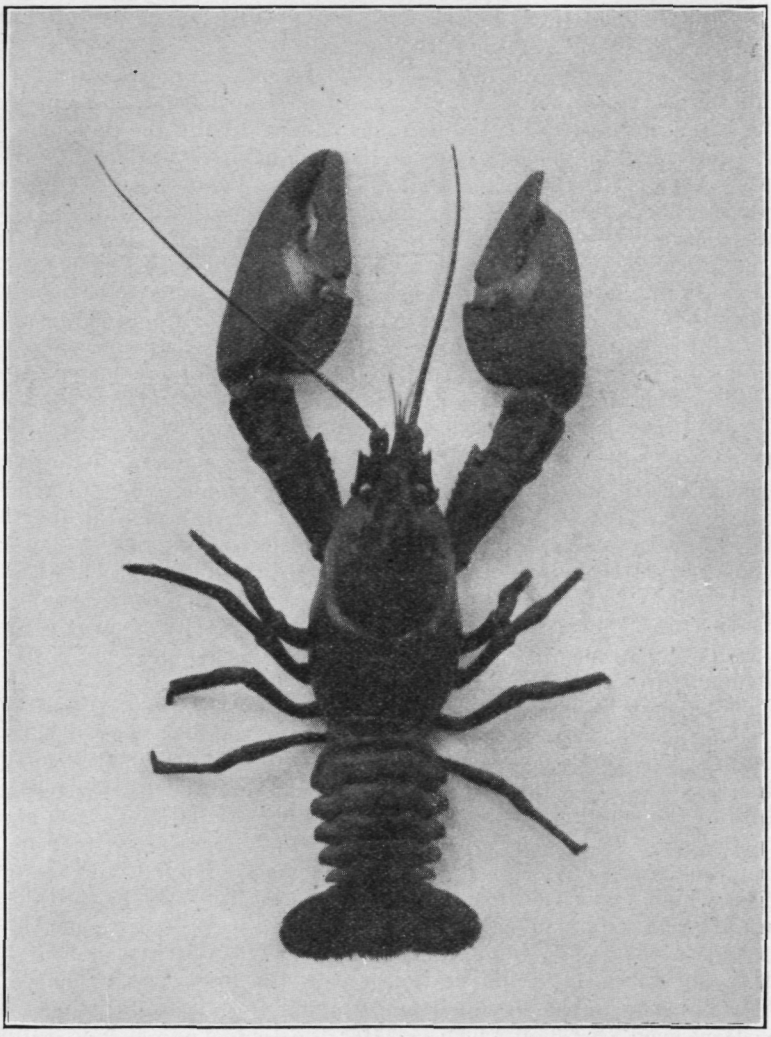

FIG. 65. *Astacus leniusculus* male (dorsal). Taken in the San Lorenzo River at Brookdale, February 7, 1930. Photograph by Paul Bonnot.

According to Holmes (1900), the distribution of the genus *Astacus* (*Potambius*) is as follows:

Astacus gambelli—Utah, Idaho, Montana, Wyoming.

Astacus nigrescens—San Francisco County to Alaska (near the coast).

Astacus leniusculus—Columbia River, San Francisco County.
Astacus trowbridgi—Columbia River.
Astacus klamathensis—Region about Klamath River and Lake.

The genera *Astacus* and *Cambarus* can readily be distinguished from each other by the following characteristics: The *Astacus* has 18 gills, while the *Cambarus* has but 17. The female *Cambarus* has a false pouch or annulus ventralis, for the reception and storage of the sperm, while the female *Astacus* has the sperm deposited on the posterior part of the thorax in spermatophores.

Crayfish are found in nearly all the fresh water streams of California, but because they are for the most part nocturnal, their presence is not often noticed. They seldom move about during the day time, but hide under logs and stones, or in natural cavities under the stream banks. Some of the eastern *Cambarus* depart from the usual burrowing in stream banks. They live on low lying land and sink their burrows to water level, piling up the mud dug from the burrows about the entrance in towers, or "chimneys." They live at the bottom of their burrows, which always contain enough water to cover them. Some species of crayfish are a great nuisance, as they riddle earth dams and levees with their burrows and greatly weaken them. The chimney builders sometimes are so abundant that they seriously interfere with farming. Their burrows undermine the roots of the growing plants and they eat quantities of the crops.

The California crayfish breed in the fall. The male deposits the sperm on the under side of the thorax of the female, where it remains until spring. The eggs of the female issue from the genital apertures which are situated at the base of each third walking leg. The eggs are covered with a viscous substance which draws out to a fine thread and attaches itself to one of the swimmerets. An adult female will produce from 200 to 400 eggs. The eggs and later the young crayfish are continually supplied with fresh water by the movements of the abdomen.

The eggs hatch in from six to eight weeks. When the egg case splits the young crayfish would fall to the bottom and be lost were it not that a tough thread holds it suspended. This thread is attached at one end to the inside of the ruptured egg case and at the other to the telson or tail fin of the small crayfish. In a few hours the young crayfish climbs up and fastens on to the thread, by which the egg case is attached to a swimmeret, by its chelae or claws. The chelae are tipped with recurved points, which make it difficult for even the crayfish to withdraw the claws after they have once secured a firm hold. As long as the thread attached to the telson remains, the small crayfish is attached at both ends. The thread attachment is lost with the first molt. The young remain hanging to the swimmerets for about four weeks, during which time they shed the shell twice. After the second molt they begin to take short excursions away from the female, returning, however, to the protection of the sheltering abdomen. After gaining a little experience they drift away on their own. During the first five months the young crayfish molt a dozen times and grow to be two inches in length. When molting the chitinous shell is shed in one piece, including the teeth and the lining of the stomach. Females have been recorded carrying eggs when one year old.

As in the case of the majority of the lower forms, crayfish can readily regenerate lost parts. A claw, an antenna, or a walking leg will be entirely replaced in the course of a few months. The younger the animal the more quickly will a lost part be replaced. The claws or walking legs, if injured, are broken off by the crayfish at a natural joint between the second and third segments. This breaking point has a muscular arrangement which acts in the same manner as a diaphram

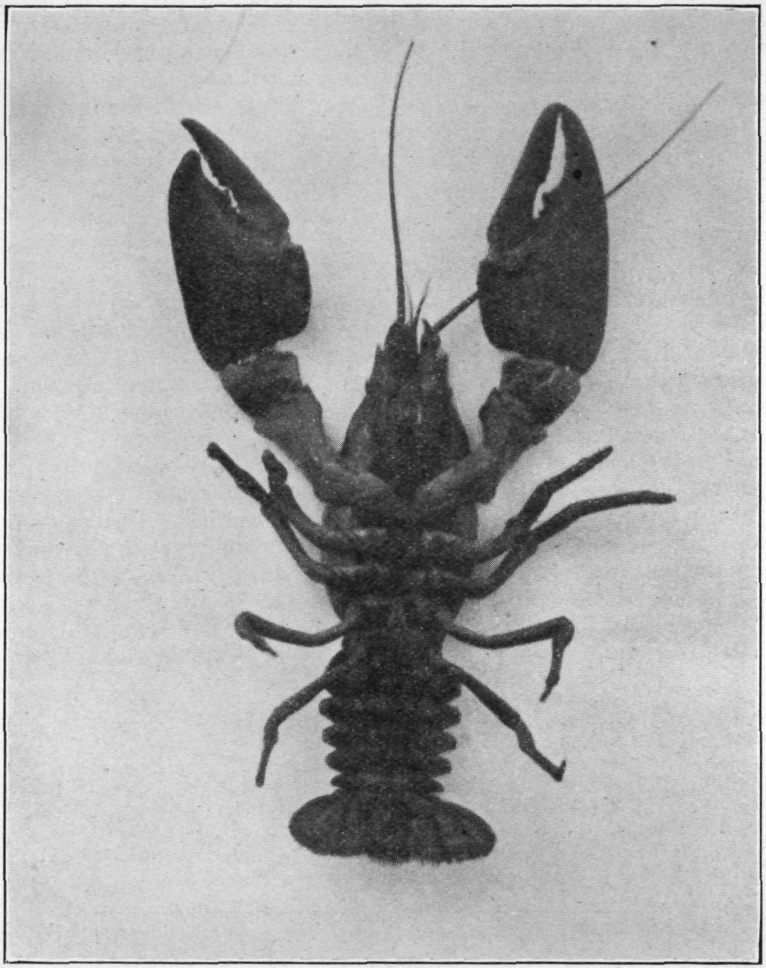

FIG. 66. *Astacus leniusculus* male (ventral). Taken in the San Lorenzo River at Brookdale, February 7, 1930. Photograph by Paul Bonnot.

and closes the open end of the break at once, preventing infection and loss of blood. The new leg or claw which develops from the stump is as large as the lost one.

Crayfish are scavengers as well as consumers of living organisms. They keep the waters they inhabit free from much debris. They will eat anything of an animal or vegetable nature, either alive or dead; fresh or stale. They have been accused of destroying salmon and trout

spawn. They furnish a food supply for many fish, other crayfish, salamanders, snakes, turtles, kingfishes, raccoons, and man.

Crayfish have never figured very extensively in a commercial capacity, both because of a lack of market and their relative scarcity. Some years ago quite a few were consumed in San Francisco, the main source of supply being Coyote Creek near San Jose. A few are still used for culinary purposes and by beginning biological students. Most of these are imported from Oregon. The Russian River figured as a source of supply at one time. In 1915 a fisherman on the Russian River took about 8000 crayfish with hoop nets (crab nets) and shipped them to San Francisco and San Jose. He found that the only bait they would not take was a salt bait of any kind. Until the last meeting of the legislature no legal protection was given to the fresh water crayfish. A law was passed at that time at the behest of interested parties in the southern part of the state, which reads as follows:

> Sec. 628*l*. Every person who in fish and game district number four takes, catches, kills, destroys or has in his possession any fresh water crayfish (Ecrevisse) before the first day of January, 1932, is guilty of a misdemeanor.

As the natural supply of many of our commercially valuable species has decreased before an ever increasing market, attention has been turned to artificially producing those species which can show a profit. Frogs and turtles have been raised experimentally, but as far as I can find out no one has tried to raise crayfish except as a laboratory experiment. If a reliable market could be had it seems to me that there should be little or no trouble in supplying it with artificially reared crayfish. The requirements are simple; plenty of water, either clear or muddy, a food supply and a minimum of enemies. Unlike frogs or turtles which are not marketable for about five years, crayfish are ready for market in a year's time. They are as prolific as the reptiles and it is not necessary to fence them in, as they seldom leave the water, and then only for a short distance. On the other hand, natural enemies and diseases might render an attempt to rear crayfish abortive.

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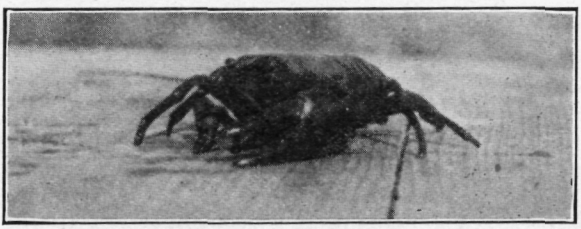

FIG. 67. *Astacus leniusculus* female. Taken in San Lorenzo River at Brookdale, February 7, 1930. This illustrates the regeneration of the right cheloe, which is only about one-third as large as the left. Photograph by Paul Bonnot.

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