

FISH CAPTURE COMMITTEE

by

E. J. de Boer

1980

Belgium

(G. Vanden Broucke)

The technical parameters affecting the performance and catchability of traditional trawl nets were further studied. The parameters concerned were the rigging, the netopening, the drag, the wear and the mesh size.

The effect of the load of the ground rope, the floats on the head-line and the bridle length on the fishing efficiency of bottom trawls, one-boat semi-pelagic nets and semi-pelagic pair trawls was studied by means of a netsonde.

The new bobbin chain for the shrimp beam fishery, composed of rubber bobbins rigged on a chain, was further tested, mainly in relation to the bottom conditions.

With the aim to adapt the rigging of a new developed high-opening beam trawl, a preliminary series of experiments was carried out. The results were promising.

A comparative study on otter boards was started.

As in the past, various types of netting yarns and netting were tested on their physical properties.

In order to achieve a better knowledge on the variations in mesh size under different conditions (new and used, wet or dry), measurements in the laboratory as well as on sea were carried out. Significant differences were noted and may be of importance in relation to mesh size regulation.

In Belgium 65 % of the synthetic yarns used are made of polyamide, the remaining 35 % of polyethylene. ISO standards are applied by the Fisheries Research Station only, for its own research projects and for tests carried out on request of the industry.

Laboratory experiments with a battery powered underwater pulse generator were carried out on shrimps. As no conductor cables were used, a considerable saving of power consumption was obtained.

The list of wrecks in the English Channel, the North Sea, the Irish Sea and the Bristol Channel was further completed. A preliminary project for a reproducible tape cassette system for the distribution of wreck positions was studied.

Different energy saving possibilities were studied. For the Belgian fisheries, the relation energy input/energy output was calculated. The vessels were classified in this context, amongst others according to the fishing methods. The energy saving was also examined in function of the existing control apparatus for the measurement of fuel consumption.

#### Future work

- Further study of the catchability in relation to the technical parameters of high-opening beam trawls and semi-pelagic nets.
- Comparative experiments on otter boards.
- Testing of a new developed acoustic board spread meter.
- Experiments with the battery operated pulse generator.
- Compilation of wreck lists.
- Study on the automatic feeding system for the flatfish grader.
- Study of energy saving on board fishing vessels.

Canada

(P.J.G. Carrothers)

The Federal Research and Resource Services Branch for the Newfoundland Region is primarily responsible for developing scientific advice in support of fishery resource management in adjacent waters. Development of the Yankee 36 shrimp trawl as a sampling tool for juvenile flatfish was initiated in 1980. Fitting short chain foot gear and 12.7 mm extended measure codend liner was successful for witch and yellowtail flounder. Fitting a 9.5 mm tickler chain was very successful for witch in the size range 6-15 cm. Fitting rubber bobbins and floats to the footrope bosum was effective for yellowtail 4 cm and larger on rough bottom. Further trials are planned for the fall of 1981. Four acoustic surveys were conducted in 1980, three for capelin and one for redfish. Development of a microprocessor-controlled, digital, acoustic data acquisition system was completed in 1980 to provide data at 5 cm intervals on 800 bpi, 9-track computer tape. Development of software for echo-integration analysis of data collected by this system is in progress, and survey design and variance in survey data are being investigated.

The Crown Corporation, NORDCO, in Newfoundland has contracted several major projects. In particular, energy considerations related to various fishing methods (fixed vs. towed gears), tactics and vessel performance were studied with emphasis on fuel consumed compared to landings and grounds fished. Reports will be issued in 1981. Instrumentation and techniques for studies on fishing gear and vessels were further developed, particularly in relation to the spread of trawls on commercial vessels, and low light level TV was used to observe fish behaviour and gear performance. Automated longline fishing for vessels less than 18 m long was studied.

The Federal Fisheries Development Branch for the Maritimes Region (Nova Scotia, Prince Edward Island and New Brunswick) works toward improved efficiency of traditional fishing operations and the introduction of technological advancements developed elsewhere, with recent emphasis on energy efficiency and improved fish quality. Major demonstrations included: Japanese automated squid jigging, inshore and offshore; pair bottom trawling and midwater trawling; lampara seining; Scottish seining on new grounds; automated longlining, particularly on small vessels; inshore ring-netting; rake design for Irish moss harvesting; and a 360° scanning sonar with 3-dimensional display and automatic fault location. Also, instrumentation for energy-related studies of fishing vessels is being developed, and a cost/earnings study of a 200-vessel sample of the fishing fleet in the Region is being conducted.

The Resource Branch for the Maritimes Region is primarily responsible for developing scientific advice in support of fishery resource management on the Nova Scotia Shelf, Bay of Fundy and in the southern Gulf of St. Lawrence. Work of interest to the Committee continues on the measurement of acoustic echo strength as a function of size and aspect of various species of fish for more rational interpretation of acoustic survey data. The new hardware is micro processor-based. Also, trawl survey techniques continue to be refined.

The New Brunswick Department of Fisheries has been active in introducing new, diversified techniques into its inshore and shore-based fisheries, including: lampara seining, gill-net haulers, automatic jigging, longline

haulers, herring barge trials, Marco Ti-liner automatic longlining, Mustad autoline and automated handline hauler. Hydro-acoustic fish-stock surveys are complemented by exploratory fishing, and stock evaluation reports are available. Fishermen have been contracted to explore for new sources of whelk, scallop, dogfish and squid. The catchability of various mesh sizes and trap types has been evaluated from catch per unit effort, and further work was conducted on shrimp-trawl selectivity to reduce by-catch of immature red-fish.

The Direction Générale des Pêches Maritimes of the Gouvernement du Québec is renewing activities of interest to the Committee. Prototype instruments for measuring trawl wing spreads during research cruises and for measuring warp lengths onto a remote display during commercial fishing have been developed and will be given trials in 1981. An original device for measuring the vertical distribution of shrimp to a height of 5 m above the sea bed has produced interesting results. A new trawl design, with oval doors, for use on rocky grounds has given good preliminary results and will be tried further in 1981. Trawl doors for shrimp fishing on muddy grounds have been constructed and will be tried on a commercial vessel in 1981. Plans for 1981 also include a shrimp trawl with sorting panel and experiments with traps for lobster, whelk (to avoid lobster by-catch) and crab.

On the Pacific coast, the Federal Fisheries Development Division 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. An automated longline system developed by a local firm was given preliminary trials, with success after modifications, and a prototype with further changes was produced for commercial trials. This system uses standard, snap-on gear and is inexpensive. Experimental commercial herring impoundments are being researched to determine the effect on the fish, particularly with regard to roe development. Experiments with release mechanisms for lost, black-cod traps indicated that the most reliable method remains an escape panel laced in with cotton twine. Two 8.5 cm rings per trap provided some selectivity when juvenile concentrations were high. Cod-end mesh selectivity studies on English and rock sole in Hecate Strait using  $4\frac{1}{2}$ ",  $5\frac{1}{4}$ " and 6" meshes indicated that the 6" mesh retained 1/3 as many under-size discards as the  $4\frac{1}{2}$ " mesh. Preliminary work is under way to determine the effectiveness of hexagonal-mesh netting to permit escape of juvenile salmon from purse-seine bunts. Results are expected late in 1981. Preliminary work is being conducted toward a model testing program to evaluate the hull resistance and sea-keeping properties of typical, west coast seiners, varying bilge form and length/beam and beam/draft ratios.

At the Pacific Biological Station, automatic longlining has been developed for rockfish on untrawable sea bed off the west coast of the Queen Charlotte Islands. Coordinated tests were conducted of hydroacoustic, swept-volume and ichthyoplankton methods for estimating the biomass of adult Pacific hake and walleye pollock in Georgia Strait. Mesh selectivity for flatfish in Hecate Strait was measured. Canadian fishing effort for Pacific ocean perch in Queen Charlotte Sound and for Pacific cod, rock sole and English sole in Hecate Strait is being standardized and fishing effort is being allotted to single species in a multi-species trawl fishery in Hecate Strait. Reports will be available.

Denmark

No report received.

Finland

(V. Sjöblom and M. Törmä)

General

No major changes in the information on materials used in nets reported to Administrative Report 1977.

Wärtsilä Fishing

Computer model for the simulation of the krill catch rates was developed. Using this model, various parameters affecting the catch rates can be analysed.

The design of the year-round operating krill factory trawler was completed.

Various methods for developing the ergonomy of fishing in winter conditions have been studied.

Feasibility studies for using heavy fuel diesel engines on-board fishing vessels have been carried out.

France

(J. C. Brabant)

Malgré la crise actuelle, un nouveau chalutier industriel est arrivé à Boulogne-sur-Mer. Celui-ci est le premier en France à être équipé de treuils à tension constante.

Au niveau de la pêche artisanale s'opère un renouvellement régulier de la flottille. Des Commissions régionales, récemment créées, sont chargées d'établir une politique de développement tenant compte des données économiques et de la ressource.

Un concours a été lancé par l'Administration pour l'étude d'un navire économique et performant de pêche artisanale. A cette occasion, l'étude d'un chalutier catamaran, à coques asymétriques et propulsé par hydrojet, a été commencée.

Le propriétaire d'un premier catamaran de pêche, lancé en 1979 à Saint-Malo, envisage la mise en chantier d'une nouvelle unité.

A Boulogne-sur-Mer (Etaples), un catamaran de 13,60 x 6,40 vient d'être mis à l'eau pour la pêche au chalut et aux filets droits.

#### Filets droits :

Les petits bateaux pratiquant la pêche au trémail ont été équipés, sur leur avant, de poulies motrices pour virer leurs filets.

Des filets dérivants pour la pêche du thon ont été essayés en Martinique.

#### Palangres :

A la suite de contacts en Grande-Bretagne et en Norvège, des systèmes automatiques pour les palangres ont été installés sur des bateaux bretons neufs ou anciens.

#### Sennes :

L'étude des sennes à thon méditerranéennes, montées différemment de celles de l'Atlantique, est en projet.

#### Chaluts de fond :

Les chaluts combinés à 4 faces (800 mm dessus/200 mm dessous) se sont développés en Méditerranée.

Un chalut à langoustines, comportant une nappe horizontale qui sépare la poche en deux, a été essayé en mer afin de tester l'efficacité de ce dispositif pour sélectionner les langoustines des poissons.

#### Chaluts pélagiques :

Les essais comparatifs entre chaluts à cordes allemands et chaluts à très grandes mailles français ont été poursuivis lors d'une campagne conjointe sur le "Solea" en Baltique. Le manque de poissons évoluant entre deux eaux n'a pas permis de tirer des conclusions définitives.

Un chalutier de grande pêche a effectué les deux premières campagnes de pêche de merlan bleu à l'aide d'un chalut à très grandes mailles.

#### Divers :

La notion de chalut à grande ouverture verticale, définie par un nombre de mailles minimum au périmètre, a été introduite dans la réglementation française. Ces engins qu'ils soient pélagiques ou non sont interdits dans certains secteurs côtiers.

Dans le cadre de l'élevage du saumon en haute mer, un dispositif de recapture par procédé électrique a été défini mais non encore essayé.

Il est envisagé d'étudier un système permettant de commander les treuils ou le moteur en relation avec les indications du sondeur de corde de dos afin de maintenir un gréement semi-pélagique en position optimum.

A Lorient, certains postes de déchargement ont été équipés de pompes à poissons.

#### Coopération avec les Pays en Voie de Développement :

Une suite à la publication de la F.A.O. : Chaluts de fond pour la pêche artisanale, a été préparée, traitant de la pêche en boeufs avec ces mêmes chaluts.

#### Fils :

Pas de changement en ce qui concerne les matériaux utilisés. Le PA est le matériau le plus employé, le PE servant pour certaines pièces des chaluts de fond et spécialement ceux pour la langoustine.

German Democratic Republic

(H.J. Fischer)

New mid-water rope trawls of the 3rd generation with hexagonal meshes in the front part of the trawl have been applied generally in the fishery of the German Democratic Republic. Their conspicuous properties connected with the raising catch efficiency and the decreasing fuel consumption have proved to be successful in all fishing regions.

The development of a four-seam bottom trawl using ropes in the front part has been completed. Regarding their properties and their resistance these trawls have shown good results. They were not used extensively because of their high amount of mid-water trawling in the fishing fleet of the German Democratic Republic.

A new bottom-double-trawl for catching shrimps for stern trawlers has been investigated using TV-underwater observation. Essential technical improvements have been obtained. Comparative trawling showed higher catching efficiency than for single trawls. The use of these trawls in commercial fishing is planned for 1981.

Investigations of different variants of guiding rolls and blocks for warps have been finished. The durability of the warp has been increased more than 10%, of the guiding rolls about 300% and of the blocks for warps about 600%.

To further improve the vertical opening of mid-water trawls, canvas sailkites have been investigated and applied in commercial fishing. The gain in vertical net opening with sailkites was up to 10 m.

In 1980 investigations concerning the application of fishing gear with low energy consumption was carried out with improved anchor pound nets in different places at the Baltic coast of the German Democratic Republic. They proved to be successful, especially in the spring season. The setting and dismantling of these pound nets need less working time. They do not show damage, even in rough weather conditions.

Federal Republic of Germany

(H.J. Bohl)

The rapid rise in fuel prices affects the fisheries of the Federal Republic more seriously than those of many other countries. This is due to the fact that the German fisheries are almost entirely based on trawling which is known to be a very energy consuming fishing method. Therefore, 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, set-netting, longlining.



As to trawling, work on the development of rope trawls and large meshed trawls was continued. - A "rope trawl" in which the ropes were replaced by belts, was successfully tested. - Trawls with a section of ropes or large hexagonal meshes in the anterior part of the lower panel proved very profitable in areas where kelp was abundant. - Comparative fishing with different types of rope trawls was conducted in midwater as well as near the bottom.

Research on the electrified flatfish beam trawl is so far advanced that meanwhile an order for the building of a pulse-generator (prototype) and necessary accessories could be given to the industry.

First experiments with Danish seines in the North Sea proved so successful that it is already of interest for quite a number of German cutter owners to switch over from traditional trawling to this attractive fishing method.

For many years set-netting in the North Sea was completely abandoned by German fishermen. Attempts were now made to reintroduce this fishing technique in this area. However, the trials were seriously handicapped by the unusually strong tidal currents and the heavy pollution off the German coast. - In the Baltic, where the traditional set-netting is still performed to some extent, experiments were carried out with various types of nets (e.g. gillnets, trammel nets) made of different materials and netting yarn constructions.

Trials were also conducted to intensify and to improve longlining especially by means of modern hauling and baiting devices.

In the cutter fishery, investigations on the possibility of reducing energy costs by the use of sails as a complementary propulsion means were initiated.

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.

Now as before ISO standards are strictly observed by scientific institutions only. - The routine investigations on nettings, netting yarns and ropes used for trawls were continued and extended to those used for set-nets and other fuel saving gears.

All the midwater trawls and about 95 % of the bottom trawls used in the fisheries of the Federal Republic were made of polyamide. The PA/PE combination yarns which have been of some importance for the manufacture of bottom trawl cod-ends in the late seventies, are not any longer in use for this purpose.

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

(G. Thorsteinsson)

Some selectivity experiments with prawn trawls were carried out. Especially the effect of increased net slack in the side panels was examined. As this alteration of the trawl proved to be effective in releasing small prawn it is now widely used commercially.

Some gear experiments were made in the blue whiting fishery off the east and west coasts of Iceland. A big meshed midwater trawl was used with different kinds of otter boards. As the fish was far more scattered than in previous years the catches were moderate. A large part of the catch was processed experimentally for human consumption.

Some measurements were made to investigate the spreading forces of different kinds of otter boards with different angles of attack in relation to towing speed and oil consumption.

Some trials were made to catch Nephrops in traps but without much success.

Efforts were made to improve the efficiency of mussel dredges by using a water pressure system in front of the gear.

A remarkable appraisal was made on commercial prawn trawls in NW-Iceland. Gear parameters of all trawls in use were measured resulting in numerous improvements of the gears, especially the otter board rigging. These experiments were financed by the fishermen themselves.

A new construction of a special light PP was taken into use. This new material is used in floatlines for gillnets with much less or no floats at all.

In commercial trawling the trend to use 4 - seam bottom trawls increased very much in 1980.

#### Ireland

No report received.

#### Netherlands

(E.J. de Boer)

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 analysed 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.

Norway  
(S. Olsen)

In general most fish capture technology activities previously reported were continued and these are presently comprising all important fishing methods in Norway, with the exception of single vessel, bottom trawling for white fish.

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.

Behaviour and reaction studies relevant to fish capture included tank and UW TV field observations of behaviour patterns relevant to long line hooking efficiency.

Recordings from a double net sonde with varying positions of the second transducer have provided data for analysis of the reaction of blue whiting towards large meshed trawls.

Prawn escapement and behaviour in trawls were investigated with the aid of small meshed pouches or bags attached at various positions in the gear.

Studies of the avoidance reaction of herring towards vessels passing above clearly indicate that such avoidance may significantly effect quantitative echo surveying results.

An investigation has been carried out of incidental catching of herring with large meshed gill nets for cod etc. and of the additional mortality of herring dying from contact with gill nets without being caught.

#### Poland

No report received.

#### Portugal

(F.R.T.O. Rebordão and F.D.T. Ferreira Lima)

The Instituto Nacional de Investigaçã das Pescas "Fishing Gear Department" has been involved in the following work :

##### 1. On board the R.V. "Noruega"

1.1 Following the "Madeira Island" programme, drift lines of monofilament (PA MONO Ø 1,8 - 2,0 - 2,5 and 30 mm) have been tested for Aphanopus carbo fisheries as well as different types of bait (sardine versus different species of squids).

1.2 Experiments with traps in deep sea (900 m depth) in the above-mentioned region.

1.3 Following the "Azores Islands" programme, long-line experiments have been carried out in order to compare the efficiency of monofilament (PA Ø 1,80 - 2,00 mm) versus multifilament (PA R - 24.000 tex) aiming at the capture of Pagrus pagrus. Exploratory fishing in deep sea (over 1 000 m depth) have been carried out using multifilament long-lines (PA R - 24.000 tex) in the same area.

2. On board the R.V. "Mestre Costeiro"

2.1 On the Portuguese coast, semi-pelagic trawl net trials have been carried out.

2.2 Four panel bottom trawl nets have been tested aiming at the capture of Nephrops norvegicus at the Portuguese south coast.

#### Spain

(J. Bravo de-Laguna Cabrera)

The main Spanish activities were carried out by the Instituto Español de Oceanografía during the joint Spanish-Moroccan cruises INB SINA 8002, IEN SINA 8005 and ELID 8005. These activities were selectivity experiments for trawling gears.

During the first two cruises, the experiments were conducted with polyamide nets of 60.9 mm mesh size in the cod end. The species studied were Octopus vulgaris, Dentex gibbosus, Diplodus senegalensis, Pagellus acarne, Pagellus couplei and Spondyliosoma cantharus. The selectivity experiments were done between the latitudes 26°N and 21°N.

The thirs cruise, ELID 8005 was carried out at a latitude of 34°30'N. Experiments were conducted with three different gears of 69, 34.2 and 39.1 mm mesh size in the cod end. The species studied were Merluccius merluccius and Parapenaeus longirostris.

#### Sweden

(J. Lunde and G. Otterlind)

1. With the aim at producing efficient otter boards suitable for Swedish fisheries four different models of O-type cambered otter boards were tested in a wind tunnel at Chalmers University of Technology.

The models may be described as follows:

Model 1: O-type cambered otter board with a camber, based on the mean line, of 0,13. For all practical purposes this was also the camber of the upper and lower surfaces of the board.

- Model 2: O-type cambered otter board with the same suction side as Model 1 but with a flat pressure side. The camber of the upper surface was 0,13, that of the mean line 0,065 and that of the lower surface 0.
- Model 3: The same as Model 1 but with a fixed single leading edge slat.
- Model 4: The same as Model 1 but with a slot approximately halfway between the leading edge and the maximum camber.

The models were all made to a scale of 1:5. They were all smooth with no turbulent inducing devices fitted other than a square cut leading edge. The Reynolds number,  $Re$ , for the full scale otter boards was approx.  $2 \cdot 10^6$ . It was, however, found that the drag and lift coefficients for the models were practically independent of  $Re$  as long as  $Re > 4 \cdot 10^5$ . All models were thereafter tested at  $Re = 6,34 \cdot 10^5$  and over a range of the angle of attack,  $\alpha$ , from  $-5^\circ$  to  $+40^\circ$ . The flow over the models at various  $\alpha$  were studied by fixing tufts of wool at regular intervals to the surfaces of the models.

While Model 3 (with a single leading edge slat) had the largest lift coefficient  $C_L$  over nearly the whole range of  $\alpha$ , it had also, for all practical purposes, the largest drag coefficient  $C_D$ .

Model 2 had the least  $C_L$  but also the least  $C_D$  over the whole range of  $\alpha$ .

Taking the lift-drag ratio  $C_L/C_D$  as a measure of the efficiency of the otter boards, Model 2 was the best of the four models. However, adjusting the area of each board in order that they should all produce the same lift force or spreading force, it was found that it, theoretically speaking, was very little difference between them. The choice



will therefore have to be based on the production and maintenance cost of the different otter boards and in particular on the ease by which they can be handled under working conditions at sea. On this basis, Model 1 was judged to be the one to prefer.

Full scale tests were carried out with otter boards corresponding to Model 1 and 2 on board an ordinary Swedich Wood side trawler of LOA=25,6 m, having a main engine of 660 HP and a three bladed CP propeller.

2. A new four seam midwater trawl was designed and produced for these tests and also for comparative fishing performance with a four-seam combination trawl. The new trawl had 6400 mm stretched meshes in the wings, square and belly. The mesh size was halved in steps towards the cod-end which was suitable when trawling for herring. The combination trawl was of similar overall size and similarly rigged but its mesh size in the wings, square and belly was 3200 mm stretched.

As expected it was found that otter boards similar to Model 1 are to be preferred in particular under adverse fishing conditions. These otter boards are also the cheapest of the four models to produce. Films taken of the Model 1 full-size otter boards during trawling operations indicated that they were much more stable under all conditions, than for example the conventional rectangular flat otter boards.

No difficulty was experienced in handling the large-mesh trawl. Nor did concentrations of jellyfish and/or drifting weeds hamper the fishing operation any more with the large-mesh trawl than with the other trawl.

By adjusting the length of warps and/or the speed of the trawls it was always possible to adjust the depth of both trawls to the depth of the shoal of herring when using Model 1 full-size otter boards. The depth adjustment by

trawling speed alterations could, however, be carried out faster with the large-mesh trawl because of the lesser resistance of this trawl compared to the smaller-mesh trawl.

As was to be expected the large-mesh trawl always operated at a greater depth than the other trawl with the same warp length and trawling speed. This is due to the lesser resistance of the large-mesh 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.

3. Mesh selection in herring trawls. In the autumn of 1980 investigations into the mesh selection of herring trawls started, using the covered cod-end technique for cod-ends of three different mesh-sizes, bar-length 18, 20 and 24 mm. The intention is to study also the effect of meshing upon the selectivity and its relation to the hauling speed and the handling of the trawl. In all 22 hauls were made with generally small or moderate catches. The investigations are to be continued during 1981. The very preliminary results indicate a 50%-length of the herring for a mesh-size of 20 mm bar-length of about 17 cm and for a 24 mm bar-length of about 21 cm. For the usually used 18 mm bar-length mesh the preliminary 50%-length noted was about 14 cm.

United Kingdom

1. England

United Kingdom

1. England

Fisheries Laboratory, Lowestoft. (G.P. Arnold)

An analysis of the behavioural reactions of acoustically tagged plaice to a Granton otter trawl is continuing, using 16 mm cine film of the sector scanning sonar display. An estimate has been made of the increased efficiency of this trawl resulting from the addition of a board-to-board tickler chain.

Development work has continued with miniature acoustic tags designed to telemeter the compass orientation of the fish back to the tracking ship. Used in conjunction with sector scanning sonar these transponding tags enable the position of the fish to be determined at the same time. To date seven plaice and two salmon fitted with compass tags have been tracked in the open sea.

During 1980/81 acoustic surveys have been performed in the southern North Sea on herring and sprat: Acoustic calibration accuracies have been significantly improved by adopting reciprocity techniques and all calibrations are now absolute in that they do not rely on assumed values of hydrophone sensitivity or the target strength of standard targets. Further progress has been made with in-situ measurements of fish target strength. By driving three survey transducers as a line array the resulting  $12^{\circ}$  by  $6^{\circ}$  beamwidth proved adequate to collect single echoes from mackerel and sprat. Analysis has commenced on the sprat data and there are initial indications that the target strength in dB/kg is higher than previously assumed. An attempt will be made in August 1981 to collect target strength data on herring.

White Fish Authority, Industrial Development Unit, Hull (Mr. Hatfield)

1. Exploratory Voyages

WFA have carried out several voyages to check the efficiency of gill net fishing in zones unsuitable for trawling. In the limited voyage periods available, catch rates were not good, although some indications were found of possible good areas on a seasonal basis. WFA also have assisted the British Government in staffing a series of exploratory voyages supervised by the British Laboratories.

## 2. Electro Trawling

A commercial set of equipment suitable for beam trawls catching sole, has been built and installed on a Lowestoft vessel with promising results. At the time of writing the vessel is just about to recommence sole fishing after a break over the winter period. A set of equipment has also been designed to replace the chain on flat fish otter trawls and the array has been tested in the Flume Tank. A full scale version is to be tested shortly on FRV CLUPEA. We are expecting full scale trials on a commercial vessel in about six months time

## 3. Line Ripping Machine

Some promising trials have been carried out using a Swedish ripping machine new to the British Industry. The trials are continuing at the time of writing indicating promising results where the fish is in suitable concentrations. The machine is fully automatic and one man can control three or four machines.

## 4. Gear Selectivity

As suggested at the last working group meeting, WFA have carried out a desk study on all information available on this topic. The report should be available to relevant institutions at the time of the coming working group meeting.

## 5. Auto Clip Long Lining System

This system is at the stage of commercialisation and present WFA activity centres on finding a suitable manufacturer to act as licensee.

## 6. Fuel Economy in Fishing

The main WFA effort in this field has concerned the electro trawling and auto clip long lining systems previously mentioned. These both have considerable connotations of fuel

saving relative to traditional methods. Several small studies have also been carried out on methods of fuel conservation in general terms including the use of nozzle and two pitch propellers and including, for the future, the possibility of use of sail propulsion. This will be reported in more detail at the working group meeting.

## 7. Pair Trawling by Low Powered Vessels

A series of sea trials has been carried out on vessels based in the South of England in order to work out fishing gear size and rigging and handling techniques for demersal pair trawlers of about 150hp. Results are now available to industry.

### 2. Scotland

(R.E. Craig)

New designs of semi-pelagic trawl were developed and tested at sea. The emphasis has been on involving the netmaking industry in such work, and clarifying the principles involved. A number of detailed studies have been published in the fishing press.

Preliminary studies were made of the geometry of ground trawls fished between a pair of boats. These were on a collaborative basis with the Norwegian Gear Research Centre.

Studies were made of the shrinkage in use of netting (twisted and plaited) made from nylon and polythene. This was joint work with the White Fish Authority, and shows that shrinkage up to 10% could occur quite rapidly, and so a suitable manufacturing allowance is needed if "legal" nets are to stay legal.

Studies of the viability of gill net fishing in Scottish waters suggest that this could only be a strictly seasonal fishery, and that fishing skippers would need experience of the different grounds before they could expect to pursue this method economically. This is a rather disappointing conclusion, as a return to gill-netting is one possible reaction to increasing fuel price.

Sufficient supplies of live mackerel and herring were obtained for a serious start to be made in assessment of their acoustic target strengths. For herring, a value of about -31.5dB per kilogramme at 37 kHz was established, as compared to observed

results of about -28dB per kilogramme for gadoid fish. The mackerel tended to swim round the perimeter of the cage and detailed analysis of the television record will be needed to calculate the corrections needed on this account. As expected, however, the target strength is much lower than for fish with swimbladders.

The remotely controlled towed vehicle was again used successfully to extend our knowledge of fish behaviour in front of fishing gear. However, it was not possible to arrange for a special winch to be fitted to a research vessel, and this aspect will need to be pursued in the future. In the meantime, the flexibility of the system is diminished by the need to use "ad hoc" handling systems on each occasion of use.

One member of staff spent 4 weeks in Ecuador, assisting with acoustic surveys of hake and other species in that sea area.

U.S.A.

No report received.

U.S.S.R.

(S.A. Studenetsky)

To improve fishing gears and fisheries schemes the following researches were carried out in 1980:

Parents Sea

- test of a mechanized longline complex was performed in July-October;
- selectivity of bottom trawls with mesh size of 120 mm and 135 mm in relation to cod and haddock was investigated;
- research on electrified bottom trawls was carried out;
- observations on fishing with a bottom trawl were carried out;
- grounds for application of small trawls in the sea inlets were studied;

Baltic Sea

- selective properties of capron (polyamid A) bottom trawls with mesh size of 110 mm in cod fisheries were investigated;
- 30 trawlings were made (33 th. fish measured); the results of these investigations revealed relations between the bycatch of the young ( $L_0 < 30$  cm), parameters of size composition of fish stocks (length mode, abundance of the young) and the catch;
- analytical values of the selectivity curves for trawl codends with mesh size of 100 mm and 110 mm in cod fisheries were determined;
- survival rate of river flounder ( $L < 21$  cm) escaping through the mesh of the trawl codend was found;

Practically full escape occurred with the mesh size of 110 mm.

