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CIRCLE GILL NETTING FOR SMELT*

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SMELTS IN THE MONTEREY FISHERY

A LARGE PORTION of the smelt catch of the Monterey wholesale fresh fish markets is brought in by operators of circle gill nets; the balance is delivered by operators of round haul and ring nets (a purse net). Circle gill netting is carried on during the months that the smelt are in shallow waters. When smelt move into deeper waters, during the winter months, netting operations are mainly with round haul and on occasions with ring nets. Smelt are landed at Monterey throughout the greater part of the year although peak poundage landings come in during the summer months.

The term "smelt" is a rather universal one. In California it is applied to the members of two families of fishes; the Osmeridae or true smelts, and the Atherinidae or silversides. The most outstanding, distinguishing characteristic of the two groups is the presence of an adipose fin in the Osmeridae and the absence of such in the Atherinidae. At Monterey the smelt catch is composed mainly of two members of the Atherinidae group: the jack smelt (*Atherinopsis californiensis*) and the bay smelt or panzarotti (*Atherinops affinis*). The grunion (*Leuresthes tenuis*), third California member of this group, is not present. The balance of the smelt catch is composed of whitebait (*Allosmerus attenuatus*), and surf smelt (*Hypomesus pretiosus*), members of the Osmeridae or true smelt group. From observations made during 1931, it is safe to say that throughout the year 90 per cent of the smelt landed at Monterey are jack smelt.

The bay smelt may be differentiated from the jack smelt by its slightly deeper body; its larger scales; the upper jaw projecting slightly over the lower jaw, whereas in the jack smelt both jaws are even; the back portion of lighter color than that of the jack smelt; the teeth being forked at the base, those of the jack smelt simple.

Circle gill netting for smelt in Monterey Bay is divided into two phases: the large jack smelt phase and the bay smelt phase. Circle gill netting for jack smelt may be termed a spring and summer fishery. It commences about April and usually runs into September or October. During this period the large jack smelt are in shallow water. With the movement of the jack smelt into deeper water in the winter months, this type of fishing ceases. Catches are then made with round haul and in a few cases with ring nets. Gill netting of smelt,

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when possible, is preferred to capturing by round haul or ring nets. The wild nature of the smelt when frightened makes the latter nets hard to handle while being pulled in. With a gill net the proper sized fish are helplessly gilled, and the net easily hauled in from one end.

Circle gill netting for bay smelt may be termed a winter fishery. Operations commence with the first appearance of the bay smelt during

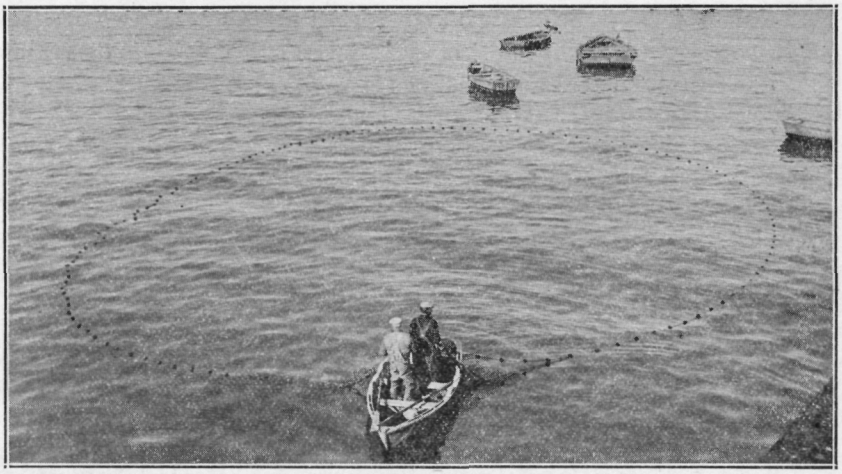

Fig. 32. A gill net laid out in a circle for smelt fishing. Photo by J. B. Phillips, November, 1931.

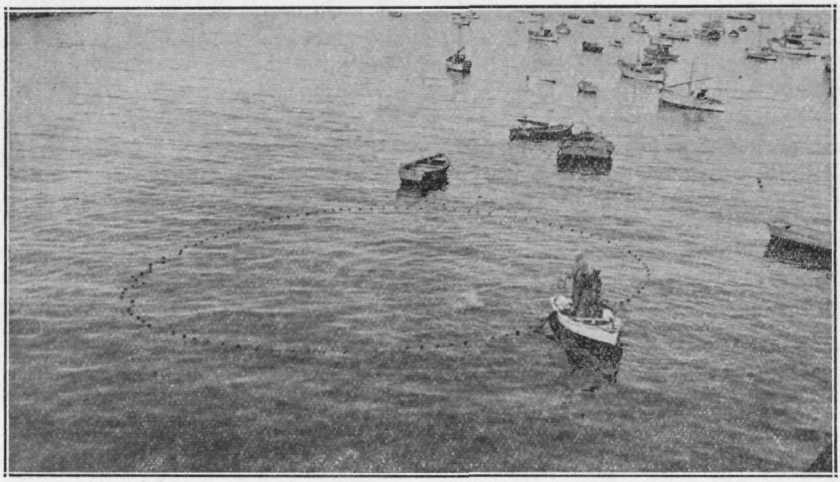

Fig. 33. Process of frightening smelt into gilling themselves while circle of netting is being decreased in size. The common method of "scaring" is as shown in Figure 34. Photo by J. B. Phillips, November, 1931.

the latter part of October or the early part of November, and may run into January or February. However, the heaviest catches are made during the first month or so of the "run." The catches then diminish and may be intermittent during the balance of the winter.

The basic principle of circle gill netting for smelt is to surround a school of desirable smelt with a net of webbing of uniform mesh. Then,

as the smelt hover inside the circle with apparent uncertainty, they are frightened into gilling themselves by use of a "scare." The set is made in shallow water so that the lower edge of the net approaches bottom, thus preventing escape in that direction.

In general, a gill net is a rectangular strip of webbing hung flat between a cork line at the upper edge and a lead line at the lower edge. The mesh of this webbing is ordinarily all of one size but sometimes the net is lengthened by tacking on another section of webbing, the mesh of which may not be of the same size as the mesh of the previous section. The Division of Fish and Game regulates the minimum size of mesh to be used in certain districts and for certain fishes, so as to insure the escape of the smaller fish.

A gill net functions as follows: Fish that are smaller than the meshes of the net go through. Fish of a certain size-range are not so fortunate. In attempting to escape through the mesh of the net, the tapering head of the fish allows it to make forward progress until the bulkier portion just back of the gill covers causes it to wedge in the mesh. Finding that it can make no further forward progress, the fish attempts to back out. This is prevented by the twine of the mesh sliding under the gill flaps, with somewhat the same effect as an attempt to pull an umbrella through a chicken wire fence, handle first.

Inasmuch as there are some variations in the actual fishing performances in capturing jack smelt and bay smelt, these two phases of smelt fishing will be treated separately.

GILL NETTING FOR JACK SMELT

Gill nets used for jack smelt vary from 500 to 800 feet in length and are 25 to 35 feet in depth. The size of mesh varies from $1\frac{5}{8}$ to 2 inches, stretched mesh. Mesh in this size-range gills jack smelt of mainly 8 to 12 inches in length. The largest jack smelt of about 16 inches length, will weigh three-quarters of a pound each. However, there is more of a market demand for the medium sized smelt of about eight inches length and running about nine to the pound. So the tendency is to add mesh of the smaller size, when making additions or replacements to a gill net. Jack smelt may be taken anywhere along Monterey Bay. Sometimes the Monterey gill netters may journey to the flats off Capitola for their catches. When the jack smelt move into deeper water, with the fall and winter months, this type of fishing ceases.

Two men and a skiff ordinarily compose a circle gill net crew. The net is piled on the stern of the skiff. When traveling any distance, a motor-powered launch is used for transportation, the actual fishing being accomplished with the aid of the skiff. During the 1931 season, one crew was able to supply most of the market demand. Some seasons several crews operate. Most of the netting is done at night, while the moon is absent. The smelt are at this time located by the characteristic luminescence that they produce in the water. Tides are taken into consideration as fishermen find that smelt move in with the tide. Occasionally catches are made during daylight, but this method is only about a third as successful as the night fishing. When a desirable school of smelt is located one man commences to pay out the net over the stern of the skiff while the other man rows in a circle. When the circle

is completed there is an overlapping of ends so as not to leave any opening. Where the ends overlap the cork lines are fastened together. The net now hangs in the water in the form of a cylinder; the buoyant property of the corks along the upper line keeps that edge of the net at the surface of the water, while the weight of the leads

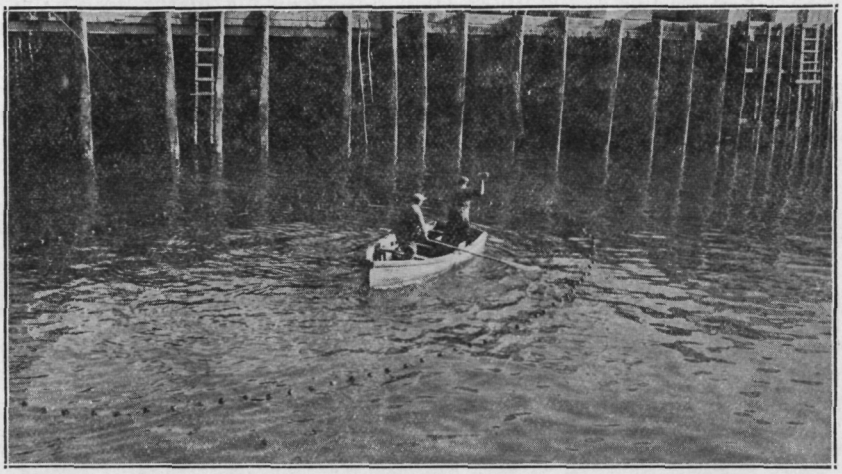

Fig. 34. The more common manner of scaring smelt into hurriedly gilling themselves. One man propels the skiff inside the circular wall of netting, while the other man repeatedly throws a brick or rock into the water. The "scare" is tied to one end of a rope so that it can be retrieved. Photo by J. B. Phillips, November, 1931.

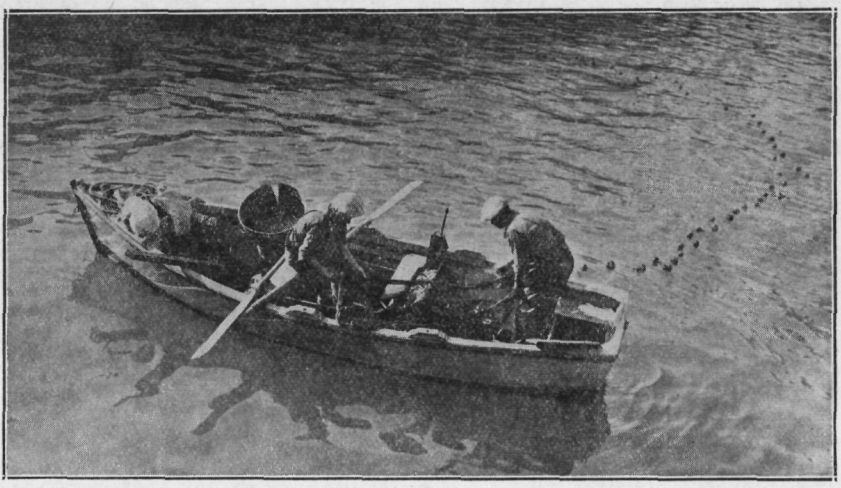

Fig. 35. Extricating bay smelt from a gill net that has been circled around a school of smelt. Photo by J. B. Phillips, November, 1931.

along the lower edge of the net stretches the rest of the net downwards in the water. The smelt, in the meantime, hover rather uncertainly inside the circle. They are frightened into hurriedly gilling themselves (if of proper size) by the splashing of a brick or rock in the water or by the flashing of a light at or under the surface of the water. The "scaring"

is done by one man while the other rows around inside the circle. The brick or rock scare is tied to one end of a small rope so that it can be retrieved and used repeatedly. Sometimes, when the smelt are close to the beach, the circle is left open in the direction of the beach. The skiff, during the "scaring" process, works outward from the beach. This method is most effective if the mouth of a small cove can be blocked with the net. After the smelt have been frightened into gilling themselves, the net is pulled into the skiff, starting with one end, the smelt being extricated as it is brought in.

GILL NETTING FOR BAY SMELT

Gill nets used for bay smelt vary from 150 to 350 feet in length and 15 to 25 feet in depth. The size of the mesh used is ordinarily 1 to 1¼ inches, stretched. This size of mesh gills smelt mostly of a 4- to 6-inch size, which run about 18 to the pound. For the past several years the catches of bay smelt for the Monterey markets have been

Fig. 36. A long gill net being divided into halves, after the initial circle is completed. The two smaller circles are then worked separately. Photo by J. B. Phillips, November, 1931.

made almost entirely in District 16. In the Penal Code of the State of California, District 16 is defined as "including those waters and tidelands to high water mark of that portion of Monterey Bay to the south of a line drawn from the extreme northerly point of Point Pinos in a straight line easterly to the eastern shore of Monterey Bay to a point north of the town of Seaside known as the 1st stake, a government survey monument." The most successful netting is just off of the Monterey sardine canneries and the fresh fish markets.

All of the bay smelt netting is done in the daytime. Two men in a skiff compose a gill net crew. The net is piled on the stern of the skiff, and circling operations are the same as those explained for the jack smelt. In practically all cases, the smelt are completely encircled with the net and the ends fastened where they overlap. The fish are frightened into gilling themselves by the use of a brick or rock "scare." One

man rows the skiff around inside the circle, while the other man repeatedly throws the weight into the water.

Sometimes a long net is divided into two smaller circles after the initial large circle has been made, so as to facilitate "scaring" operations.

Fig. 37. Unloading a catch of jack smelt at Monterey. The launch is used mainly for transportation to and from the fishing grounds. The actual fishing is accomplished with the aid of one, and sometimes two, skiffs. Photo by J. B. Phillips, August, 1931.

A rare variation of the above netting performance is for one man to start drawing in the net from one end as soon as the circle has been completed, the other end being anchored to the skiff. As the net is being pulled in by one man, the other stands in the stern of the skiff and throws the "scare" into the water so as to prevent the smelt from passing under the boat and to frighten them back into gilling themselves as the circle diminishes in size.

A few days after the evident appearance of the bay smelt off Monterey, the catch by gill nets is about 90 per cent bay smelt and the balance mainly jack smelt. After the first month or so, the percentage of bay smelt in the catches decreases until their disappearance from the commercial catch about January or February.

About the time of the appearance of the bay smelt in the commercial catch, large catches of small jack smelt, called "fryers," also make their appearance. These are smelt that range in the main from three to four inches in length, and are caught with small meshed lampara nets in shallow water. Whereas the catches of bay smelt fall off after the first month or so of their appearance in the commercial catch, the catches of "fryers" are continuous throughout the winter months (depending upon weather conditions). Examination of the catches of "fryers" during the 1931 season showed them to be composed of jack smelt in the main. No bay smelt were found mixed in these catches. Often times, however, there are found up to 20 per cent of similar sized sardines and occasionally smaller amounts of whitebait and surf smelt.

OTHER DRIFT GILL NETTING IN MONTEREY BAY

As has been mentioned, the bay smelt phase seems to be confined entirely to District 16. A legislative enactment allows a drift gill net as the only type of net* that can be used for fishing in this district, except that a round haul net or a purse net may be used only for the purpose of catching squid, anchovy and sardines.

A set gill net is differentiated from a drift gill net, as follows: "A set gill net is one that is made fast in any way and shall not be free to drift with the tide or current, or a net so placed as to catch or impound fish within a bight, bay, or estuary against the shore upon the receding tide."

Drift gill nets, of about 4-inch mesh, are also used in the taking of various perches off the shallow rocky portions of the beach in District 16. Two men in a skiff operate the net. Instead of circling, the net is more often placed across an indentation in the shore or a small cove. Gilling of the fish in this case is accomplished by frightening the fish outward from the shore.

Gill nets are also used in Monterey Bay for the capturing of kingfish, herring, white sea bass and halibut, but these nets are more often in the nature of set gill nets.

REFERENCES

Bonnot, Paul.

1930. The California whitebait fishery. Cal. Fish and Game, vol. 16, no. 2, pp. 130–136.

Clark, Frances N.

1928. The smelts of the San Pedro wholesale fish markets. Cal. Fish and Game, vol. 14, no. 1, pp. 16–21.

1929. The life-history of the California jack smelt, *Atherinopsis californiensis*. Cal. Div. Fish Game, Fish Bull., no. 16, 22 p., 12 figs.

Walford, Lionel A.

1931. Handbook of common commercial and game fishes of California. Cal. Div. Fish Game, Fish Bull., no. 28, pp. 65–69.

* Fyke nets, shrimp nets, or crab nets are not considered as set nets.

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