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TO THE PROBLEM OF COMPLEX INFLUENCE ON FISH
OF SIGNALS OF VARIOUS MODALITY.

D.B. V.R.Protasov, N.A.Treschova *



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It becomes more and more vivid that the development of complex fishing is quite promising. In order to organize rational fishing on the basis of scientifically grounded reproduction of harvested fish stock a number of scientific studies should be undertaken for the study of fish behavior when it is influenced by many factors (light, electricity, sound, air-bulbs curtain, heat and aromatic enticements).

Combined application of electric light and electric current proved to be successful in fishing without nets. Possibility of creation of big concentrations while using this method depends on water transparency and electro-conductivity alongside with minimum intensity of light and electric fields which are needed for a certain species. Insignificant penetration of light into the water thickness puts limits to its use.

The search of new complex of effective stimulators has lead to the study of complex influence of sound and electric current. The ability of sound to spread on big territories with slow decay gives right to assume that fish get bigger part of information of the environment through the biological sound perception system. That is why the use of sound as one of the stimulators in a complex is so tempting.

Institute of evolutionary morphology and ecology of animals
Academy of Sciences, Moscow, USSR

The use of electric current as the second stimulant is determined by its strong irritating effect on fish. It is obvious that the character of the effect depends on the kind of signal, its power and time regime. Hence, the choice of the best volume and quality parameters of the electric current becomes one of the main tasks of the study. In case it is done, the response reaction of the fish can be formed voluntarily and the energy can be saved while creating electric impulses.

A series of experiments have been carried out at the Institute of Evolutionary Morphology and Ecology of Animals at the USSR Academy of Sciences. Their task was to study the threshold sensitivity of the fish to the electric current with additional sound stimulant.

The smallest volume of the current which could cause motor excitation of fish was taken as the initial reaction. It is known that the volume of the current which causes the initial reaction depends on the kind of fish and its position in the electric field. However this can be observed when the a.m. parameters are fixed (Mironov 1948, L.M.Nusenbaum, T.I.Faleeva 1961). It should be mentioned that the changes of the kind are registered in experimental conditions as well as in natural ones. This fact became the base for elaboration of complicated statistic methods of obtaining current values of the initial reaction.

In view of the above stated it is quite natural to suppose that the reason of such changes lies not only in the influence of the electric current as for example it

was registered in the experimental conditions, but in the simultaneous effect of other stimulants too. Polyfactor influence increases excitability of the motor center of the fish and sensibility to electric current. The results of the study of behavior and reflex activity in the field increased by consequent and simultaneous use of new stimulants showed the possibility of these phenomena.

The aim of our experiments was to find the value of the current causing initial reaction of the fish (starting at switched on and cut electric current).

The experiments were made in a shoot made of plexiglas, size 52 x 28 x 28 cm, at the shorter sides of which plate electrodes were fixed. The electrodes were made of stainless steel, size 27 x 27 cm. The mobile catode permitted to change the current value by narrowing the gap between the electrodes. The latter were connected with the accumulator (up to 18,7 v) by conductors. The voltage of the electrodes was controlled with a voltmeter, the current in the circuit controlled with an ampermeter. Electric impulse was produced with the help of the key switching the accumulator battery on and off. The impulse lasted one second. A fish (a perch size 12 - 13 cm or a verkhovka size 5 - 8 cm-) was placed between the electrodes. During the experiment the position of the fish was fixed and only the cases when it was parallel to electrodes were registered. The experiment showed that the initial threshold reaction of the perch, is 40 ma, the reaction of verkhovka is 60-68 ma.

The next series of the experiments was arranged to find out the initial reaction of fish the same way, but

this time an isolated hydrophone was placed in the shoot. With the help of sound generator ZG-10 it created various sound fields in the water (from 40 cycles per second to 2 k c/s).

The process of changes is the following. Electric current of considerably smaller value than the one which caused the initial reaction was created in a shoot. In the experiments the absence of reaction of the fish was registered only for the cases when the electric impulses were switched on or off. Then the volume of the current was changed, sound generator and hydrophone were switched on and the volume of the current which caused the initial reaction was measured. It was registered that the volume of the current which caused the initial reaction of the same verkhovka individual dropped to 20-23 ma and to 13-14 ma for perch.

Thus, under the influence of sound which was another stimulant of new modality the volume of the current which caused the initial reaction changed for nearly 30%.

Even the first results of the experiments give us the right to make a conclusion that the joint application of sound and electric current as two stimulants reduces the amount of energy needed for the effective electric stimulus.

The results have also proved that simultaneous and consequent use of two irritants which are the electric current and the sound helps to increase the excitability of the motor center, i.e. to increase

the behavior and reflex activity.

The experiments allowed to find out that the parameters of the electric field which caused the initial reaction are in inverse proportion to the size of individual when the electric current is accompanied with the sound. So, the reaction of the studied fish individuals to the joint influence of the electric and sound fields proved the regularity which was stated earlier by a number of experimentators (2, 3) for the case of the reaction caused by only one stimulant.

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