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International Council for
the Exploration of the Sea

C.M. 1977/B:4
Gear and Behaviour Committee

REPORT OF THE WORKING GROUP ON REACTIONS OF FISH TO FISHING OPERATIONS

Note This Report has not yet been approved by the International Council for the Exploration of the Sea; it has therefore at present the status of an internal document and does not represent an advice given on behalf of the Council. The proviso that it shall not be cited without the consent of the Council should be strictly observed.

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Rapporteur: Dr S J de Groot

1. Meeting time and place: 21, 22 April 1977, Hamburg

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3. Introduction

Relevant Resolutions (passed at 64th Statutory Meeting, 1976)

C Res. 1976/2:20. (b)

The Working Group on Reaction of Fish to Fishing Operations, convened by Dr C S Wardle, to discuss in particular "Methods of Attracting Fish", as well as sound and vibrations in relation to fish capture, electrical fishing and other relevant matters at the discretion of the Convener.

C Res. 1976/2:20 (e)

The Working Group on Sound and Vibration in Relation to Fish Capture should be merged with the Working Group on the Reaction of Fish to Fishing Operations.

The Chairman of the Gear and Behaviour Committee and the Conveners of the Reaction and Engineering Working Groups agreed that the progress in electrical fishing might best be considered at a joint session. This took place as the morning session of 21 April 1977.

Historical Note

The aims of the Working Group have not changed since its first meeting at Nantes in 1973. They are: to discuss current practical problems in fishing operations particularly those that might involve aspects of fish behaviour, to keep in touch with techniques and facilities used to observe the reaction of fish to fishing operations, to maintain an up-to-date knowledge of relevant studies of fish physiology and behaviour, to discuss interpretation of fish behaviour in relation to fishing operations, and to identify and encourage co-operative experimental work where this seems worthwhile.

The first meeting, in Nantes in 1973, considered and defined these aims. The second meeting, in Aberdeen in 1974, gave special attention to the swimming performance of fish and generated a special ad hoc meeting at Texel which published a 76 page report on design and practical operation of research aquarium systems (Gear and Behaviour Committee, C.M. 1975/B:3). The third meeting in Ostend in 1975 concentrated on the effect of electric fields on fish (C.M. 1975/B:19 and B:20). The fourth meeting in Hull in 1976 as well as producing a general report (C.M. 1976/B:2), held a joint session with the engineering working group and produced a special joint session report on the methods for observing gear and reaction of fish to gear (C.M. 1976/B:3).

4. Agenda

Thursday morning, 21 April 1977, 0900 - 1200 reported as separate meeting

Short business session. P J G Carrothers, Chairman

Joint session on biological and technological aspects of electrical fishing, C S Wardle and E J de Boer, Co-conveners. Chairman G P Boonstra.

Thursday afternoon, 21 April 1977, 1330 - 1700 and Friday 22 April 0900 - 1700.

Fish Reaction Working Group, C S Wardle Convener.

Progress reports - summaries from member countries of current research relevant to this Working Group.

New Contributions

Discussion of methods of attracting fish

Future special topics

Recommendation

5. Progress Reports and Current Research Topics

FRANCE (Kurc). The research on electric fishing has been concluded and is now ready for commercial application. However the recent success of pelagic nets together with the reduced commercial interest in species such as sardine and anchovy throw doubt on the need to put in operation the electric fishing method, at least for the time being. Further effort will be made in the tuna trolling studies, including analysis of the catching power of artificial lures. Surveys by acoustic methods to assess biomass and schooling behaviour of other pelagic fishes should start in the near future.

GERMANY. See progress report Engineering W.G. reporting work on blue whiting and further studies on krill. Steinberg presented a film on the German Surveys of the Antarctic Krill (1976).

NETHERLANDS. Work continued at University of Utrecht, Lab Comp. Physiol. on hearing in fish including a joint Scottish, Dutch investigation which will take place in the summer of 1977. The institute also studies the sensitivity of fish to natural electrical fields. Laboratory studies on the rhythmic activity of flat fishes have been resumed together with analysis of data collected in the field. A new aquarium building will be started in the summer of 1977.

NORWAY. The plans outlined in detail in 1976 Report C.M. 1976/B:2 are being continued.

UNITED KINGDOM . (DAFS). Hawkins described the work including the determination of contrast perception of cod and including some work on colour sensitivity using heart beat conditioning techniques. They demonstrated that deep red light is not seen by the cod and can therefore be used to illuminate experiments with cod for TV recording. Other work is investigating the improvement of longline structure and design of hooks and positions of the bait. Hearing studies now include the hearing sensitivity of salmon (S. salar) and together with Sand (Norway) studies of the spatial discrimination of sound sources. The acoustic tracking range is being used to study the activity of the cod in the sea and factors controlling predation by the cod.

Wardle showed extracts of videotapes demonstrating the reaction of fish to various parts of fishing gears, recorded by new diving techniques with a divers' vehicle developed during the last year. Copies of the tape shown will be available by the end of the year for those interested. He proposed a paper to the next Council Meeting summarising swimming performance and related this to fish gear movements. A graph summarising what is known of fish swimming speeds was discussed in relation to fish reactions.

USSR. Saburenkov informed the meeting that three contributions relevant to this working group on the following subjects; 1. a new electrical fishing generator; 2. the reaction of fish to sounds and electrical fields; 3. the analysis of fish behaviour in a trawl, will be presented to the Council Meeting.

6. Bioluminescence and its importance in fish reactions to gear

Wardle presented a contribution by P Tett and P Anthony (Oban, Aberdeen) estimating the quantity of illumination generated by netting moving through water containing bioluminescent organisms and related this light level to the light sensitivity of the eye of the cod. The meeting asked after discussion that this contribution be prepared for presentation to the coming Council Meeting.

Further work was obviously required both in the literature and at sea on investigating the distribution of these organisms in commercial fishing areas. Direct measurement of the level of bioluminescence might also be related to the type of fish reaction seen in pelagic fishing gears observed with sonar devices.

7. Methods of attracting fish

Light

Kurc presented a paper by Diner and himself on the attraction of fish by artificial light, which reviewed particularly the use of lights to attract sardines and some experiments which developed this technique.

Discussion concluded that there were dangers in attracting fry of many other species together with the species fished for, and that this technique is therefore banned in several countries, particularly in fresh waters. However G. Kurc explained that in France the use of light attraction in fresh water is also banned but, in the sea fisheries it is reasonable to use this method. It should be noted that the juvenile fish are attracted in such a way as to become immobile and they are washed away by the current and do not remain available for capture. Only the adults maintain an active reaction to the attracting light and can be caught. In fact one can say that the attraction by light in these conditions is selective and moreover the shoals of fish caught by this method are typically homogeneous, as pelagic fish often appear to group together according to size.

Lures and baits

Fernø presented a preliminary paper on the behaviour of fish in relation to longlines. This was a progress report, describing the way in which fish took the bait on the line and also had the aim of determining the fishing volume of the longline and these studies will make use of the acoustic tag, pinpoint-system to show up movements of fish in relation to baited hooks.

The meeting discussed in detail the possible complications in behaviour studies of reaction of fish to longlines, including the chemistry of the bait, the water currents, the lay of the line, the line material, the snood structure and properties, the temperature and seasonal changes and distribution of the fish.

Hawkins reviewed the evolution of the longline fishing technique as an attraction method for fish, and pointed out the advantages particularly in relation to fuel saving and rough ground fishing. He stressed the importance of understanding the attraction of both the artificial and natural baits in order to develop baits suitable for automatic baiting machines. He went on to describe systematic laboratory studies (A. Johnston and himself) designed to classify the acceptability of any particular best bait. The meeting encouraged him to present these techniques and results in a ICES paper to the next C.M.

Kurc presented a comparative study of lures used by French fishermen to catch tuna (authors - H Alonde and F Delaporte). The paper analysed the success value of a number of coloured plastic lures using a computer technique. The meeting recommended that this paper be presented to C.M.

The problem of sound of the fishing boat effecting the success of this fishing method was discussed but as yet no research has been carried out on this subject.

Sound

K Olsen outlined a successful series of experiments carried out by Balchen and his team in Trondheim which showed that fish could be rapidly trained to be attracted to a sound source when this is associated with food.

Electricity

This subject was dealt with in a special joint session and is reported separately.

Recommendations. It was agreed to recommend that the working group be reconvened in Bergen - Norway in May 1978. K Olsen (Norway) suggested that it would be appropriate to take up the Council Resolutions C. Res. 1975/4:11 and C. Res. 1976/5:4 relating to acoustic methods for pelagic and demersal stock assessment, and discuss the behaviour patterns of commercial fish and their effect on echo target strengths. The Meeting agreed to recommend this subject to the Council Meeting. However, it was also stressed that the special subject chosen should not limit the overall contribution to the working group meeting but should as described in the historical note add to the subject matter covered by the working group members.