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Gear and Behaviour Committee

Report on FAO Conference on Fish Behaviour in Relation to Fishing Techniques and Tactics

Bergen, 19-27 October 1967

by

Steinar Olsen[x)]

This Conference brought together 125 participants from 34 countries, mainly research workers engaged in studies pertinent to the subject of fish behaviour in relation to fishing. ICES, ICNAF, IPFC and GFCM were represented. 54 Experience papers and 12 Review Papers were presented to the Conference and discussed during the plenary sessions. The Summary Report and the submitted papers will be published as the Proceedings of the Conference.

Six ad hoc Working Parties submitted separate reports on the following subjects:

1. Acoustic techniques for studying fish behaviour.
2. Use of submersibles in marine research and fisheries.
3. Possibilities of controlling movements of fish for the purpose of improving harvest relevant to extant gear and futuristic entractive processes.
4. Experimental designs for behaviour studies and design of facilities.
5. Short-term distribution patterns and fishing strategy.
6. Sensory physiology - its possible contribution to behaviour studies and to design of fishing gear.

As a result of an exchange of views during Working Parties and discussions in plenary sessions it was agreed that certain fields of study require particular attention, and suggestions were made to intensify the following areas of studies:

1. The short-term and long-term effect of intensive fishing on school size and distribution, and the attendant changes in the behaviour of fish schools.

2. The differences in behaviour of schools of the same species but of different school size in relation to fishing gear.

3. The effect of meteorological changes on local hydrographic conditions and fish behaviour.

4. The influence of differential behaviour, due to age and sex, reproductive state, feeding state and diurnal rhythm on catchability.

5. Burst speeds and cruising speeds measured in the natural environment, as for example by sector-scanner, underwater observations by divers, and underwater swimming speed apparatus.

6. The effect of escape reaction on subsequent swimming performance.

7. Direction and step length in escape from gear.

8. Developing a more adequate theory of fish locomotion, taking into account metabolic expenditure and hydrodynamic losses.

9. The use of acoustic techniques to count fish immediately in front of gear, such as trawls or Danish seines, requires further attention.

10. The physical character and patterns of sounds, biological and non-biological, that are most effective for producing favourable directional response in fish.

11. The effect of ship noise, particularly in connection with purse-seine fisheries.

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x) Mr. Steinar Olsen, Marine Biology and Environment Branch,
Fishery Resources and Exploitation Division, FAO, Rome.

12. Thresholds of behavioural responses in terms of $\Delta I/I$, (where I is the initial stimulus strength and ΔI is the change in the strength of the stimulus just necessary to provide a response), and the significance of the time component of a stimulus (e.g. rate of rise in relation to accommodation; duration in relation to adaptation) to behavioural responses.

13. The reactions of fish to chemical substances, particularly from the point of view of developing artificial bait.

14. Observations on fish behaviour during the act of capture, with divers, cameras, submersibles, sector scanners and other observational tools.

15. The characteristics of fish sounds, according to size and species, and also on the incidence of sound production according to size and species.

16. The determination of dominant sensory modalities employed by fish in the detection of gear.

17. The effects of bridles (sweeps) on trawl catches and elucidation of their mode of action.

18. The mapping of pressure fields and water-speed variations in front of and in and around fishing gear.

The Conference agreed on three recommendations urging FAO to consider the possibility of establishing Working Parties:-

"1. To promote techniques and procedures for constructing an underwater laboratory and apparatus in order to measure behavioural and physiological responses in the natural environment. It is suggested that the Working Party be comprised of laboratory experimentalists competent in the fields of behaviour and physiology and divers with knowledge and experience of submersibles and underwater diving technology.

"2. To consider specific aspects of the theory and techniques of fish behavioural experimentation in relation to fishing techniques and tactics, with a view towards developing and disseminating through FAO a manual of procedure and analytical approaches to this problem.

"3. To review investigations into schooling behaviour of fish as the objective of commercial fisheries, by a small Working Party of schooling behaviour experts, possibly convened aboard ship, to evaluate and study schooling in the natural Environment".