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International Council for the
Exploration of the Sea

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Fish Capture Committee

REPORT OF THE WORKING GROUP ON RESEARCH AND ENGINEERING
ASPECTS OF FISHING GEAR, VESSELS AND EQUIPMENT

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Research
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(a) The Working Group on Research on
Engineering Aspects of Fishing
Gear, Vessels and Equipment, con-
vened by Mr. S. Olsen, to consider,
in particular, fishing methods with
low-energy consumption;

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.

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AGENDA

1. Progress reports.
2. Presentation of papers and verbal contributions.
 - 2.1. Contributions on low energy fishing methods.
 - 2.1.1. Parameters affecting catching efficiency in cod gillnets.
K.K. Angelsen
 - 2.1.2. Demersal gillnet fishing in Norway.
K.K. Angelsen
 - 2.1.3. Fishing methods of low energy consumption.
Augustsson A. & Ragnarsson, E.
 - 2.1.4. Long line fishing in Norway.
A. Bjordal
 - 2.1.5. Effects of hook shape and dimensions on long line catch rates.
A. Bjordal
 - 2.1.6. Technologie des engins et economies d'energie: Le chalut de fond a quatre faces, ses effects sur le volume et la composition des captures des chalutiers dans le golfe du lion.
P.Y. Dremlere
 - 2.1.7. Methodes de peche peu consommarices d'energie utilisees sur les cotes francaises de mediterranee.
P.Y. Dremlere
 - 2.1.8. German low energy gear experiments in 1980.
G. Freytag
 - 2.1.9. Importance of different gear types in the Faroe Islands.
H. Jakupsstovu

2.1.10. Recent trends in Scottish fishing methods.

P. Stewart

2.1.11. Engeneering and comperative fishing trials
on trawls with large hexagonal meshes in the
front part.

B. Van Marlen

2.1.12. Quelques techniques de peche Francaise.

J. Prads

2.1.13. Les pecheries fixes en milieu lagunaire.

J.P. Quignard & H. Furrugio

2.1.14. Full scale trials with wind propulsion on a
small fishing vessel.

P. Schenzle & K. Lange

2.2. General contributions.

2.2.1. Performance studies of demersal pair trawling.

W. Dickson, R.D. Galbraith & J.W. Valdemarsen

2.2.2. Problems in getting pair trawling started.

W. Dickson

2.2.3. The need for a definition of the diameter of
fishing net twine.

R.S.T. Ferro

2.2.4. Line ripping trials with automated equipment.

A.B. Hopper

2.2.5. La polyvalence, problems ou solution.

J. Prado

2.2.6. Some comments on the GOV-trawl.

P. Stewart

2.2.7. Drag measurements on conical nets in a flume tank at low Reynolds numbers and comparison with theory.

Zhou Ying-qi

2.2.8. Le probleme de l'identification des detections et son influence sur la precision des evaluations de stocks par ècho-intègration. Cas de la prospection acoustique du hareng dans le secteur des Shetland.

N. Diner

3. Fish capture research data index scheme.

4. Recommendations.

1. PROGRESS REPORTS

Belgium

There are 3 points to mention. The first is about the projects that we finished in 1981.

One of those projects was to allow that coastal shrimpers in some seasons should be able to fish for roundfish and flatfish. It is so that our shrimpers are beam trawlers. So the aim of the trials was to have an easy changing of fishery. Therefore, we introduced a system which allowed to operate with the otter-boards in the tops of the booms. Another project we finished was the selectivity-trials for the sole beam trawling with three vessels of different horsepower.

A second point is that we start with a project for fuel-saving- In that field we start the container-transport of the catches to the Belgian fishing harbours, the use of econometers in fishing vessels to measure the effect of fuel consumption. The

skippers have an indication of the fuel consumption per nautical mile.

Further we will start with an experiment with a special hull-paint to keep the hull clean in order to avoid an increase of the hydrodynamic resistance during steaming.

A third point of our programme is the use of a colour-screen-echosounder which gives a better discrimination of the bottom fishing schools and the fishspecies and further the continuation of our study of electrical fishing for flat fish and shrimps, the introduction of oval otterboards and the flatfish grader for the beam trawling.

Canada

Nordco has several projects related to energy considerations, particularly concerning fishing methods, tactics and vessel performance. Instrumentation for full-scale gear measurements was further developed and low light level TV used for qualitative observations of fish and gear.

The Federal Fisheries Development Branch in Halifax is re-orienting its program emphasis towards energy problems and improved fish quality, including development of instrumentation for energy-related studies and cost/earnings studies of a 200-vessel sample of the fleet. In 1980, several fishing techniques new to the region were demonstrated, including automated squid jigging and longlining (on small vessels), pair trawling, lampara seining and ring-netting.

The New Brunswick Department of Fisheries has been active introducing new, diversified techniques into its inshore and shore-based fisheries, including: lampara seining, gill-net haulers, automated squid jigging and longline haulers and herring barge trials.

The Quebec Department of Fisheries is renewing activities of interest. A prototype instrument has been developed for measuring warp lengths into a remote display. A new shrimp trawl

design, with oval doors, for use on rocky grounds has given good preliminary results. Shrimp trawl doors for muddy grounds have been built and will be tried in 1981.

The Federal Fisheries Development Division in Vancouver is sponsoring wind-tunnel model tests at NRC, Ottawa, to compare a cambered, combination, midwater/bottom trawl door of 1.3 aspect ratio with the standard Suberkrub design. A local, automated longline system using snap-on gear is under development. The most reliable release mechanism for lost, black cod traps was still found to be an escape panel set in with cotton twine. Preliminary model studies are under way to evaluate hull resistance and sea-keeping properties of typical west coast seiners, varying bilge form and length/beam and beam/draft ratios.

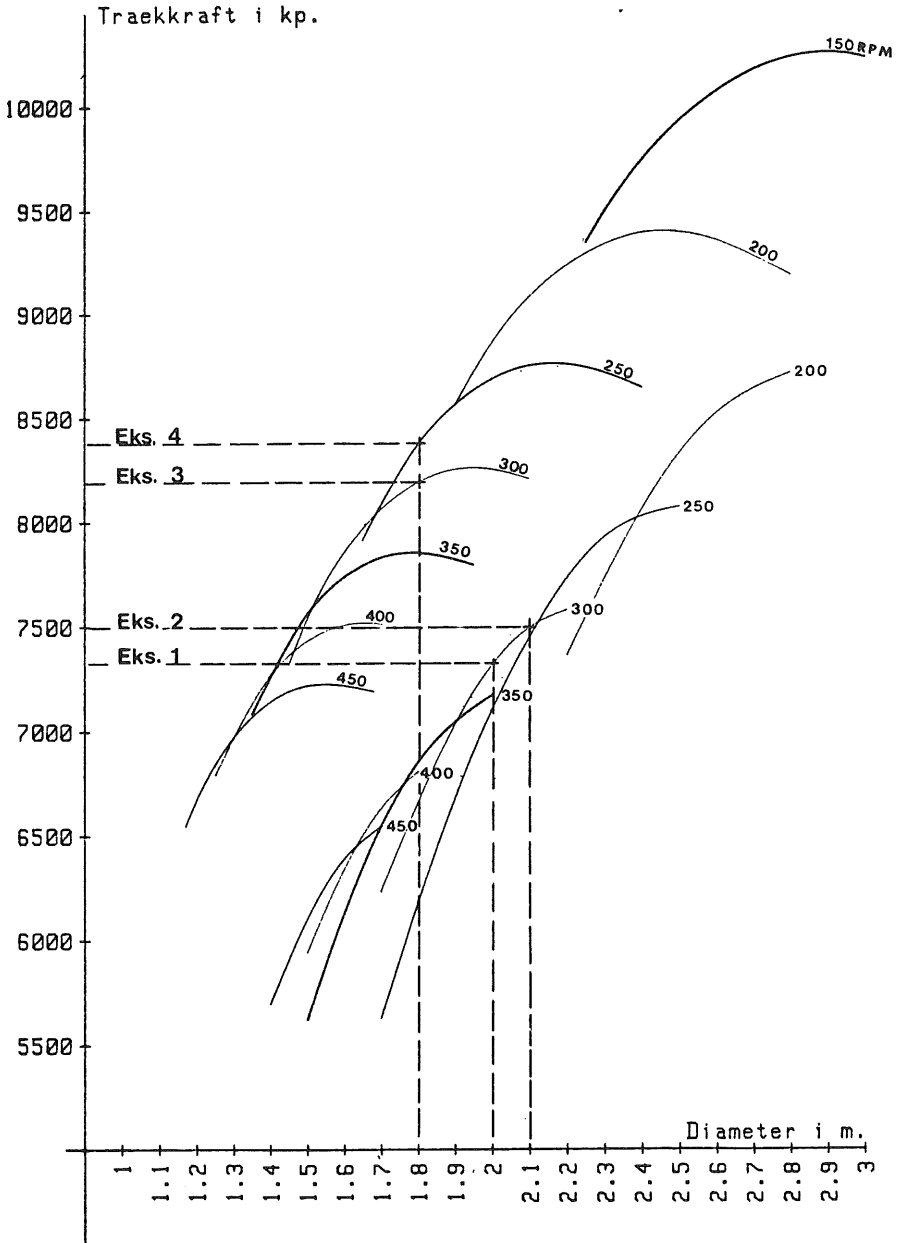
Denmark

- Investigations on propellers, gear, engines on diff. type of trawlers.
- Stimulate fishermen to change to fuel savings systems (nozzels, ecometers (etc.)). Information pamphlet on this subject distributed to the fishermen.

In the field of fuel saving, investigations are done on the following aspects: propellers, gears, engines and propellers nozzels on different types of trawlers.

Fishermen are stimulated to use fuel saving systems (nozzels, ecometers etc) and an information pamphlet on this subject is distributed to the fishermen.

Traekkraft ved trawlfart
Med / uden dyse. 700 PHK



Faroe Islands

Various parameters influence on the efficiency and economy of the long line fishery was tested. These were distance between snoods, monofilament line against multifilament line, monofilament snoods against multifilament snoods, bait quality, hook form and size. The experiments will be continued in 1981.

Experiments with very big meshed trawls for blue whiting fishery were continued.

Experiments with pairtrawling for demersal fish species were carried out. These yielded equal or better catch rates as the combined catch rate for the boats fishing on a single boat basis. A substantial reduction in oil consumption and gear renewal was observed. This has further resulted in a significant shift from single boat trawling to pairtrawling in the small and medium sized trawler fleet.

Squid jigging experiments were carried out with two vessels equipped with hydraulic jigging machines.

Experimental fishery for tusk, ling and blue ling with demersal gillnets is planned.

France

On last year a competition has been decided in order to establish the design of a low consumption and efficient fishing boat. For that purpose catamarans project has been studied. In fact there are already two (one old, one new) for the same owner in St. Molo and a third one in Boulogne. They are mainly specialised in trap fishing or gill netting.

The first of three tuna sailing boats is launched and will start on July. The two others are following.

For the first time French trawlers have been fishing for blue whiting. They were using large meshes (16-20 m) pelagic trawls with 4 or 5000 meshes as circumference.

In several coastal areas the use of large opening trawls is forbidden. This type of trawls includes every trawl with more than a given length as circumference. This regulation is necessary to avoid interferences between trawls and passive gears in shallow waters.

A four panel bottom rope trawl without ropes in the lower panel has been used successfully by one trawler of Boulogne on saithe, whiting and haddock. This net is used with pelagic doors which

becomes easily twisted when fastening on the bottom. A stronger type than Suberkrub is useful.

This type of net and rigging has been tested recently on the Roselys II. It seems necessary to adjust accurately the speed or, and the length of the warp in order to maintain the opening of the trawl.

Some trials in the flume tank are starting in order to compare the drag and the spread of different models. Strain gage sensors have been developed for that purpose.

A first attempt to measure horizontal opening of trawls has been made on board Rosely II but the transducer housing was not steady in the stream.

As reported on last meeting comparative fishery experiments between rope trawls and large meshes pelagic trawls have been carried on board "Solea" on Bollic Sea. The results indicate that there is only few reaction to the large meshes when the fish are on the bottom.

Gill netting is developing in France. Most of the boats are equipped with power-blocks. Observations will be carried out on suitable meshsize, hanging ratio and rigging. Already the increasing number of gill netters seems to cause some problems of coexistence.

Longlining is also developing mainly in Brittany and also a few in the Channel. Some observations has been made and an automatic system for the lines is under study. A first trial, without fishing, of an automatic jiggging machine for squid has been carried our recently.

Germany (Federal Rep.)

Research was concentrated on the development of fuel saving trawling techniques as well as on the introduction and promotion of low-power consuming catching methods not yet widely applied in German fisheries, e.g. Danish seining, setnetting, longlining.

As to trawling, work on the development of rope trawls and large meshed trawls was continued.

On the West European continental slope an exploratory fishing was carried out in autumn. This season was not yet covered by previous German research in that area.

On board the FRV "Walther Herwig" a recently developed Japanese Colour/Video-echosounder was installed and tested. The traces obtained from this instrument are very spectacular and thus more easily interpretable than those obtained from the conventional echo recorders.

The selectivity of beam trawls used for catching soles in the German Bight was studied aboard FRV "Solea". The aim of these investigations was to assess the effects of the proposed increase in mesh size to 90 mm on the North Sea sole fisheries. - The series of cod selectivity experiments in the central Baltic was completed by trials conducted in October.

Gear technological work in combination with research on fish stocks was carried out in Surinam. Preparations were made for a fishery project in the area of the Seychelles.

Iceland

In September - October some fishing experiments on blue whiting were carried out off the Icelandic east coast and in the Dohrn - bank area. The fish concentrations were very scattered and pelgical. The most successful gear under those circumstances was a bigmeshed midwater trawl although no big catches could be obtained due to the scattered concentrations. A special design of high opening bottom trawl could not be tested as no blue whiting were found close enough to the bottom.

Selection experiments of the side panels with special attention to the net slack in a shrimp trawl were continued. A paper on this will be presented on the next statuting meeting.

Some gear work has been carried out by the shrimp fishermen on their boats. In this way the fishermen got first hand information on the performance of their gear. This often resulted in more economical towing speed and better rigging of the otter boards.

In a netting factory some material experiments have been carried out. It succeeded to produce polyethylene netting yarn with less resistance than before without reduction of the breaking strength. Efforts to produce polypropylene ropes with less gravity than before offer promise.

The Fisheries Association of Iceland continued general work on finding and presenting methods on lowering the fuel consumption of the Icelandic fishing fleet. We have some projects running, such as usage of cheaper fuel, presenting econometers to the skippers, and advising on how to run the machinery economically. For the last half year we have been dealing with low-energy fishing gears and we have recorded fuel consumption on some gillnetters and longlines, and we are presenting a paper on general description and usage of those methods, as well as some fuel data. For the next year we will continue in a similar way and we are now planning some projects to be carried out in cooperation with other Nordic institutes.

Netherlands

A 1:25 scale model of a midwater trawl with large hexagonal meshes in the front part was tested in the flume tank of the Fisheries Training Centre in Hull. As a result of the observations of the model gear in action a modified full scale gear was constructed and tested during instrumented gear trials onboard the F.R.V. "Tridens".

Onboard a 660 kW beamtrawler further comparative fishing experiments between a conventional rigged beamtrawl (mechanical stimulation) and an electrified beamtrawl were carried out.

The objective of improving the working conditions onboard beamtrawlers and at the same time improving the survival rate of the discards was reached when the development of a proto-type flatfish grader was concluded. The first unit is in operation onboard a 880 kW beamtrawler.

A project was started with several types and power ranges of fishing vessels using heavy or blended fuel oil. At the end of 1980 two 880 kW beamtrawlers were converted to use a light blend fuel oil (viscosity 7,5 cSt/50° C). A 2200 kW freezer sterntrawler is burning a heavy fuel oil with a viscosity of 150 cSt/50° C. Early 1981 two 880-1100 kW beamtrawlers will be converted to use a fuel oil with a viscosity of about 55 cSt/50° C. The objective of the project is to collect technical and economical data when operating vessels with these types of less expensive fuels.

Research was carried out into the performance of a high-headline trawl fitted with a sail-kite or delta-kites as lifting devices for an increased vertical netopening.

The research group which develops an efficient electrical barrier preventing fresh water fish to enter the cooling water intake systems of industrial plants further analyzed the video-tapes showing the behaviour of small fishes in electrical fields.

The application of electrical stimulation when developing a towed gear which catches eel only was tested during systematic fishing experiments in the IJssel Lake.

Activities related to fish capture technology in countries with a developing fishing industry were carried out in India.

Sweden

Four different models of O-type cambered otter boards were tested in wind tunnel at Chalmers University of Technology and full-scale tests were carried out with two of them on board an ordinary Swedish wood side trawler.

A new four seam large meshed midwater trawl was designed and produced for these tests and also for comparative fishing performance

with a four-seam combination trawl. The time available did not admit comparative fishing to be carried out over as long a period as one should wish. However, the results obtained do not give cause to suspect that the large-mesh trawl should not fish at least as well as the other one.

In the autumn of 1980 investigations into mesh selection of herring trawls started, using the covered cod-end technique for cod-ends of three different mesh-sizes.

Norway

The Long line investigations were extended with special studies of how bait size and hook dimension affect catch rate and fish length, and further comparisons of hook types, rigging methods etc. were conducted with long lines for ling and tusk. The work on artificial baits was carried out with comparative fishing trials for cod and haddock.

Initial trials were conducted with a semiautomatic small boat trolling system for mackerel.

Gill net work was also extended to studies of selectivity and catching efficiency in the new net fishery for tusk and ling, and in cod gill nets special investigations were made on catch composition in relation to net height.

Experimental trap fishing for Nephrops was continued and potential fishing grounds have been mapped on the west coast between Stavanger and Trondheim. A small commercial trap fishery has started.

Work on prawn trawling was in 1980 concentrated on experiments to examine the effects of various gear parameters on catching efficiency and selectivity.

In cooperation with the Faroese Fisheries Research Laboratory a new version of the blue whiting trawl with very large

elongated hexagonal meshes was tested in February/March, and a final, larger design was produced and tried out on a large stern trawler in August/September.

The experimental pair trawling program in the North Sea was continued and included tests of different trawl designs, rigging etc., and a special trawl performance study was done in cooperation with the Marine Laboratory, Aberdeen, with the aid of UW TV, operated and monitored from a third vessel.

The sinking performance and other characteristics of hexagonal mesh netting in purse seines have been further studied. This type of netting is now commercially applied in all types of Norwegian purse seine fisheries. Netting with double bars is produced by all manufacturers, and one company has succeeded in making a mesh with nearly equal twine thickness in all 6 bars.

Two commercial automatic purse seine net stacking systems reducing the hauling work by 2-3 men, have been developed and successfully tested.

The program for developing improved gear and catch handling systems for coastal combination vessels was extended to include the whole field of working and safety conditions on such vessels.

Work on energy conservation in fishing operations has progressed. Better data on fuel consumption in the various types of fisheries have been collected, and the emphasis is now being concentrated on methods to improve propulsion efficiency.

United Kingdom

Scotland

Demersal Trawls

Development work has continued on a range of 3-bridle trawls suitable for inshore use by vessels of 100-300HP. Commercial trials have taken place with encouraging results.

A joint project with FTFI, Bergen was carried out on demersal pair trawling. Instrumented trials were conducted on an Engels balloon trawl. A third vessel was used to tow the Marine Laboratory television vehicle to make direct observations on this gear and on a Faroe box trawl.

Observations on fish reactions to gear suggested that different species enter a trawl at different heights. To investigate this idea a 3-level sampling trawl has been constructed. Preliminary results show that cod can be caught by a headline as low as $\frac{1}{2}$ m and that haddock rise well in front of the footrope and enter the top part of the net.

Instrumented trials were conducted with two 600HP GOV trawls; one constructed from nylon, the other from polythene. No significant difference in performance was found. It seems acceptable therefore, to use nets made from less expensive polythene for international trawling surveys.

A 1/15 scale model of a 1000HP GOV trawl was tested in the flume tank in Hull, prior to trials with a full-size gear at sea. Certain deficiencies were identified in the model and the short-wing version appeared to behave in the most satisfactory fashion. The full-scale version of the short-wing GOV trawl was found to catch few flatfish, indicating that excess flotation was reducing ground contact.

A comparative study of the model and full-scale measurements made on four demersal trawls is in progress. The objective is to develop rules for conducting model tests to obtain realistic predictions of gear performance. This study has highlighted the lack of a precise definition of twine diameter. An exercise is being planned to collect data on the variability of the diameters of twines of different forms of construction.

Pelagic Trawls

Development of the Laboratory's semi-pelagic trawls has continued and commercial trials have been conducted with satisfactory results. Video-tape recordings of observations on the gear have been made as an aid to design. It is planned to carry out more detailed measurements, as part of a programme of producing numerical design rules for the selection of netting sizes on pelagic trawls, i.e. defining the limits to changes in mesh and twine sizes down a net.

Work on the manoeuvring of small pelagic gears is still continuing. Analysis of data collected on an acoustic range is in progress.

Net Theory

Analysis of data on netting panels has enabled a comprehensive theory of netting behaviour to be developed. More data is required on the hydrodynamic characteristics of netting at low angles to water flow and on the characteristics of knots and rough twine. It is planned to collect this data soon.

Set Gears

During 1980, six exploratory gill and tangle net trips were sponsored on commercial vessels in Scottish waters. The objective was to prospect for grounds suitable for exploitation by these fishing methods. Results were variable and suggest that there is room for further prospecting and for gear development. It is proposed to start engineering and behavioural studies on gill nets during 1981.

Mesh Shrinkage

A series of experiments was carried out in the Moray Firth to investigate the effect of sand absorption on cod-end mesh size. Machine-made and hand-made netting of nylon and polyethylene was used. The tests were conducted by towing cod-ends in pairs; one near the surface and one on the bottom attached to a trawl. No effect due to sand absorption was found, but it was observed that untreated nylon twines shrank significantly on immersion in sea water. A further set of tests are now in progress on nylon and polyethylene twines, of known origin, to investigate shrinkage in water and the effects of heat treatment.

United Kingdom - WFA

- Passive gears/less than 5% of landings.
- Gillnetting introduced to W. Scotland, gives fuel saving compared to trawling.
- Automatic jigging for cod - not successful yet.
- Automatic longline (autoclip) - not resulted in commercial fishing.
- El. fishing/40% fuel reduction with electr. ticklers.
- Sail - no solution in trawl fisheries
- Increase effect of diesel engine/reduced speed/nozzels/intelligent use - fuel saving.
- 96 hrs voyage, compared fuel saving of rope trawl versus normal trawl

	dragging	30%
Fuel saving:	tot. trip	5%

U.S.S.R.

The following work was carried out in 1980:

- test of mechanized longline complex
- studies of selectivity, bycatch and survival rate in bottom trawls
- research on electrified bottom trawls
- observations on fishing with a bottom trawl
- studies of grounds for application of small trawls in the sea inlets
- design of trawl to reduce total resistance (blue whiting)
- development of selective shrimp trawl based on studies of shrimp behaviour and distribution.

F A O

1. FISHING METHODS AND GEARS

In many FAO field projects masterfishermen and fishing technicians continued their efforts to improve local fishing techniques and gear, and to introduce new types of equipment.

1.1. In comparative fishing trials carried out in Bangladesh, polyethylene gillnets were tested in comparative fishing against the conventional nylon gillnets, with encouraging results.

1.2. A small low-priced echo-sounder, designed to meet FAO specifications to serve artisanal fishermen in developing countries, has been tested under field conditions in cooperation with a German manufacturer.

1.3. Fish aggregation devices (FAD): Several FAO field projects are involved with the development, introduction or promotion of the use of the FADs. A FAD is a floating device in the form of

a raft-buoy with all sorts of appendices suspended from the float in the water, and it is anchored over the ocean floor at a depth of several hundred meters or more. After several weeks of "soaking" fish start to accumulate under and around FADs: first small fry, then bigger predators like tuna, which can then be caught with hooks (pole and line) or with purse seines.

1.4. In Guinea, an FAO fiels project continues the introduction of purse seines to the small-scale canoe fishery.

2. FISHING VESSELS

The main activites of FAO in the fiels continued along three main line; energy-saving propulsion systems, use of ferro-cement and improved small craft for small-scale fisheries.

2.1. Energy saving propulsion.

2.1.1. A research by John Fyson on the use of sail power has been prepered.

2.1.2. An FAO project in Tonga deals with introduction of sailing boats with auxiliary engine power and aims at a dissemination of this idea and practise in the Pacific region.

2.1.3. A similar project is being planned for the Western Indian Ocean region.

2.1.4. The introduction of sails for inshore fishing boats is being planned in Somalia.

2.1.5. An FAO/TCP project is investigating the possibility of the improvement of a propulsion system for the inshore shrimp trawlers in India. The possibility of having a nozzle installed in these trawlers, together with an improved propeller, will be studied.

2.2. A series of six ferro-cement 11-m fishing boats is being produced in Tunisia under an FAO/TCP project. A 17-m lobster boat with live-fish, well designed by an FAO project for the same country is already in operation, and has demonstrated satisfactory performances.

2.3. Beach craft to replace canoes: several types have been tested in different countries in FAO projects.

2.3.1. GRP work-dories of Japanese constructions are being tested in Nigeria for surf crossing and fishing.

2.3.2. FAO-designed craft will be tested for beaching through surf and fishing - also in Nigeria.

2.3.3. Three FAO-designed types of inshore craft are undergoing field tests, with promising results, in India.

2.3.4. A watertight engine box with a "swinging" arrangement entangling the lifting of the propeller shaft with the propeller out of the water while beaching the boat has been developed and is being tested in India.

2.3.5. The quality of the traditional kattumarams in India is being improved by impregnation of the wooden logs of which the kattumarams are made.

2.3.6. Small shallow-draft European-type trawling/combination boats are being tested in Nigeria.

2.3.7. GRP canoes have been designed and constructed by FAO for the transportation of fish in Mauritania.

3. FISHING TECHNOLOGY SERVICES

FAO's Fisheries Technology Service has continued in its effort to improve or establish fishing technology services and units in developing countries.

4. TRAINING COURSES

The improvement of fisheries technology capacities in developing countries is actively pursued through FAO-organized courses for fishing technologists, fishing boat designers and builders.

4.1 Two courses in fishing vessel design were held during the period.

4.1.1 In Bangkok for the countries of Southeast Asia.

4.1.2 In Guayaquil for the Latin American countries.

4.2 Boatbuilders: a course for African countries was held in Freetown, Sierra Leone.

4.3 A course for fishing technologists, advanced stage, will be held in June 1981 in Lorient, France for French-speaking countries in Africa.

4.4 Project proposals for introductory courses in fishing technology have been submitted to donors: one each for the Caribbean and West Africa (in English), Latin America (in Spanish), Oceania (in English) and Arab countries (in Arabic).

5. PUBLICATIONS

The following publications and papers have been produced by FAO Fisheries Technology Service during the reporting period.

- 5.1 Pair Trawling with Small Boats, by H.S. Noel and M. Ben-Yami
FAO Training Series No. 1 (Available in English, French and Spanish)
 - 5.2 Fishing with Bottom Net and Gillnets, by I. Roseman
FAO Training Series No. 3 (Available in English, French and Spanish)
 - 5.3 FAO Fishing Manual: Echo-sounding and Sonar Fishing (Fishing News Books Ltd.)
 - 5.4 FAO Fishing Manual: Tuna Fishing with Pole and Line (Fishing News Books Ltd.)
 - 5.5 Directory of Fishing Technology Institutes and Services
FAO Fisheries Technology Paper No. 205 (Trilingual)
 - 5.6 Fishing Boat Designs 3: Small Trawlers, by J.F. Fyson
FAO Fisheries Technical Paper No. 188
 - 5.7 Redes de arrastre de fondo para la pesca artesanal, by J.C. Brabant and C.F. Nédélec
FAO Fisheries Technical Paper No. 189 (Spanish version of formerly issued English publication)
 - 5.8 Low Energy Fishing Vessels: The Use of Sail Power, by J.F. Fyson
(Paper submitted to ICLARM Workshop on appropriate technology. To be published in the frame of the Workshop Report)
 - 5.9 Bibliographie pour la formation des pêcheurs, by A. von Brandt
FAO Fisheries Technical Paper No. 195 (French version of formerly issued English publication)
 - 5.10 Bibliografía para la capacitación de pescadores, by A. von Brandt
FAO Fisheries Technical Paper No. T204 (Spanish version of 5.9)
 - 5.11 The Fishing Technology Unit, by E. Grofit
FAO Fisheries Technical Paper No. 199
 - 5.12 Manual de capacitación pesquera a bordo, by Birgir Hermansson
(Spanish version of formerly issued English publication)
- The following publications are in different stages of preparation:
- 5.13 Handbook of Fishing Vessel Design
 - 5.14 Le chalut (The trawl), an updated edition
 - 5.15 A Supplement on Pair Bottom Trawls
 - 5.16 FAO Fishing Manual: Calculation for Fishing Gear Designs

- 5.17 FAO Fishermen's Pocket Manual
- 5.18 FAO Fishing Manual: Jigging for Squid
- 5.19 FAO Fishing Manual: Materials for Fishing Ropes
- 5.20 Fishing Boat Designs 4: Simple Steel Boats
- 5.21 Fishing Boat Designs 5: Small Combination Boats
- 5.22 Handbook on Ferro-cement Construction of Fishing Vessels
- 5.23 Engineering Applications 2: Design and Construction of Simple Deck Marking

2. PRESENTATION OF PAPERS AND VERBAL CONTRIBUTIONS

2.1. Summaries of contributions related to low energy fishing gear.

2.1.1. PARAMETERS AFFECTING CATCHING EFFICIENCY IN COD GILLNETS. by K.K. Angelsen

Parameters as meshsize, hanging ratio, buoyancy, twine/thread (material, colour, dimension), bottom conditions current, fishing depth and the fish behaviour are discussed. Increase of hanging ratio has shown good results and give savings of net material. Buoyancy evenly distributed along headline indicates increased catch efficiency. Monofilament, monotwine and multimono give better catch rates than multifilament.

2.1.2. DEMERSAL GILL NET FISHING IN NORWAY. by K.K. Angelsen

The important demersal gill net fisheries in Norway is briefly described (species, areas), and the main parameters of the different gears are given. Further, information on size of vessel and crew, methods of operation and the normal number of nets used given.

2.1.3. FISHING METHODS OF LOW ENERGY CONSUMPTION.

by A. Augustsson & E. Ragnarsson.

Different information on Longline, Handline, Gillnets and Danish seine in Iceland is given: Fishing statistics

of these gear types compared to bottom trawling. Description of gear, vessel, handling equipment, methods of operation and information on fuel consumption is given for gillnetting and longlining. Detailed information on fuel and time consumption during the total operation is given: Cruising to and from fishing grounds and the different stages of the fishing operation.

2.1.4. LONG LINE FISHING IN NORWAY. by A. Bjordal

Information on the main methods of Norwegian long line fishery is given: Types and handling of gear, size of vessels and crew, methods of operation and main species and fishing areas.

2.1.5. EFFECTS OF HOOK SHAPE - AND DIMENSIONS ON LONG LINE CATCH RATES. by A. Bjordal

This contribution give a review on previous hookexperiments and present results from recent investigations on hook design. The results indicates that there is a potential for increased catch rates and species and size - selectivity, with different hook patterns and dimensions.

2.1.6. TECNOLOGIE DES ENGINES ET ECONOMIES D'ENERGIE: LE CHALUT DE FOND A QUATRE FACES, SES EFFECTS SUR LE VOLUME ET LA COMPOSITION DES CAPTURES DES CHALUTIERS DANS LE GOLFE DU LION.

by P.Y. Dremlere

Trawling is known to be a high fuel consumer activity. Given the heavy number of trawlers now in service, it is inconceivable that this activity be suddenly curtailed. In the future, we will have to consider the means of insuring the maintenance of this activity in the best possible cost-effective ways.

The production costs of the fishing vessels cannot justify a heavy increase of the mean selling prices of fish, so we have to admit that a balanced management of the fishing vessels is linked primarily to two alternatives:

- In the areas where all the present species are fully exploited, the cost-effectiveness of the fishing vessels seems to depend essentially on a decrease in the cost of production, for a maintained level of catches. The decrease in costs is here linked with a search for better techniques either on the vessels or on the gear.
- On the other hand, in the areas where fishing effort can be increased on certain species or groups of species, an economy in energy may be understood in terms of an increase in catch for a maintained level of exploitation costs. The increase in catches is here linked more precisely to a refinement of fishing gear enabling (without an increase of fuel consumption) the exploitation of areas or species which up to now have been neglected.

This second alternative has been applied in the gulf of Lions (French Mediterranean coasts) with the widespread introduction of the high opening four panels bottom trawl.

Comments about the influence of professional use of this type of trawl are described below (increase of the catches and modification of their composition with a raise in the weight of pelagic or semi-pelagic species).

2.1.7. METHODES DE PECHE PEU CONSOMMARTRICES D'ENERGIE UTILISEES SUR LES COTES FRANCAISES DE MEDITERRANEE.

by P.Y. Dremiere

This note contains an inventory of traditional fishing methods, in general passive, used on the Mediterranean french coasts by professional fishermen. It should be noticed that these methods, mostly very old in the area, were not originally conceived with the problem of saving energy in mind.

Since they existed before engines were installed in vessels, they were maintained or developed in the areas where continental shelf is limited (and in the lagoons). On the other hand, they were proportionally less developed when the extension of the continental shelf has encouraged trawling or purse seining (e.g. in gulf of Lions).

The fact that these passive methods enable low fuel consumption and demand relatively low investments lead us to think that they should in the future attract new interest among fishermen, given nevertheless the limits of fisheries production potential in the area.

2.1.8. GERMAL LOW ENERGY GEAR EXPERIMENTS IN 1980.

by G. Freytag

Following fishing trials were conducted:

Set net experiments in the North Sea and the Baltic, Danish seining (Plaice and Cod-seines), Long line experiments in the Baltic. Comparative fishing with electrified beam trawl and fuel saving gears for deep sea fisheries (belt.trawl).

2.1.9. IMPORTANCE OF DIFFERENT GEAR TYPES IN THE FAROE ISLANDS.

by H. Jakupsstovu

Historically the fishing method used in the Faroese fishery for demersal fish species was handline. This was complemented later by trawl and longline and to a minor extent in recent years by gillnets.

The importance of the different geartypes is illustrated in the table below where catch in weight (%) of demersal species by gear from the Faroe Plateau by faroese vessels is given

Year	Trawl	Longline	Gillnet	Handline	Other
1973	27,0	50,7	5,0	17,0	0,4
1974	24,6	34,9	12,2	28,1	0,3
1975	29,4	44,8	9,3	16,3	0,1
1976	24,4	53,2	8,3	14,0	-
1977	23,0	55,4	8,8	12,8	-
1978	44,9	39,4	6,3	4,4	-
1979	59,5	29,5	5,5	5,5	-
1980	57,5	32,1	4,0	6,5	-

2.1.10. RECENT TENDS IN SCOTTISH FISHING METHODS.

by P. Stewart

The trends from 1975 to 1979 is given for different fisheries: Demersel, Pelagic, Shellfish, Setnets. Comparative data on fuel consumption for different gears are not available.

2.1.11. ENGINEERING AND COMPARATIVE FISHING TRIALS ON TRAWLS WITH LARGE HEXAGONAL MESHES IN THE FRONT PART.

by B. Van Marlen

As a follow-up of the measurements done in November 1979 (see reference (3)) the period of November '80 was used to do experimental trials on trawls of similar size with large hexagonal meshes in the front part. Two designs were tested. A very big net, denoted as Hexanet 3 with design openings of 70.0 m across the wing-ends horizontally and 52.0 m vertically.

The second design had been derived from the first one with reduced design openings i.e. 56.0 m (horizontal across wing-ends) and 28.0 m respectively and with a different taper of the net panels.

This one should fit better to values obtained in practice with trawls of similar size, and is denoted as Hexanet 5.

A series of tests has been conducted on both gears using the same rigging as during November '79 for hexanet 5 and different doors and heavier bridle weights with hexanet 3.

Major parameters of the rigging were varied such as warp length, bridle weight and bridle extension and both the gear geometry and its drag characteristics were measured. It became standard procedure to do the trial on two courses, one in the opposite direction, in order to determine tidal or current effects.

With the aid of a computer programme calculating the shape of the warps, the gear drag, being the sum of the components of the warp load in the direction of motion has been calculated with the measured door spread and door depth and the characteristics of the warps as given in reference (1) and (2) as a function of the towing speed. All other data have been processed manually on a HP 9830 desk top computer.

With 720 kg bridle weights a reduction in gear drag of appr. 10% was found for hexanet 5 when compared to the results of measurements on a 2700 meshes conventional trawl (see reference (3)).

When using 1100 kg of bridle weights both gear drags were quite similar. The first design (hexanet 3) showed a much larger gear drag than the conventional trawl.

Some other parameters of the rigging seemed to have a lot of influence too such as bridle extension and warp length.

The vertical dimensions of hexanet 5 could vary with several metres when increasing the extension from 4.50 m to 8.50 m, while in general the spreads were reduced, probably caused by a loss in door spreading force.

Usually the tilt angle of the doors increases with more extension causing the hydrodynamic efficiency of the doors to decrease.

General performance criteria such as "Swept Volume per unit time per unit load" or "Gear Drag per unit area" indicate hexanet 5 to be more efficient than a conventional trawl using 720 kg weights at speeds below 4.5 knots. The same applies to the 1100 kg case but to a much lesser extent.

The results of hexanet 3 were very poor compared to both a conventional and the smaller hexagonal trawl.

Comparative fishing trials done with hexanet 5 in March 1981 on "Tridens" showed no significant discrepancy between catches of other trawlers fishing in the same area. This has been experienced in the past with rope trawls. Indeed from the echo-sounder traces of transducers placed on two spots on the net (one at the headline centre as usual and one at the junction of hexamashes to original netwebbing) it is clear that a distinct herding effect of the hexamashes exists. This applies to both daytime and nighttime fishery.

A further reduction in gear drag may be expected from alterations of the aft part of the net. Hexanet 5 has rather large panels of 400 mm and 200 mm meshsize which can probably be shortened with no loss in fishing capability. In the near future the performance of trawls with hexagonal meshes will be compared to designs with large diamond shaped meshes, both from an engineering and a practical fishing point of view. The big-meshes concept seems to be valuable.

2.1.12. QUELQUES TECHNIQUES DE PECHE FRANCAISE.

by J. Prado

Several methods are described: Trolling for albacore, gillnetting for hake, longline for dogfish and skate, longline (floating) for porbeagle, gillnet for crab, spiny lobster, turbot and skate, trammelnet for sole, longline for conger eel, creels for shrimp, creels for crab, lobster and spiny lobster.

2.1.13. LES PECHERIES FIXES EN MILIEU LANGUNAIRE.

by J.P. Quignard & H. Farrugio.

In this note are given the characteristics of some passive fishing methods used in western Mediterranean lagoons, especially in France, Italy and Tunisia. These stationary fisheries (fyke nets, weirs and "bordigues"), showing either a low energy consumption or no consumption at all, are conceived taking in account the seasonal or permanent migratory behaviour of some fish species.

2.1.14. FULL SCALE TRIALS WITH WIND PROPULSION ON A SMALL FISHING VESSEL.

by P. Schenzle & K. Lange

This contribution describes experiments with wind propulsion on a 27 m vessel. Speed of vessel at different wind speeds and directions are given.

2.2. General contributions.

2.2.1. PERFORMANCE STUDIES OF DEMERSAL PAIR TRAWLING.

by W. Dickson, R.D. Galbraith & J.W. Valdemarsen

Vessels, gear and instrumentation is described. Measurements on gear and net drag and curvature of sweep/warp are given.

A video tape recording of the net performance was shown.

Conclusion:

The experiments clearly demonstrated the problems and possibilities of direct observations using TV on pair trawl gear from a third vessel. It should be noted that snagging of the long sweeps gives the net lateral movement to a much greater extent than a single boat trawl with otterboards and this adds to the difficulties of the third vessel maintaining station on the gear.

Nevertheless in reasonable conditions and with skilful operation of the vessels and the towed vehicle it is quite possible to observe pair trawls in action.

2.2.2. PROBLEMS IN GETTING PAIR TRAWLING STARTED.

by W. Dickson

Two boats - getting them together from possibly different fisheries is an operational problem one boat doing well (single boat trawling) is not been to shift over to pair trawling. The other possibly working marginally is afraid to shift over because of the risk.

Investment

Each of these boats probably has 3 bottom trawls. A large pair trawl for each boat is a considerably investment. While the pair trawl is or can be with shorter sweeps quite good on rough bottom the boats will be rather cautious because of the investment.

If one boat goes out of action the other goes back single boat trawling and it is another operational problem to re-commerce pair trawling.

Spotty fishing.

If fish are in small dense clumps the searching power of pair trawlers (tied together) is effectively halved. The net is slower to turn unless heaved up to the surface (it is not necessary to bring it aboard). Neither of the ships is in the path of the gear and this may be either advantageous or disadvantageous. If the ships are small (much less than the distance between ships) the information on either echosounder is not relevant without re-setting the gear but if the aggregation is bigger then pair trawling is advantageous because the pair can steer forwards the side from which the greater echo density is being recorded.

Generally it is necessary to catch much more than twice as much to be attractive to new entrants to the pair fishery. For all these reasons new entrants to the pair trawl fishery would probably welcome some help in doing so.

SUMMARY NOTES UK/WHITE FISH AUTHORITY
Industrial Development Unit

Field Report No. 947

April, 1981

LINE RIPPING TRIALS WITH AUTOMATED EQUIPMENT

CELTIC MOR - FEBRUARY/MARCH, 1981

SUMMARY

As part of the continuing investigation into static fishing methods, the W.F.A.'s Industrial Development Unit have carried out trials with automatic line ripping equipment. This work was carried out on the 15m CELTIC MOR with the co-operation of Bridport Gundry Ltd.

Ripping (or jigging) is the fishing method in which a weighted line with a number of hooks is lowered into a shoal of feeding fish. The hooks are disguised with coloured lures to attract the fish and the line is moved rapidly up and down. This has traditionally been a handline fishery, but new equipment from Scandinavia has now fully automated the process at very reasonable cost.

The trials were carried out during February and March 1981 off the N.W. Coast of Skye. It was believed that cod would be spawning in the area and starting to feed again. This proved not to be the case but the equipment was found to work well under some very arduous weather conditions and some good results were obtained on coley and pollack.

The trials were not conclusive, but it is hoped other opportunities will arise for a more decisive demonstration later. The equipment can be quickly fitted to any vessel.

Selectivity of Fishing Gear. TR no. 183.

Selectivity of fishing gears has become an important issue in recent years as a consequence of greater awareness of the necessity to conserve fish stocks, and to take only those species and size of commercial value.

This report summarises current research work in this field and the "state of the art" of different selectivity methods. Research is being carried out by several international research organisations and among the leading authorities are the DAFS Aberdeen Laboratory and MAFF Lowestoft.

Most of the studies relate to trawls and the response of fish to the different components from the doors to the cod-end. Much information has now been gathered on how fish respond to the different configurations, on colour of twine, noise and even on the different flight reactions of some of the main species. In this connection, the importance of the sand cloud and its

shape caused by doors, sweeps and bridles is discussed in depth. However, the patterns of response are mostly irregular, and much more work is needed before this knowledge can be used to design effective trawls which are both selective and can catch fish in commercial quantities.

The possible applications of selectivity to the mackerel and scad fishery are discussed since this is where the need is most pressing. It has to be conceded that it is not possible at this stage to be able to trawl only for commercial sizes of these fish whilst allowing the other to escape. Some possibilities exist with the use of separator panels leading to split cod-ends but this is only likely to apply to scad for coarse grading and there is justification to proceed with this work.

With static fishing gears, such as gill nets, pots, trammel nets and hooks, the problem of selectivity is less complex and progress can be expected. Many of these nets are, of course, inherently selective in their design by the mesh size, hook size or position of setting in the water.

The study shows that the factors influencing selectivity especially of trawls also have an effect on the reliability of stock assessment and abundance estimates. The need to use a standard trawl and thereby reduce the selectivity variables is shown to be an important matter.

Sail Propulsion TR No. 187.

The rising cost of fuel which has amounted to almost 700% in the last decade has resulted in a revival of interest in sail power as a means of fishing boat propulsion. This study examines the theory of sail power and its relevance to the modern fishing vessel especially the trawler or trawler/seiner of under 24m. in length.

The high standards of stability now required for fishing vessels coupled with the hull form developments which have taken place since the advent of the diesel engine preclude the application of sail power to existing vessels. The study develops the formulae for the sail area which can be carried by the modern vessel whilst still remaining within the IMCO criteria and this is so negligible to be not worth the structural changes and expense.

The traditional sailing vessel of the last century relied on length, a large wetted surface area in relation to displacement and ballast to carry the necessary sail area. It also required a low profile in the superstructure to enable easy working of the sails. The modern fishing vessel has a superstructure which is built up vertically in order to allow maximum deck length.

The study then examines a specific case of a 17.2m 375 H.P. seiner trawler and calculations are given and designs produced for the same power with a 35% and 90% contribution to thrust from sails. This results in an increase in length to 21.7m and 31.0m respectively with other increases in beam and depth.

A 10.37m gill netter is also studied from the point of view of providing auxiliary sail power when free running. The contribution with the unmodified hull form is small but can be improved by deepening the keel and lowering the deck house. A far more significant saving in fuel is made however by accepting a lower free running speed as of course would be expected.

It is concluded that for the U.K. fishery in the immediate future there is no useful gain by applying sail to existing vessels and to achieve significant gains in thrust and power would lead to substantial increases in first cost for a less efficient and dependable form of propulsion than the diesel engine.

Many countries in the near future however may be compelled to adopt through sheer lack of fuel especially in the artisanal sector. This changes the economic picture to one of necessity and in these circumstances sail power would be a practicable proposition.

Abstract from work on energy saving in trawling.

TABLE 3: Energy account for a 25m - 522kw trawler
with and without low drag trawls

Voyage Phase	Power used kw	Period hr	Fuel Consumed	
			Full mesh trawl A	Rope Trawl B
Free Running	512	24	2.998	2.998
Search & mend	261	18	1.146	1.146
Towing A	449	54	5.915	
Towing B	406	54		5.352
Total Voyage		96	10.059	9.496

saving 5.6%

The rope trawl is now being superseded by the hexagonal mesh or large diamond mesh trawls. The difference in drag is negligible but the stress distribution in the netting is much improved and catching performance for certain species would seem marginally better.

Not to be quoted without prior reference to the author

International Council for the
Exploration of the Sea

CM 98/
Fish Capture Committee

REPORT ON THE TRIAL YEAR OF THE FISH CAPTURE RESEARCH DATA INDEX SCHEME

By

Peter A M Stewart
DAFS
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Abstract

Data index forms were circulated to all members of the Fish Capture Committee and the Working Group on Research on Engineering Aspects of Fishing Gear. Twenty-three completed forms were returned; 18 from the Institut fur Fangtechnik in Hamburg and 5 from other institutes. All described work on fish capture research of interest to ICES members. Minor problems with the forms are discussed. The small number of institutes returning forms is taken to indicate a general lack of interest in the scheme.

The very small number of institutes returning forms suggests a general lack of interest in the scheme. Four of the five non-FDR contributors who returned forms considered the scheme to be of little value. Specific points of criticism were: that most scientists would prefer to publish their work, rather than complete detailed questionnaires, and that the scheme would not be sufficiently useful as a means of exchanging information to justify its costs.

The Institut fur Fangtechnik contributed most of the forms and scientists from that institute presumably see merit in the establishment of a data index. As the present proposal has attracted little international interest, it could be that a simpler scheme might receive support. For example, the formalised exchange (through ICES) of annual lists of publications and unpublished reports from each institute, might improve the exchange of research information between member countries.

Conclusion

The very small number of institutes returning forms, during the trial year of the fish capture research data index scheme, has demonstrated that there is little interest in the creation of a data index for information exchange. It must be concluded that workers in fish capture research either find the existing means of information exchange adequate, or consider the costs and complexity of the proposed scheme to be too great for the information it might provide.

TABLE 1 Summary of returned data index forms

Country	Reporter	Year of Experiment	Experiment
1 FDR	H Bohl	1979	Selectivity experiments with various codend mesh covers
2 FDR	Horne	1979	Comparative fishing with electrified beam trawls
3 FDR	H von Seydlitz	979	Trials of rope-trawls to investigate gear handling and catch efficiency for herring
4 FDR	H von Seydlitz	1979	Trials of rope-trawls for pair trawling
5 FDR	R Steinberg	1980	Experiments to establish a Danish seine fishery on a commercial cutter
6 FDR	H von Seydlitz		
7 FDR	Horne	980	
8 FDR	D Mentjes	1979	Testing of an Integrated Fish Catching system
9 FDR	Horne	1980	Comparative fishing with electrified and conventional beam trawls
10 FDR	E Dahm	1979	Comparative investigations with big mesh and rope trawls
11 FDR	G Freytag	1980	Experiments with 2 mid-water trawls with 11 m meshes and a new type of Suberkrub door
12 FDR	H Bohl	1978	Selectivity experiments as a basis for mesh regulation
13 FDR	E Dahm	978	Investigations on two different trawls and otterboards
14 FDR	H von Seydlitz	1978	Commercial Pair Trawling for Baltic herring with rope trawls
15 FDR	E Dahm	1978	Trials of three mid-water trawls
16 FDR	R Lange	1979	Comparative investigations on three different rope trawls and two otterboards

Country	Reporter	Year of Experiment	Experiment
17 FDR	H von Seydlitz	1975	Trials with rope, Blacksprutte and bottom trawls
18 FDR	R Steinberg	1980	Comparative fishing with different gill and set nets
19 Netherlands	B van Marlen	1980	Measurements of trawl openings with various otterboards and kites
20 England	A R Margetts	1979	Mesh selectivity experiments
21 England	G P Arnold	1971/74	Measurements of gear efficiency by acoustic tracking of tagged plaice
22 Scotland	R S T Ferro	1979	Performance measurements on a 600 hp pelagic trawl
23 Scotland	P A M Stewart	1974/76	Comparative fishing for flatfish using a divided electrified beam trawl

4. RECOMMENDATIONS

In response to R.S.T. Ferro (2.2.3.) it was recommended to establish a working party consisting of R.S.T. Ferro (convenor), J.C. Brabant, E. Dahm and B. van Marlen, to consider the need for standard definition and standard measuring, technique for twine diameter, and the possible needs for relevant research.

Mr. R.E. Craig invited both the Engineering and Fish Reaction Working Groups to meet simultaneously in Aberdeen 10 to 14 May 1982. This invitation was accepted with thanks and it was agreed to recommend that the Working Group on Research and Engineering Aspects of Fishing Gear, Vessels and Equipment should meet in Aberdeen to consider in particular the trawl as an instrument in assessment of pelagic fish stocks.