INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA

C.M. 1992/B:4
Fish Capture Committee




# REPORT OF WORKING GROUP ON FISHING TECHNOLOGY AND FISH BEHAVIOUR, BERGEN, 15-16 JUNE 1992



General Secretary
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## 1. INTRODUCTION

| | |
|---|---|
| Convener: | B. van Marlen, Netherlands Institute of Fisheries Research, IJmuiden, The Netherlands |
| Rapporteur: | Daniel L. Erickson, University of Washington School of Fisheries, USA. |
| Meeting place: | Bergen, Norway |
| Dates: | 15-16 June 1992 |

In accordance with ICES Resolution C. Res. 1991/2:8, the Working Group met in Bergen Norway, 15-16 June 1992, (Chairman: Mr. B. van Marlen, Netherlands), to consider techniques for measuring selectivity of fishing gears, analysis procedures, and forms of reporting results.

In accordance with ICES Resolution C. Res. 1990/2:9, a joint session of this Working Group and the Working Group on Fisheries Acoustic Science and Technology, under the chairmanship of Dr. P.A.M. Stewart (UK), was held on 16 June 1992 to consider, in particular, radiated noise of survey vessels.

## 2. PARTICIPANTS OF THE FTFB AND FAST WORKING GROUPS

| Country | Name |
|---|---|
| Australia | Rudi Kloser |
| Belgium | Ronald Fonteyne |
| | Hans Polet |
| Canada | Alfred Appenzeller |
| | W.R. Bowering |
| | Gerald Brothers |
| | Frank Chopin |
| | Chris Cooper |
| | Ralph G. Halliday |
| | Pingguo He |
| | Yvan Simard |
| | David Tait |
| | Philip Walsh |
| | Stephen J. Walsh |
| Denmark | Klaus Lehmann |
| | Bo Lindgren |
| | Karl-Johan Staehr |
| | Jens Pedersen |
| (Faroe Islands) | Jan Arge Jacobson |
| | Bjarti Thomsen |
| (Grønland) | Frank Riget |
| United Kingdom (England) | G.P. Arnold |
| | Ken Arkley |
| | Catherine Goss |
| | Ron Mitson |
| | Mike Nicholson |
| (Scotland) | Richard Ferro |
| | E.J. Simmonds |

| | |
|---|---|
| | Peter A.M. Stewart |
| | Bill Dickson |
| | Jack Robertson |
| Finland | Petri Suuronen |
| France | Noel Diner |
| | Pierre Freon |
| | François Gerlotto |
| | M. Soria |
| | François Theret |
| Germany | Erdmann Dahm |
| | Hans Eberhard Götze |
| Iceland | Gudni Thorsteinsson |
| Italy | Loris Fiorentini |
| The Netherlands | Bob van Marlen |
| | Dick de Haan |
| | Clemens van der Nat |
| Norway | Asgeir Aglen |
| | Arnt Amble |
| | Arvid Beltestad |
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| | John Dalen |
| | Birger Enerhaug |
| | Arill Engås |
| | Dag M. Furevik |
| | Olav Rune Godø |
| | Magnus T. Hafsteinsson |
| | Irene Huse |
| | Ludvig Karlsen |
| | Svein Løkkeborg |
| | Laila Mikalsen |
| | Ole Arve Misund |
| | Egil Ona |
| | Steinar Olsen |
| | Kjell Olsen |
| | J.T. Øvredal |
| | Shengmen Ren |
| | Roar Skeide |
| | T. Sigurdsson |
| | Aud Vold Soldal |
| | Geirmund Oltedal |
| | John Willy Valdemarsen |
| Spain | P.C. Lopez |
| Sweden | Olle Hagström |
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| | N. Håkansson |
| | Bertil Johansson |
| | Roger Karlsson |
| | L.E. Palmén |

| | |
|---|---|
| USA | Sara Adlerstein<br>D.L. Alverson<br>Daniel L. Erickson<br>Arnold Carr<br>Donald R. Gunderson<br>D. Van Holliday<br>Stephen M. Kaimmer<br>William A. Karp<br>Ellen K. Pikitch<br>Craig S. Rose<br>Mike Stone<br>Jim Traynor<br>Robert J. Trumble<br>Charles W. West |
| FAO | Andrew Smith |

## 3. AGENDA

### 3.1 Special Topic

**Techniques for measuring selectivity of fishing gears, analysis procedures, and forms of reporting results.**

1. *Effects of changes in codend mesh size and shape to a U.S. West Coast bottom trawl fishery: size selectivity, dollars per trawling hour, and discards.*
(Pikitch, E.K. & Erickson, D.L. - presented by Erickson - no paper )

2. *Selectivity experiments with different designs of cover.*
(Ferro, R.S.T. - no paper + video)

3. *Whole trawl selectivity for prawns.*
(Ferro, R.S.T. - no paper + video)

4. *Experiments with square mesh windows in Icelandic waters.*
(Thorsteinsson, G. - no paper + video)

5. *Influence on selectivity using canvas lift in seine net codends.*
(Beltestad, A.K. & Isaksen, B. - presented by Beltestad - paper)

6. *Controlled attractant release in Nephrops pot fishing.*
(Bjordal, Å. & Løkkeborg, S. - presented by Bjordal - no paper)

7. *Grid sorting of penned saithe.*
(Misund, O.A. & Skeide, R. - presented by Misund - no paper)

8. *An effective sea bird scarer in longline fishing.*
(Løkkeborg, S. & Bjordal, Å. - presented by Løkkeborg - no paper)

9. *Development of a species selective beam trawl.*
(Fonteyne, R. & De Langhe, F. - presented by Fonteyne - paper + video)

10. *Escapement of fish underneath the groundrope of a standard bottom trawl used for stock assessment purposes in the North Sea.*
(Dahm, E. & Wienbeck, H. - presented by Dahm - no paper + video)

11. *Survival of saithe (Pollachius Virens L.) escaping through trawl meshes.*
(Jacobsen, J.A., Thomsen, B. & Isaksen, B. - presented by Jacobsen - no paper + video)

12. *Pair trawl selectivity.*
(Ferro, R.S.T. - no paper)

13. *Between haul variability.*
(Ferro, R.S.T. - no paper)

### 3.2 Other presentations - Gear engineering studies.

14. *Considerations about the accuracy required for the calculation of the hydrodynamic resistance of trawls.*
(Stengel, H. - presented by Dahm - no paper)

15. *Further comparison of full scale and 1:3 model tests on Italian bottom trawl.*
(Fiorintini, L. - paper)

16. *The effect of ship motions on the dynamic behaviour of a beam trawl.*
(Van der Nat, C.G.J.M. *et al.* - presented by Van der Nat - paper)

### 3.3 Report from FTFB-subgroup.

**"Evaluation of possible variability in fishing power of the GOV trawl."**

Presentation of draft report and discussion.

### 3.4 National progress reports.

### 3.5 Discussion and recommendations.

## 4. SUMMARIES OF PAPERS, VIDEOS AND VERBAL PRESENTATIONS.

### 4.1 Effects of changes in codend mesh size and shape to a U.S. west coast bottom trawl fishery: size selectivity, dollars per trawling hour, and discards.

An alternate haul technique, following a randomized block design, was used to determine short-term biological and economic effects of different codend mesh sizes and shapes on the U.S. west coast bottom trawl fishery. West coast trawl vessels, operating under production conditions, donated vessel time during the 1988-1990 field work; 102 experimental trips were conducted from the Canadian border to south-central California. Potential short-term effects of four diamond mesh codends ranging from 76 to 140 mm and two square mesh codends (114 and 127 mm) were presented for one segment of the bottom trawl fishery (i.e. Deep Water Complex). The 76 mm diamond mesh codend resulted in high discard rates of marketable species and extended deck sorting times. Discarding and sorting times were substantially reduced with increases in codend mesh size. The decrease in dollars per trawling hour was relatively small as

mesh size was increased from 76 mm to 114 mm (diamond), but additional increases in codend mesh size resulted in more severe reductions in revenue with little improvement in discard rates. Surprisingly, the square mesh codends produced higher revenues than did equivalent sized diamond mesh codends. Indeed, dollars per trawling hour observed for the 114 mm square mesh codend was not significantly different from that of the 76 mm diamond mesh codend, even though discarding was less for the square mesh codend. Comparison of square and diamond mesh codend selectivity indicated that the square mesh codends retained smaller flatfish than did equivalent sized diamond mesh codends, whereas the opposite was true for roundfish. However, the selection range was narrowest for the square mesh codends for both round and flat-fish species.

### 4.2 Selectivity experiments with different designs of cover.

Two experimental trips were conducted to evaluate the potential masking effects of the standard ICES codend cover to codend size selectivity estimates. Experiments were conducted using the twin trawl technique; comparisons were made between the standard ICES codend cover and a cover held away from the codend using semi-rigid rings. Results obtained using the standard ICES codend cover were biased; the 50% retention length was for the standard cover than for the codend cover with semi-rigid rings. In addition, the selection range of the standard cover was approximately 2x the selection range observed for the ringed codend cover. Between tow variability was higher using the standard ICES codend cover; individual tow ogives were most consistent using the codend cover with semi-rigid rings.

### 4.3 Whole trawl selectivity for prawns.

Experiments were conducted to estimate Nephrops size selection by the entire trawl net. The twin trawl technique was employed; one net was constructed using "normal" mesh sizes, while the other net was constructed entirely of small mesh (35 mm). Codend mesh sizes of 70 and 80 mm also were compared using a 35 mm mesh codend as the standard. The two whole nets produced similar length frequency histograms, and there was virtually no difference in selection curves between the 70 mm and 80 mm codends. Whole net selection ranges observed during this study (7.13 to 9.59 cm) were lower than selection range estimates used in stock assessments (10 to 15 cm).

### 4.4 Experiments with square mesh windows in Icelandic waters.

Field trials were conducted to test the effectiveness of various gear designs for reducing bycatch of non-target species in the Icelandic Danish seine flatfish fishery and the Nephrops trawl fishery. Various experimental designs were employed. Catch comparisons of experimental Danish seines to a commercial Danish Seine indicated: (1) herring bycatch was reduced using seines with a square mesh window, (2) some cod escaped through the square mesh window, and (3) haddock and whiting bycatch decreased using a square mesh window installed into a specially constructed seine (i.e. no headrope overhang). Escapement of fish from Nephrops trawls installed with square mesh windows varied with location of the window. No difference in selection was observed between commercial Nephrops trawls and those with a square mesh window installed 5 m in front of the codend (i.e. in the extension); however, significant reductions in bycatch were observed for haddock (42%), whiting (60%), and cod (38%) using a square mesh window installed anterior to the extension. Use of square mesh windows became regulatory for all Nephrops trawls following these trials.

### 4.5 Influence on selectivity using canvas lift in seine net codends.

The storage of live cod captured at sea is desirable during periods when catches are more than processing plants can handle and to increase the value of the catch. A canvas lift technique has been developed for improving the survival of cod captured with Danish seines. This technique involves mounting a canvas piece inside the end of the codend; up to 1000 liter of water is lifted with the catch out of the sea. This gear currently is illegal, however, due to the possibility of reduced selectivity. The objective of this research was to evaluate the effects of a canvas lift on the size selection of cod. Twenty hauls were conducted using the trouser trawl method. It took some time to dump fish out of the first codend while the other codend floated in the water next to the vessel, causing small fish to be washed out of the meshes. Hence, the sequence of lifting the catch for each codend type was alternated between tows. Virtually no difference was observed in cod length frequency distributions for codends with and without the canvas lift installed, although the number of undersized cod was somewhat higher in the codend with canvas than without. The washing out effect of small fish from the codend laying in the swell along the side of the vessel was much greater than the effect of the canvas lift on the selectivity.

### 4.6 Controlled attractant release in Nephrops pot fishing.

A new technique was developed to control bait smell release rates and increase the size of the concentration field of baits used in Nephrops pots. Initial field studies were conducted using a mackerel extract placed in a bait container which allowed passive diffusion of the extract. Results were opposite of those expected - Nephrops caught in pots containing the mackerel extract was 1/3 that of pots containing normal mackerel bait. Additional trials were conducted using containers that better controlled the release rate of the mackerel extract. Ten pots were set; five of the devices released 6-8 ml of the extract per hour, whereas the remaining devices worked improperly. The properly working devices caught more Nephrops than did the pots with "normal" bait, whereas the improperly working devices caught less. Results indicate that a larger attraction field may be realized by controlling the release rate of the bait extract. Increasing the size and duration of the attraction field may increase the size of Nephrops catches as well as the selectivity of the pots for larger individuals (i.e. larger animals exhibit a wider feeding range than smaller animals).

### 4.7 Grid sorting of penned saithe.

Saithe caught at sea often are stored in pens until they can be sold, yet many vessels are too small to hold live fish onboard. Hence, saithe are transferred to pens prior to sale. The objective of this study was to develop and test a grid sorting system to separate small, unmarketable saithe from the catch. Grids were place on the ends of pens. Large and small saithe were purchased and placed into these pens. Fish were forced slowly through grids spaced 55 mm apart resulting in good separation of fish sizes. Additional work was conducted to compare selectivity of 30 mm and 40 mm grids. The selection range for both grid sizes was quite narrow; the L50 for the 35 mm grid was 7 cm less than that for the 40 mm grid. Most size selection occurred within the first 1/2 hour. No mortality of saithe escapees was observed; mackerel mortality was high.

### 4.8 An effective sea bird scarer in longline fishing.

During setting of longlines, many seabirds follow the vessel and actively feed on the baited hooks floating on the surface. How effectively seabirds can "steal" baits from longlines is not documented, but reducing this type of bait loss may substantially im-

prove longline efficiency. In addition, seabirds may be hooked when feeding on baited longlines, and bycatch of seabirds, turtles, and mammals has caused strict regulations for specific gears in the Pacific. A seabird scarer device was developed and tested to determine the rate of bait loss relative to autolines without the scarer device. Streamers were attached to a 5 mm mainline by swivels at 5.5 m intervals. Longlines were set without anchors to prevent the lines from sinking to the sea-bed. Some lines were baited with squid, while others were baited with mackerel. Bait loss was significantly lower for the streamer line (26.3% and 13.0% for mackerel and squid bait, respectively) than for the line without streamers (69.9% and 18.2% for mackerel and squid bait, respectively). No seabirds were caught when using the streamer line, whereas 3 fulmar were caught on lines without streamers.

### 4.9 Development of a species selective beam trawl.

Although flatfish are the target species of beam trawlers, these vessels also land a considerable amount of demersal roundfish. The need for improved roundfish selectivity in beam trawling has led to the project "Improved selectivity in the North Sea Fishery - Beam trawling", financed by the EC and carried out by the "Rijksintituut voor Visserij Onderzoek" (RIVO-DLO) IJmuiden, The Netherlands, the Sea Fish Industry Authority - Seafish Technology (SEAFISH) Hull, United Kingdom and the "Rijksstation voor Zeevisserij" (RVZ) Ostend, Belgium. Results presented herein represent the third of a four phase project. Objectives of this third phase were to observe beam trawl operations and fish reactions to the gear using underwater video, prior to comparing catches between various experimental gears and a standard beam trawl using the twin trawl method. Experimental 9 m chain mat rigged round net designs were: (1) trawls with a square mesh top panel (15 cm bar size), (2) trawls with reduced top panels (two designs), and (3) trawls with a largely reduced top panel and a square mesh window installed (13 cm bar size, 17 x 12 bars). Underwater video indicated that fish behaviour in relation to a beam trawl differs from the behaviour towards otter trawls. No reactions to the gear could be observed until the fish came into physical contact with the chain mat. The response seems rather uncontrolled, and most individuals were overtaken by the fast approaching net. Most attempts to escape took place in the aft part of the net. No flatfish were lost using any of the experimental trawls, and infact, the experimental gears seemed more effective for catching flatfish than did the standard gear. A complete square mesh top panel released up to 75% whiting (all size classes) and 29% haddock (mainly fishes less than 33 cm) relative to the standard beam trawl; no difference in cod catch was observed between these trawls. Providing the top panel with a large escape opening behind the beam was more effective for escapement of haddock (all sizes) during the night than during the day (46% and 15% catch reduction, respectively), suggesting that visual stimuli are important. The reduced top panel did not result in lower catches of cod or whiting relative to the standard beam trawl. A square mesh window installed forward of the codend in this trawl did reduce cod catch (23% during the day and 41% during the night), mostly in the length ranges under 28 cm, as well as the catch of whiting in all length classes (60% during day and night).

### 4.10 Escapement of fish underneath the groundrope of a standard bottom trawl used for stock assessment purposes in the North Sea.

The objective of this field work was to estimate fish escapement under the footrope of the standard bottom trawl used for stock assessment purposes in the North Sea. A commercial trawl with 50 mm rubber discs on the footrope was used. This net could be towed over soft or hard ground; rocky or stony sites could not be sampled using this gear. Catch comparisons were made between fish escaping under the footrope and fish retained within the codend. It was found that for most species, more than 50% of fish encountering trawl gear escape below the footrope. Results varied with fishing location

and fish size. Because of this variability, interpretation of results from current stock assessment survey techniques may be problematic.

### 4.11 Survival of saithe (*Pollachius Virens* L.) escaping through trawl meshes.

The basic philosophy of mesh selectivity research is that by allowing escapement of undersized fish, potential future yields are likely to increase. A necessary requisite of this philosophy is that fish which escape the codend meshes survive the fishing process. Hence, the objective of this research was to estimate the survival of saithe escaping through codend meshes. An ordinary bottom trawl with a 145 mm diamond mesh codend was towed at 3 knots. A codend cover, held away from the codend with 2 m diameter aluminum rings, was trailed by a 2 m x 5 m cage. The cage was acoustically released from the codend cover; a float on the terminal end of a line attached to the cage floated to the surface for retrieval. Cages were not allowed to remain on the bottom because currents were swift and lighting was poor. Hence, cages were slowly retrieved to a depth of 30 m (ascent time was approximately six hours) and allowed to float with the current. A pan and tilt underwater video camera system was mounted to the cages to observe fish behavior. Two cages were recovered after six days approximately 75 miles from the site of detachment. Saithe mortality in these cages was 0% and 2.35%. The swim bladders of the dead saithe had exploded; hence, it is likely that the reason for the observed mortalities was cage ascent (i.e. too rapid) rather than injuries received during escapement of the codend meshes. Underwater video observations of saithe within the cages indicated no behavioural abnormalities.

### 4.12 Pair trawl selectivity.

There has been concern that the technique of pair trawling is not very size selective (i.e. numerous small fish are captured). A model has been developed for estimation of pair trawl selectivity parameters. The objective of this study was to compare pair trawl parameter estimates previously provided by the model with "normal" single trawl parameter estimates. Field trials were conducted using a single otter trawl with a codend cover installed and held away from the codend sides with semi-rigid rings. Data from forty valid hauls were analysed. Results of the field trials were surprising; pair trawls and single boat trawls exhibited similar selectivity parameters. More trials are planned.

### 4.13 Between haul variability.

The most common method used to analyse selectivity data has been to pool data across all hauls. Because selectivity may vary between hauls, this approach can lead to spurious conclusions. Standard error estimates are too small using this traditional approach, which can lead to incorrect inferences of selectivity between different nets. A new method for analysing selection data, taking into account haul to haul variability, was presented. Using this method, each haul represents a sample; a mean selection curve is fit to these data while weighting each individual curve (i.e. sample) by catch size. The result is a narrower selection range and more realistic standard error estimates. A software program has been developed to analyse selectivity data using this technique and can be obtained from:

*R.J. Fryer, SOAFD Marine Laboratory,*
*P.O. Box 101, Victoria Road,*
*Aberdeen, AB9 8DB, Scotland (UK).*

### 4.14 Considerations about the accuracy required for the calculation of the hydrodynamic resistance of trawls.

Theoretical guidelines for accurate calculations of the hydrodynamic resistance of trawls were delineated. Hydrodynamic resistance at various trawl locations was described, and relative error terms were presented. It was concluded that more research is needed, particularly in the area of the codend.

### 4.15 Further comparison of full scale and 1:3 model tests on Italian bottom trawl.

A previous study demonstrated substantial differences in drag and vertical opening between full scale and model Italian bottom trawls. These differences prompted additional trials to measure forces acting on various portions of the trawl; comparisons were made between full scale and 1:3 model trawls. It was found that the vertical opening, as well as the drag of the net, headline, footrope, and wing netting panel each were higher for the full scale trawl than for the 1:3 model. Variance tended to be higher for regressions of the response variables against vessel speed over the sea bottom relative to regressions against net speed through the water. Potential factors responsible for the observed differences were discussed.

### 4.16 The effect of ship motions on the dynamic behaviour of a beam trawl.

Lighter trawl gear would be easier and safer to handle and may reduce potential adverse effects on the benthic ecosystem. Little is known, however, about the interaction between a fishing vessel and her gears. The objective of this study was to determine whether a beam trawl bounces off the bottom, and if so, under what conditions. A numerical model of the vessel with beam trawl, based on the "lumped mass" method, has shown that gear can bounce off the bottom under specified conditions. Most important parameters affecting this behaviour are: the mass of the gear, the warplength-water-depth ratio, and the wave direction with regard to the ship's centerline. Underwater observations are necessary to validate these findings.

## 5. NATIONAL PROGRESS REPORTS

Progress reports were submitted in written form by several countries (@), but not discussed at the meeting. The information given is summarised below for the ICES countries when available. A blank does not necessarily mean that activities do not take place, but they were not revealed in the progress report or otherwise presented.

| COUNTRY CODE | 1 B | 2 CAN | 3 DK | 4 FIN | 5 F | 6 D | 7 ICE | 8 IR | 9 NL | 10 N | 11 PL | 12 P | 13 E | 14 S | 15 GB | 16 USA | 17 SNG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOPIC: | @ | @ | @ | @ | @ | - | - | - | @ | @ | - | - | - | @ | @ | @ | - |
| **1. Survey gears** | | | | | | | | | | | | | | | | | |
| GOV-net | | | | | | | | | X | | | | | X | X | | |
| other gears | | X | | | | | | | | X | | | | | | | |
| plankton torpedos | | | | | | | | | X | | | | | | | | |
| methodology | X | X | | | | | | | | X | | | | | X | | |
| **2. Selectivity** | | | | | | | | | | | | | | | | | |
| codend selectivity | X | | X | | | | | | | | | | | X | X | X | |
| bottom trawls | X | X | X | | X | | | | X | X | | | | X | X | | |
| beam trawls | X | | | | | | | | X | X | | | | | | | |
| midwater trawls | | | | | | | | | X | | | | | | | | |
| seine nets | | X | X | | | | | | | X | | | | X | | | |
| gill nets | | X | | X | | | | | | | | | | | | | |
| longlines | | X | | | | | | | | X | | | | | | | |
| pound nets | | | | X | | | | | | | | | | | | | |
| pots/traps | | X | | X | | | | | | | | | | | | | |
| methodology | | | | | | | | | | | | | | X | | | |
| roundfish | X | X | X | | | | | | X | X | | | | X | | | |
| pelagic fish | | X | | X | | | | | X | X | | | | | | | |
| flatfish | X | X | | | | | | | X | X | | | | | | | |
| shrimps | | X | | | | | | | | X | | | | | | X | |
| Nephrops | | | | | X | | | | | | | | | | | | |
| square mesh codends | | X | | X | | | | | | | | | | | | | |
| square mesh window | X | | | X | X | | | | X | | | | | | | | |
| shortened lace ropes | X | X | | | | | | | X | X | | | | | | | |
| grates or grids | | X | X | X | | | | | | X | | | | | X | X | |
| separator panels | | X | | | | | | | X | | | | | | X | X | |
| other devices | X | | | | | | | | X | | | | | | | | |
| **3. Fish Behaviour** | | | | | | | | | | | | | | | | | |
| reaction to trawls | X | | | X | | | | | X | | | | | | X | X | |
| reaction to seines | | | | | | | | | | | | | | | | | |
| reaction to static gear | | X | | X | | | | | | X | | | | | | | |
| reaction to sound | | | | | | | | | | | | | | | | | |
| effect of temperature | | X | | | | | | | | | | | | | X | | |
| effect of light | | | | | | | | | | | | | | | X | | |
| swimming speed | | X | | | | | | | | X | | | | | X | | |
| schooling behaviour | | | | | | | | | | X | | | | | | | |
| migration | | | | | | | | | | X | | | | | | | |
| mathematical models | | X | | | | | | | | | | | | | | | |

| COUNTRY CODE<br>TOPIC: | 1<br>B<br>@ | 2<br>CAN<br>@ | 3<br>DK<br>@ | 4<br>FIN<br>@ | 5<br>F<br>@ | 6<br>D<br>- | 7<br>ICE<br>- | 8<br>IR<br>- | 9<br>NL<br>@ | 10<br>N<br>@ | 11<br>PL<br>- | 12<br>P<br>- | 13<br>E<br>- | 14<br>S<br>@ | 15<br>GB<br>@ | 16<br>USA<br>@ | 17<br>SNG<br>- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4. Survival** | | | | | | | | | | | | | | | | | |
| roundfish | | | | | | | | | | X | | | | | | X | |
| pelagic fish | | | | X | | | | | | X | | | | | | | |
| flatfish | | | | | | | | | | | | | | | | X | |
| non-fish species | | | | | | | | | | | | | | | | X | |
| from trawls | | | | X | | | | | | X | | | | | | X | |
| from seines | | | | | | | | | | | | | | | | | |
| from gillnets | | | | | | | | | | | | | | | | | |
| from purse seines | | | | | | | | | | X | | | | | | | |
| from longlines | | | | | | | | | | X | | | | | | | |
| **5. Gear engineering** | | | | | | | | | | | | | | | | | |
| model tests | X | | X | | X | | | | X | X | | | | | X | X | |
| f/s measurements | X | | | | X | | | | X | | | | | | X | | |
| door tests | | | X | | X | | | | | | | | | | | | |
| new materials | | | | | | | | | | | | | | | | X | |
| single-door trawl | | | | | | | | | | X | | | | | | | |
| net drag studies | X | | X | | X | | | | X | | | | | | X | X | |
| **5. ROV observation** | | | | | | | | | | | | | | | | | |
| ROV-development | | | | | | | | | X | | | | | | | X | |
| towed gears | X | | X | | | | | | X | | | | | | X | X | |
| static gears | | | X | | | | | | | | | | | | | | |
| **6. Vessel topics** | | | | | | | | | | | | | | | | | |
| vessel design | | | | | X | | | | X | X | | | | X | | | |
| safety aspects | | | | | X | | | | X | X | | | | X | | | |
| working conditions | | | | | X | | | | X | X | | | | X | | | |
| noise reduction | | | | | | | | | | | | | | | | | |
| fuel consumption | | | | | | | | | | X | | | | | | | |
| sound emission | | | | | | | | | X | | | | | | | | |
| living fish transport | | | | | | | | | | X | | | | | | | |
| catamarans | | | | | | | | | | X | | | | X | | | |
| **7. Acoustics** | | | | | | | | | | | | | | | | | |
| acoustic surveys | | | X | | X | | | | X | X | | | | X | X | X | |
| tagged fish studies | | | | | | | | | | X | | | | | | | |
| methodology | | | | | | | | | | X | | | | | X | X | |
| TS measurements | | | | | | | | | | | | | | | | | |
| new instrumentation | | | | | | | | | | X | | | | | | | |
| new software | | | | | | | | | | | | | | | | | |
| radiated vessel noise | | | | | | | | | X | X | | | | | X | | |
| **8. Environment** | | | | | | | | | | | | | | | | | |
| impact active gear | X | | | | | | | | X | | | | | | X | X | |
| impact passive gear | | X | | X | | | | | | | | | | | | | |
| Benthos studies | X | | | | | | | | X | | | | | | X | | |
| by-catch mammals | | | | X | | | | | | | | | | | X | | |
| by-catch others | | | | | | | | | | | | | | | | X | |
| seabirds vs gears | | | | | | | | | | X | | | | | | | |

## 6. REPORT OF THE FTFB-SUBGROUP.
*Evaluation of possible variability in fishing power of the GOV-trawl.*

During the working group's meeting in Ancona Italy 1991, a small subgroup was established, consisting of:

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|---|---|
| A. Engås | Norway |
| O. Hagström | Sweden (convener) |
| P. Koeller | Canada |
| K. Lange | Germany |
| B. van Marlen | Netherlands |
| P.A.M. Stewart | Scotland UK |

This subgroup defined its terms of reference as follows:
a) To review factors that could be the source of bias and variation in trawl performance.
b) To review the present manual for ICES IYFS/IBTS.

The subgroup met again during the meeting in Bergen with E. Dahm replacing Mr. Lange, in absence of Mr. Koeller. The draft document was further discussed and refined during two sessions.

The draft document was also presented in a plenary session of the FTFB-working group on June 16, 1992 by Mr. O. Hagström and findings and recommendations discussed. The following methods were recommended to reduce the variability in survey results to a greater extent:
- An improved and more detailed net drawing and rig plan.
- The establishment of a checklist of major dimensions of the gear and its rigging.
- The use of only one total length (60m) for sweeps and backstrops irrespective of warplength and depth.
- The use of the described standard (rubber disc) ground gear by all participants in the survey.
- A more precise definition of starting and stopping time of a haul.
- To tow trawls at 4 knots true water speed; ground speed measurements are to be recorded when possible.
- To measure door spread, headline height, and wing-end spread during surveys.

Further recommendations involve:
- To study the effect of warp diameter on trawl geometry.
- To standardise the weight and the rigging of the otterboards.
- To investigate a new method to reduce variability in door spread (i.e. a constraining rope attached in front of the doors to the warps).
- To measure or record environmental parameters that may affect the result such as bottom temperature, light intensity, water transmissivity, bioluminescence, bottom type and bottom contact, and sea state.
- To conduct underwater observations on trawl performance and fish reactions.

The definite revised document will be presented at the 80-th statutory meeting of ICES in Rostock, 1992.

## 7. DISCUSSION AND RECOMMENDATIONS.

The Working Group discussed its present status and reflected on adequate ways to answer queries raised by other Committees of ICES. It was felt that an adapted working method would be desirable, focusing on fewer topics and enabling more

extensive discussions and shared data analysis, as well as the production of documents containing more definite conclusions.

The Working Group felt that it was necessary to limit the number of presentations. However, the need was also recognised for the broad exchange of information between workers in various fields of fishing gear technology and fish behaviour, as common in recent years. Cross fertilisation of ideas is vital for proper functioning as a scientist in our field and few other possibilities exist to meet on a regular basis. For the exchange of scientific information both the Working Group meeting and the Statutory meeting of ICES exist. The latter also deals with matters of concern to other standing Committees, but has the drawback of attracting fewer field workers. Theme sessions are more readily used for presentations on selected topics.

In addition it was expressed, that regular communication with the Working Group on Fisheries Acoustic Science and Technology (FAST) would remain beneficial for both groups. A solution suggested was to organise a joint session between both working groups every other year with the possibility to deal with a wider variety of topics. Some members of the FAST working group also stressed the importance of coherence between both groups and emphasized frequent joint meetings.

The Working Group decided to prepare a document for consideration at the next meeting, concerning necessary information to record during selectivity experiments, the various techniques developed and the various methods of data analysis. Three members were selected (Mr. R.S.T. Ferro, Mr. R. Fonteyne, and Dr. S.J. Walsh) under a chairman to be decided, to prepare these topics by correspondence with the help of other working group members. The various topics will be dealt with in temporary subgroups working in parallel with a plenary session at the end of the meeting.

Other topics on which the working group can provide assessment and advice are:
- Survey and sampling gears.
- Techniques for improving gear selectivity.
- Survival of fish escaping from fishing gears.
- Comparison of fishing effort by gear type.
- Environmental impact of fishing gears.
- Selectivity aspects of static gears.

The Working Group on Fishing Technology and Fish Behaviour (Chairman. Mr. B. van Marlen) recommends to meet in **Gothenburg, Sweden** from **20 April** until **23 April (4 days) 1993** to produce a document, containing:

a) A description of all information to be recorded during selectivity trials and a specification of its format,

b) A description of the recognised techniques for conducting selectivity experiments, including their application, advantages and disadvantages and recommendations for further development and testing, and

c) A description of the recognised methods of analysis of selectivity data, to be used for the techniques described in b) above, and recommendations for further development.

It is also recommended to maintain close communication with the Working Group on Fisheries Acoustic Science and Technology and to organise a joint session between both working groups, possibly in 1994, with time venue and special topics to be decided at later date.