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REPORT OF THE AD HOC GROUP ON ARTIFICIAL BAIT AND BAIT ATTRACTION

Convenor: Åsmund Bjordal, Institute of Fishery Technology Research,
Bergen, Norway.

Rapporteur: Alastair Johnstone, DAFS, Marine Laboratory, Aberdeen, UK.

Meeting time and place: 28 - 31 May 1985, Bergen, Norway.

Terms of reference:

This working group shall concentrate on the stimuli aspects of research on artificial baits, divided into two main topics: Bait attraction, and Bait acceptance. The working group will also review past and current research on artificial bait and related subjects.

During the meeting in Bergen, the following topics should be considered in particular:

- a) Review the experimental techniques used in the laboratory.
- b) Review the experimental techniques employed in the field.
- c) Make recommendations for future research on artificial bait.

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AGENDA

1. Status reports.
2. Experimental techniques for the investigation of artificial baits
in the laboratory.
3. Experimental techniques for the study of artificial baits in the
Sea.
4. Discussion.
5. Recommendations.

1. STATUS REPORTS

1.1. Japan

Yamaguchi, Y. and Hidaka, I. " A short review of the recent longline fishing and developmental works on artificial baits in Japan". A review of long lining in Japan and presentation of the results of comparative fishing experiments using squid and artificial baits. Data is also given on the use of oil, luminescent material and chemical additives during line fishing trials.

1.2. Norway

Bjordal, Å. Values for physical strength and stimuli release patterns have been established for different natural - and artificial baits.

Promising results are obtained with minced bait and silage in "tea bags", both in field behaviour studies and full scale longline trials.

Light stimuli on baited hooks did not improve the catch rates for tusk and ling.

1.3. Scotland

Johnstone, A.D.F. & Mackie, A.M. Artificial bait studies in the U.K. Experiments to investigate feeding stimulants and future work on bait preference studies were described in general.

1.4. Canada

Way, E. Status report, Newfoundland: During the past 3 years, researchers at the Marine Sciences Research Laboratory have been investigating several alternatives to the traditional mackerel and squid baits presently employed in the cod longlining fishery. To date,

semi-natural (artificial) baits consisting of either fish hydrolysates or fish processing plant wastes bound in a colloidal gel appear most promising in terms of texture and hook retention characteristics. However, the effectiveness of the artificial baits has not been adequately tested under commercial fishing conditions.

Subsequent work has been conducted on the use of dried squid, mackerel and capelin, ground to a fine powder and enclosed in a "tea bag" form. Results so far have been encouraging. Further work is expected to be carried out with the "tea bag" concept later in 1985.

Walsh, J.M. "Report on artificial bait studies and trials conducted in Harbour Breton, Newfoundland 1985". Comparative fishing trials in the sea with artificial squid and capelin meat baits were not successful. Alternative methods of testing artificial baits are discussed. Reference was made to an Industrial Development Branch (Dept. of Fisheries & Oceans, St. John's, Newfoundland). Report, 1984 "A field and laboratory evaluation of artificial baits for the cod longlining fishery in Newfoundland".

Ouellet, G. and Levesque, G. Status report, Quebec,: Field trials with traditional synthetic and semi-synthetic bait for the lobster fishery in Magdalen Island. Field trials conducted in 1982 with different natural baits have shown that herring, redfish and mackerel were better baits than cod, plaice, squid and rock crab for catching lobsters. Herring and redfish have therefore been selected as attractants for the preparation of semi-synthetic baits. In 1983, 3 colloids have been chosen to compose the semi-synthetic baits with the ground up fishes. These are corob gum (= locust bean gum), carrageenan-B and xanthan.

Field trials conducted in 1983 during the commercial season have shown that the semi-synthetic baits were significantly less attractive than the traditional baits. The best results have been obtained with a bait composed of carob gum and xanthan as colloidal support (3%) and 30% of

ground up herring. The catch rate obtained with this bait was 70% of the catch rate obtained with the standard (fresh herring). Two synthetic baits have given no catch at all.

1.5. France

Sacchi, J. "Outline of research on an artificial bait conducted by a French private group (GERN)". A brief report on preliminary results on the use of chemical stimuli to simulate live polyodour for the capture of shoaling fish was presented.

1.6. West Germany

Dahm, E. Preliminary results of current studies into the effects of deep freeze storage of herring bait on fish capture was discussed. Comparative fishing trials indicate that deep frozen bait is more effective than fresh bait.

POST 1. DISCUSSION

The session on the status of line fishing and artificial baits was followed by discussion of the following main topics:

1. Visual and acoustic stimuli were considered to be most relevant in addition to chemical stimuli emitted from baits to improve fishing performance.
2. The seasonal nature of established longline fisheries and the need for continuity of bait supply was identified as an important factor for consideration during bait development studies.

2. EXPERIMENTAL TECHNIQUES FOR THE INVESTIGATION OF ARTIFICIAL BAIT IN THE LABORATORY.

2.1

Løkkeborg, S. "Methods for testing physical strength and release of stimuli from bait". Physical strength of bait was tested by measuring the force needed to pull the baits off the hook. The artificial bait tested was stronger than mackerel, but weaker than squid bait. The stimuli release pattern of artificial bait with carrageenan binder was comparable to that of mackerel.

2.2

Johnstone, A.D.F. and Mackie, A.M. "Laboratory investigations of bait acceptance by the cod, *Gadus morhua* L." Aquarium feeding studies involving the omission of various components of a synthetic squid mixture have so far shown that most activity resides in the neutral L-amino acid fraction.

POST 2. DISCUSSION

The papers presented were followed by a short discussion focusing mainly on the following aspects:

- 1) The need for investigation of the residual pool of attractants and feeding stimulants remaining in natural and artificial baits after differing "soak" times was identified.
- 2) The use of microencapsulatori techniques to retain feeding stimulant activity in baits until physical contact is made by fish was discussed.
- 3) Previous feeding history is an important factor for consideration,

especially during laboratory, bait acceptance investigations.

- 4) Alternative techniques applicable to aquarium experiments on food acceptance and preference were discussed. A variety of experimental methods for testing baits in the aquarium would help the transition to bait trials in the sea.

3. EXPERIMENTAL TECHNIQUES FOR THE STUDY OF ARTIFICIAL BAITS IN THE SEA

3.1

Ona, E. "Experimental design for behaviour studies in a field laboratory". The use of acoustics to quantify fish attraction and avoidance behaviour in a controlled field environment was discussed.

3.2

Løkkeborg, S. "Experimental design for bait preference tests by behaviour studies in the field". Field experiments using underwater television are described. Cod appeared to take artificial bait as often as mackerel bait but haddock, although attracted to the artificial bait, did not retain the bait after initial contact.

3.3

Johannessen, T. "Fishing experiments with minced bait in nylon bags". Results of comparative fishing trials with semi-pelagic monofilament longlines using mackerel and whole mackerel, shrimp and minced mackerel in nylon bags in separate experiments, were presented. In general catch rates were 25 to 40% lower than with equivalent natural baits. Species and size selection effects were discussed.

3.4

Floen, S. "Experimental design for data collection and analysis in comparative longline fishing trials". An outline of methods using a microprocessor to collect and analyse data from longline experiments in the field was presented.

3.5

Alaskan film of Halibut Capture in the Pacific. Underwater T.V. observations of baited lines demonstrated the effectiveness of various baits and different hook designs for commercial halibut capture. (Made by: Camera One Productions, Seattle, USA).

POST 3. DISCUSSION

- 1) Sonar could improve the area of observation during the attraction of fish to longlines and experimenters should be aware of sonar developments for future use.
- 2) The use of underwater television to gain insight to fish behaviour in response to artificial baits was supported. It is considered important, prior to full scale fishing trials, to test new baits using TV observation techniques.
- 3) Care should be taken to ensure that comparative fishing trials are, as far as possible, designed so that statistically significant results can be obtained.

4. FINAL DISCUSSION

4.1

Some doubt was expressed regarding commercial fishermen's willingness to accept artificial baits. However, the success of such new baits ultimately depend upon their effectiveness and cost. The possibility of using trash fish, underutilized fish species or fish/shellfish processing waste as bait was also discussed.

4.2

Further investigations of the effect of "soak time" on the effective fishing area of baited longlines and on the residual level of feeding stimulants is also considered worthwhile.

4.3

Hook design and bait attachment are outside the aims of the working group but should be considered in the overall view of bait presentation and effectiveness. There is also a degree of species selectivity involved in bait attachment and hook types used during fishing.

4.4

Although the enhancement of attraction of fish to baited longlines using additional stimuli (visual or acoustic) is worth investigating, bait acceptance, the taking and swallowing of a presented bait, is still considered to be the most important factor for further study.

4.5

More work should be conducted on the detailed analysis of the various behavioural stages during bait acceptance by fish of different species. Analyses of recorded television observations obtained from bait trials in the sea would help to describe, quantify specific behaviour patterns.

4.7

It was agreed that communication among contributors and others working in similar research fields be maintained by the circulation of a newsletter.

During 1986 it was proposed that A.D.F. Johnstone should coordinate the newsletter and maintain informal contact with the group.

4.7

The participants suggested that the following aspects of research were of highest priority for future investigation:

- Identification of specific feeding stimulants.
- Enhancement of attraction of fish to baited longlines using visual and/or acoustic stimuli.
- Retention of feeding stimulants in baits over different soak times.
- Detailed behaviour analysis of bait acceptance by different fish species.
- Possible use of microencapsulation techniques to improve feeding stimulant retention in baits.

5. RECOMMENDATIONS

5.1

The proceedings of the Ad Hoc Working Group on Artificial Bait and Bait Attractance 1984/1985 are published in the Council's Cooperative Research Report series.

5.2

The status of bait development studies and research on longlining should be kept under review.