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Summary Account of the Investigations Carried out in the U.S.S.R. on the Behaviour of Fish in the Zone of Fishing Gear

by

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The problems of fish behaviour in the zone of fishing gear (principally towed type) have been studied in the Soviet Union for a comparatively long time. As far back as in the thirties a group of frogmen-ichthyologists under the guidance of Professor Mesyatsev carried out a number of interesting observations on the behaviour of Caspian herring (Caspialosa caspia caspia) caught by beach seines. Incidentally, herring trying to escape were found to display a different activity at the different stages of fishing:- at the beginning of hauling they become extremely active and it is at this time that many fish escape from the path of a net, whereas at the beginning of shooting they swim just as quietly as prior to fishing.

By means of echo-sounding equipment, relatively recent investigations (1953) in the Gulf of Riga have shown that salaka (Clupea harengus membras Linné) keeping formations comparable in size with the size of a trawl considerably decrease the catchability coefficient of the trawl, whereas in the case of dispersed formations of no shoaling salaka the value of this coefficient tends to increase markedly (Manteufel, Lishev, Radakov & Yudanov, 1959).

In 1960 the engineer Jonas used aqua-lung apparatus for underwater observations in the Azov Sea. He found that various species of fish concentrated under the foot rope of the moving goby drag net and swam in the same direction as the net, though the majority of the fish could easily pass through the mesh, its size being large enough for that. As it has already been reported in a paper presented to the Comparative Fishing Committee in 1962, (No.129), D.V. Radakov, who also used a diving equipment, observed a similar reaction of fish to trawl in the Azov Sea. He also noticed that the goby who swim to the water thickness at the approach of a trawl show a deficient reaction and that practically all of them are captured by the trawl, whereas, on the contrary, those who remain at the bottom actively try to swim away from the trawl and frequently succeed in escaping even in very narrow cracks under the ground rope; it was also observed that, for example, pike perch swim in the front part of the trawl all through the haul, though it is potentially capable of accelerating its movement in order to escape from the path of the trawl.

As a result of his underwater observations in the Black Sea, B.V. Vyskrebentsev (1962) has discovered that defensive reactions of fish in the path of a trawl vary considerably within different fish species; Vyskrebentsev came to the conclusion, among other things, that pelagic fish, being in danger, show an increased activity and shoaling behaviour, whereas bottom fish are in most cases passive in their defense and flee only in the very last minute.

The fishing gear model observations at sea and in the testing basins carried out by the workers of the Ichthyological Laboratory of the Institute of Morphology of Animals of the U.S.S.R. Academy of Sciences have shown that despite more or less stereotype manoeuvres of pelagic fish being approached by trawl models, the lines of escape chosen by anchovy, young atherina, mullet and other fishes are rather different, i.e., they try to escape from the path of a trawl below the ground rope, over the head rope, through the mesh or, generally, in the way they find most "convenient" under the circumstances.

The data available show that the catches of a gear trawled depend on a number of factors, e.g., on what fish are doing when they get into the path of a trawl net, i.e., whether they are feeding, migrating or wintering, whether they keep in shoals

(and on the size of a shoal) or dispersed; on the relation between the hauling speed of the fishing gear and the speed which can be achieved and maintained within a certain period of time by the given species of fish; on the number of fish and fishing gear (irrespective of and in relation to the number of fish swimming outside the path of a fishing gear but in close proximity to it), etc. Should the assumption by A.P. Golovchenko be true to the effect that fish can develop conditioned defensive reflexes to net fishing gear, the fate of the catch may largely depend on the ratio of fish in the path of a fishing gear that either possess or lack such reflexes.

In the case of purse-seining the size of the catch depends considerably on whether the pursing rope is in contact with the bottom and if not, on the position of the discontinuity layer which, in some cases, may prevent escape of fish from the space surrounded. In purse-seining considerable importance is attached to the "dominant" principle according to which the animals engaged in some sort of vital activities (e.g., feeding) display a poor or an unusual reaction when influenced by other factors (Manteufel & Chayanova, 1958). The visibility conditions in the fishing layer, i.e., the degree of illumination and transparency, are certainly of great importance to the efficiency of the fishing operations.

There are, of course, a number of other peculiarities in fish reactions to fishing gear, specific for certain species and fishing conditions, which, together with the above-mentioned factors, determine the size and the composition of the catches (of course, under equal technical conditions of fishing). All this leaves no doubt that in estimating the number of fish, both in absolute and relative values, in shoals, areas or seas, one should carefully consider the behaviour of fish during test fishing, the neglect of this side of the matter may result in serious errors. It is evident at the same time that the catchability coefficient of any fishing gear, especially of a control gear, can be estimated only on the basis of special methodical work covering both the physical side of the phenomena in question and the variety of the reactions of fish during fishing. In this short review we want to underline that further studies along these lines with application of modern technique of ichthyological research is a goal of paramount importance.