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Administrative Report

FISH CAPTURE COMMITTEE

by

G. Kurc

1979

Belgium

(G. Vanden Broucke)

The technical parameters of the traditional nets used in the Belgian fisheries (net opening, rigging, drag, wear) were further studied.

Comparative studies with beam trawls were continued. The main purpose of these studies was to adapt the rigging in function of the fishing ground and the characteristics of the fishing vessel. In order to improve the abrasion resistance a new type of bobbin chain was developed. This bobbin chain - composed of rubber bobbins fixed on a chain - was tested for the shrimp fishery.

The investigations on double beam trawls for shrimps and roundfish mainly concerned the length of the legs in function of the catchability of the upper and lower net.

Within the framework of the project "Comparative semi-pelagic fishery in coastal waters", three types of semi-pelagic nets and their rigging were tested.

Investigations on the use of oval boards were started.

Various yarns and nettings were tested for yarn strength, knot strength, mesh size, shrinkage and elongation.

Polyamide nettings of different construction and different ways of knot setting were examined on the influence of repeated moistening and drying, on the variation of the mesh size in function of the drying time and on the influence of the absorption of sand.

Use of synthetic yarns in Belgium : Polyamide : 65%, polyethylene: 35%. Application of ISO standards in Belgium : only by the Fisheries Research Station; a) during its research projects and b) during the tests carried out on request by the industry.

Experiments with electrified nets were carried out on sole and shrimps. The research on shrimps was mainly concerned with the definition of the exact voltage with the aim to develop a battery powered underwater pulse generator.

For soles, the disposition and the material of the electrodes were studied.

A list of Decca positions of wrecks in the English Channel, the Bristol Channel and the Bay of Liverpool has been drawn up.

A preliminary study on energy saving in sea fisheries was started.

In order to follow up the possibilities of the use of a Dutch flatfish grader for the Belgian fishery, experiments have been carried out on board a Dutch beam trawler equipped with a flatfish grader.

Future Work

- Study of rope trawls and high opening beam trawls.
- Laboratory experiments with a battery powered underwater pulse generator for shrimps.
- Compilation of a "List of Wrecks" for fishing grounds.
- Study on the automatic feeding system for the flatfish grader.
- Studies about energy saving aboard fishing vessels.

CANADA

(P. J. G. Carrothers)

The Federal Research and Resource Services Directorate in the Newfoundland Region reports on two selectivity experiments, one for American plaice and yellowtail on Grand Bank using alternate hauls with uncovered codend and the other concerning the "drying twine" area on the back of cod traps. Also, a technique has been developed to reconstruct mathematically a population of Atlantic salmon fished at West Greenland using the catch in two sizes of gillnet mesh, fished concurrently with equal effort. The experimental catch is identified by comparison with the commercial catch and mortality was adjusted using rates for Pacific salmonids.

The Newfoundland Provincial Government reports on five projects. A comparative fishing trial between a Yankee 36 and Ivor Christensen star bottom trawl in the Strait of Belle Isle for 5 days in August on two 58-ft (18 m) vessels of similar horsepower yielded nearly three times as much catch with the latter as with the former. A trial with bottom longlines in Harbour Breton in November-December, comparing spun nylon with monofilament gangings, yielded 47.5 fish per hundred hooks with the latter as compared with only 19.1 for the former. Trials in Strait of Belle Isle with a rope-wing pelagic trawl in contact with the sea bed in 22 fm water for cod were not successful, even though the net sounder indicated the net was behaving properly and even though cod were being caught commercially with bottom trawls in the area. Ship sounder traces did not show in the net sounder, indicating that fish were avoiding the trawl. An original, longline, hook-baiting device has been developed and proven effective for small fishing vessels. Two Scottish vessels in the 80-85 ft (25 m) class were chartered to determine the feasibility of a Scottish seining/pair trawling operation in middle-distance waters. Location of suitable grounds is a factor.

The Federal Fisheries Development Branch, Maritimes Region (Halifax) reports on 13 projects of interest. Squid jigging was conducted by automated Japanese vessels, both to determine seasonal distribution and extent of the stocks and to demonstrate the technique commercially. Two Canadian inshore vessels (12 m) were fitted for commercial demonstration and a mid-size vessel (20-25 m) is to be fitted to promote a Canadian squid fishery. Pair bottom trawling with existing inshore vessels was demonstrated in northern New Brunswick, using nets twice as large as would be towed by a single trawler of similar total horsepower. Pair mid-water trawling for capelin was tried for 14 days with good catch results. Considering the high percentage of females, commercial success would depend on development of roe-capelin food market. The development and promotion of stern drum seining continued with the outfitting of a 44-ft (13.5 m) Cape Breton vessel with necessary deck equipment. The success of the method relies heavily on the incidence of schooled fish. A 42-ft (13 m) Norwegian fiberglass sjark class vessel has been fitted with a full shelter deck and complete, 11000-hook Mustad autoline system, making it the smallest vessel in the world with this fishing capability. It will fish commercially out of Campobello Island and will be used for demonstration elsewhere in the Maritimes Region. A diesel-powered, portable

blast freezer has been demonstrated in areas where suitable electric power is not available. Gutting machines are being tried on 45- to 65-ft (14 to 20 m) inshore vessels in an effort to improve the quality of landings. In the shrimp fishery, an onboard grader for separating shrimp into two size groups has resulted in a premium price for the larger shrimp, hold-chilling units reduced ice consumption and freezer capability is to be installed, and handling of the catch by mesh bags is an improvement over present bulk-icing procedures. This shrimp project will also include evaluation of an automatic cooker, trash separator and an automatic, on-deck, blast freezer. A prototype scallop shucking machine has been demonstrated on small scale and is to be developed on larger scale with eviscerator. The automatic rotary scallop meat washer is to be redesigned for smaller vessels. Equipment for washing and spreading dulse for improved product quality is being developed. Development of onshore unloading equipment (1000 lb = 450 kg capacity) suitable for local fabrication is under way. Irish moss raker design is being improved to decrease resource damage without reducing productivity. Fish handling techniques for better fish quality from inshore boats are being developed by a permanent, insulated, fiberglass hold (30000 lb = 13.6 t capacity) with removable working deck, cargo net bags (1000 lb = 450 kg capacity) and onboard weighing. A second design involves a removable fiberglass compartment of 5000 lb = 2.3 t to 7000 lb = 3.2 t capacity.

The Federal Resource Branch, Maritimes Region (St. Andrews) is developing improved fish-stock survey techniques. For acoustic survey methods, target strengths of individual herring, groups of herring at high density in captivity and groups of capelin in cages have been quantified. Single pulses were recorded to study variance and confidence in measurements. A new hardware system involving microprocessors and dual beam transducers has been constructed, but scheduled trials have been frustrated by lack of fish. Techniques for photographic truthing of acoustic observations and spawn surveys from a towed, sea-bed referencing vehicle continue to be developed with promising results. New instrumentation for survey trawl mensuration has been calibrated, given sea trials and used for some measurements, but further development and de-bugging are required. A revised Canadian standard for fishing gear textiles, incorporating features of relevant ISO Standards, is being developed.

The Federal Research Branch, Quebec Region, reports two projects related to management (husbandry) of the fishery resource. The feasibility of using small-vessel, ichthyoplankton surveys for spawning biomass estimates of near-shore, demersal-spawning, species, particularly herring, is being investigated as possibly being more precise and less expensive than standard, area-based surveys with larger vessels. At least, these new surveys will complement the offshore surveys. The use of aerial surveys, involving both visual counts and scale photography, are being investigated as a means for assessing the fishing effort in the dispersed, fixed-gear, coastal fisheries, specifically for herring at present.

The Great Lakes Biolimnology Laboratory in Ontario continues to investigate acoustic techniques for studying freshwater fisheries. Few problems arise with pelagic populations, but observations of benthic communities are adversely affected by soft-bottom responses. The fibre-optic, CRT visicorder is being used to assist data interpretation. Acoustic and conventional fishing methods (trawl and gillnet) are being used to characterize a fishery in a study of response to nutrient control measures.

Hydroacoustic techniques continue to be used extensively from the Biological Station in Nanaimo for fish-stock assessment. An original, fully portable, echo counter is used for salmon smolt in lakes and an original, semi-portable, echo integration, micro-processor system is used for large-scale marine biomass estimations.

No reports were received from the Provincial Governments of Nova Scotia, New Brunswick or Quebec, nor from the Federal Pacific Industrial Development Branch, even though it is known that they sponsor projects of interest to the Committee.

Polyethylene and nylon continue as the dominant netting materials, although accurate estimates of percentages are not available. Most trawl codends, mid-water trawls, gillnets and seines are nylon. The forward panels of bottom trawls are more frequently polyethylene than nylon for reasons of cost and handling. Longlines are predominantly nylon. Fishing effort measures for shellfish are of interest, although little research in this area has been done. Selectivity experiments have been directed to specific problems related to resource management (regulations) and have been restricted to materials currently in commercial use. There are no fish-capture technology projects directed to developing countries and no research on new types of netting yarn. Development of a new Canadian standard on fishing gear textiles has already been mentioned.

Fisheries Development Division, Pacific Region (R.H. McIlwaine)

The Fisheries Development Division (formerly Industrial Development Division) of the Pacific Region, carried out a number of projects of interest to the Committee.

Work continued on the development of a prototype combination midwater/bottom trawl door which is cambered with an aspect ratio of 1.3, has removable weights, and a fully adjustable tow plate. Warp tension meters were constructed and tested for use in experimental work.

Further development of the rope trawl is continuing with replacement of wire and non-spliceable ropes by spliceable ropes to reduce construction costs and improve ease of handling. Work has been started on the development of an escape mechanism for lost black cod traps.

In the area of exploratory fishing, a project was carried out to explore for rockfish and demonstrate the capability of the Mustad Autoline System for these species on hard bottom grounds on the West Coast of the Queen Charlotte Islands.

Denmark

(P. Kanneworff)

No work has been carried out in 1979.

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

- Full scale experiments in trawling in ice conditions onboard the Finnish ice-operating trawler "Järvsaar".
- Model tests for trawling under the ice in different ice conditions were started.
- Model tests and full scale experiments for using "Wärtsilä Air Bubbling System" (WABS) for cleaning the aft area from ice to obtain icefree surface for shooting and hauling the nets.
- Model tests for optimal situation of sonar in ice operating fishing vessels.
- The design of the year-round operating krill factory trawler was started.
- International co-operation in designing the feasible equipment for processing krill into peeled krill, minced krill, krill meal and krill oil.

France

(J.C. Brabant)

Chaluts :

Les chaluts de fond à 2 faces sont utilisés pour la pêche traditionnelle sur le fond.

Les chaluts de fond à 4 faces, avec une entêture en mailles de 800 mm sur le dessus et les côtés et 400 mm en dessous, sont très répandus en Méditerranée où la puissance motrice des chalutiers est limitée à 430 ch.

Le chalutage en boeuf se poursuit dans toutes les régions et peut durer toute l'année.

Une méthode de chalutage utilisant 4 panneaux (2 classiques sur le fond et 2 petits pélagiques sur les bras supérieurs) s'est développée à partir d'Etaples vers la côte Atlantique. Ce système permet de traîner un chalut pélagique avec des longues fourches et de passer au chalutage de fond sans changer de panneaux.

Un chalut de fond à 4 faces et à grande ouverture verticale dont la face supérieure et la moitié des faces de côté est en 800 mm, alors que la partie inférieure est en 200 mm, a été essayé en Méditerranée.

Une campagne de prospection et d'essais de chaluts de fond et pélagique (pour le krill) a eu lieu au mois d'octobre et novembre 1979 dans les parages des îles Kerguelen.

Une mission franco-allemande dans la Manche à bord du 'Solea' a permis d'établir des comparaisons entre un chalut à cordes allemand et un chalut pélagique à très grandes mailles français.

Une mission complémentaire en mer Baltique est prévue pour le mois de juin.

Chaluts sélectifs :

Pour séparer la langoustine du poisson, un dispositif sélectif adaptable sur les chaluts traditionnels a été testé : l'amorce et la poche ont scindé longitudinalement par la mise en place d'une nappe horizontale. Les premiers résultats sont encourageants.

Sélectivité :

Des expériences à la mer ont montré que le facteur de sélectivité des langoustines était très peu différent pour les poches en polyamide et celles en polyéthylène. Par ailleurs, il existe une relation entre le facteur de sélectivité et le diamètre du fond de chalut c'est-à-dire, l'importance de la prise accessoire du poisson.

Senne :

Traditionnellement dans le Golfe de Gascogne, la sardine est capturée à l'aide de senne de 250 à 300 m de longueur et 60 m de chute théorique. Des mesures, au cours de pêches commerciales, ont montré que la chute pratique était de 22 à 24 m ; les vitesses de chute étaient très variables, de 10 à 20 m par minute selon les conditions de manoeuvres.

Pour l'étude du comportement des grandes sennes à thon utilisées en Afrique, des maquettes au 1/40 ont été réalisées et testées en piscine.

Panneaux :

Les panneaux rectangulaires plans en bois sont moins utilisés et remplacés par des panneaux métalliques de divers types.

Bassin d'essais :

Une étude conjointe entre la France et le Québec a débuté pour la réalisation d'un bassin d'essais dans ce dernier pays.

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Fils :

La rétraction des fils en polyamide après usage gêne les pêcheurs qui se trouvent de ce fait facilement en infraction lors d'un contrôle du maillage des culs de chalut. Les pêcheurs de langoustines ont demandé la création d'un label certifiant la conformité du maillage acheté aux réglementations en vigueur. La solution semble plutôt dans l'amélioration de la définition des conditions de mesure et dans l'information des pêcheurs sur les qualités des filets mis en vente.

En France, les chaluts et les sennes sont réalisés avec des fils PA. Cependant, l'usage du PE se développe pour des pièces de chalut de fond et pour des culs de chalut afin d'éviter la rétraction du PA.

Echo-intégration.

En juin 1979, une campagne de 8 jours a été effectuée par le n/o "Thalassa" avec pour objectif principal l'étalonnage de l'ensemble d'écho-intégration. La calibration sur des poissons vivant en cage a été menée sur les espèces suivantes : anchois, maquereaux et chinchards.

En juillet 1979, le n/o "Thalassa" a également participé à la campagne internationale d'évaluation des stocks de harengs dans la division IIa.

Coopération avec les pays en voie de développement.

En Tunisie, des mesures ont été effectuées sur des sennes à thon de type espagnol. Par ailleurs, des plans de chaluts ont été fournis pour des projets FAO dans ce même pays.

German Democratic Republic

(H.J. Fischer)

The development of a new generation of mid-water rope trawls for different types of fishing vessels with elongated rope parts has been successfully finished. These results justify the application of these trawls in commercial fishing.

The development of mid-water pair-trawls for high-powered stern trawlers using ropes in the front part of the trawl has been finished. They proved to be very successful when fishing for blue whiting in the North Atlantic and received better results than two single trawlers, mainly at concentrations of low density.

The development of a bottom shrimp trawl to be used on trawlers up to 1 700 HP has been completed. At present it is used in commercial fishing. Further improvements using underwater observation module are planned for 1980.

Investigations concerning the applicability of ropes in the net part of bottom trawls have not shown final results. These experiments will be continued in 1980.

Different variants of guiding rolls and blocks for warps with a hardened surface were tested in order to reduce wear and tear of the rolls themselves and of the warps. These investigations will be further continued.

Further investigations concerning the fish behaviour relating to different types of trawls using underwater observation module were carried out. The obtained results stored on video-tape are presently being processed.

Nearly all fishing gear used in 1979 in the fishery of the German Democratic Republic were made of polyamide fibres (Multi-filament, fineness 188 tex and 94 tex).

Germany, Federal Republic of

(H. Bohl)

The enormous 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 one hand on the development of trawling techniques allowing a reduction of fuel consumption and on the other on the introduction of appropriate "new" catching methods not yet applied in German fisheries to a great extent, e.g. Danish seine and passive gear (set-nets, longlines, traps).

As to trawling, research work was dealing with rope trawls, the use of which saves energy as a consequence of their relatively low towing resistance. In 1979, in the midwater, trawl types with extremely long rope sections and, near the bottom, types having chains instead of ropes in the lower panel were successfully tested. Furthermore, a trawl with extraordinary large meshes in the forenet (French origin) was compared with rope trawls. This net construction was found to be most favourable with respect to its very low towing resistance, but it was not suitable for semipelagic trawling. - For the first time, rope trawls could also be efficiently used in pair-trawling.

The experiments with an electrified flat-fish beam trawl were continued. Apart from its protective effect on under-sized fish and bottom fauna, this gear contributes markedly to the reduction of energy. Whilst previous trials mainly aimed at the capture of sole, recently the plaice is the chief object of electric fishing.

First steps were made to further the introduction of seining (Danish seine) into the German fishery because of the relatively low expenditure of energy required for this fishing method.

Even more drastically the consumption of fuel can be reduced by the use of passive gear. Preparatory work was done in order to investigate the applicability and rentability of set-net and longline fishing carried out with the aid of modern deck equipments (net and line hauling devices).

For the capture of Grey Mullets which occur since some years in the German wadden-sea, gill-nets made of polyamide monofilament proved again most suitable. The experiments in 1979 were handicapped by the scarcety of mullets due to the extremely cold summer.

In model tests (scale 1 : 4) conducted in the Mediterranean, different types of rope trawls were studied. In the course of these experiments various other board constructions were also investigated. The so-called "tandem boards" were found to be superior to otter boards as far as handling, stability and compactness are concerned. On the same occasion, "sailing kites" made of canvas were very successfully used in order to achieve optimum vertical net openings with midwater and bottom trawl models.

Now as before ISO standards are strictly observed by scientific institutions only. The commercial fishery, however, still sticks to the traditional designations (e.g. denier, metric numbers). - In the national working group on standardization a new standard for rope splicing was established. - Aramid ropes which are distinguished by extremely great strength and very little elongation, were tested with respect to their applicability as frame lines in trawls and seines.

All the midwater trawls and more than 90% of the bottom trawls manufactured in the Federal Republic of Germany are made of polyamide. A slight increase in the use of polyethylene in the form of PA/PE combination yarns for the manufacture of bottom trawls cod-ends could again be stated.

A ship-borne data collection device was amended in such a way that an immediate evaluation of trawl measurements becomes possible. The multi-netzsonde used in this connection was equipped with a current sensor.

In 1979, the series of cod selectivity experiments conducted with bottom trawls in the central Baltic was continued. During these investigations for the first time a current meter was towed alongside the vessel in order to measure the towing speed as accurately as possible. The aim was to study a possible relationship between trawling speed and selectivity. On the same occasion, also for the first time, the selective properties of a cod-end made of a combination yarn (50% PA multifilament and 50% PE monofilament) were tested.

(Further selectivity experiments were carried out aboard German commercial trawlers in New Zealand and Argentine waters.)

Gear technological work in combination with research on fish stocks was conducted in the areas of and in cooperation with the following developing countries: Indonesia, Malaysia, Peru, Philippines, Seychelles and Surinam.

Iceland

(G. Thorsteinsson)

In July some experimental fishing on blue whiting were carried out off the east coast of Iceland. A rope trawl and some types of big meshed midwater trawls were tested in comparison with conventional midwater trawls. The fishing with the experimental trawls did not prove very successful, perhaps due to unusual behaviour of the blue whiting.

In November blue whiting was searched for off the east as well as off the southwest and west coast of Iceland. Since almost no blue whiting was found the sceduled fishing experiments had to be omitted.

No shellfish is captured in Iceland in fixed gears.

In all Icelandic selectivity experiments an ICES mesh gauge with 4 Kgf has been used. By mesh size controls a conventional plate is used. The measurements with the plate give slightly larger figures than the ICES gauge.

No changes in materials for fishing gear have taken place in 1979, so the statement in the administrative report for 1978 is still valid.

The information on the ISO-standards given in the 1978 report is still valid.

No experiments to reduce the shrinkage of meshes have been made, since the PE used in all bottom trawls has no tendency to shrink.

In 1979 the possibilities of technical assistance in fisheries to developing countries have been considered. In 1980 a technical program to support the fisheries of Cape Verde will be started.

Ireland

(J.P. Hillis)

The effect of Nephrops trawl mesh on the catch of Nephrops and by-catch of Whiting with trawls of differing mesh was investigated in a parallel haul experiment with two chartered trawlers during September, a traditional Nephrops trawl of mesh ranging from 43 mm to 57 mm being compared with one of 70 mm throughout (with cod-ends of 70 mm and 50 mm) and with one of mesh about 55 mm throughout. Small-meshed covers were attached to different parts of the trawl to examine escapement through the mesh at these areas.

Netherlands

(E.J. de Boer)

The research group developing an efficient electrical barrier which prevents fresh water fish to enter the cooling intake and/or discharge systems of industrial plants studied and analysed the behaviour of small fishes (5 and 8 cm length) in electrical fields. These behaviour studies were carried out in a small flume tank (6 m x 0.8 m). Under optimum conditions 95 percent of the fishes did not pass the electrical barrier.

The prototype of the flatfish grader was further tested on board a powerful commercial beamtrawler fishing in an area where the composition of the catch and the condition of the seabed differed from previous tests.
In addition to research into the influence of the grader on the survival rate of discarded flatfish also technical and ergonomical research was carried out.

Research was carried out into the possibilities and conditions of using heavy and blended fuel oils for the propulsive machinery of different types and powerranges of fishing vessels.

In 1979 the activities in relation to catching flatfish species by means of electric stimulation were limited to the development of a new type of pulse-generator and analysis of the results obtained in recent years.

The study into the application of multi-chine hull forms was continued. The parameter study to be used when designing the optimum (beam) trawler was extended with data of 16-27 metre vessels. As a result this study covers vessels in the 16-40 metres range.

The geometry of rigging and net-opening of a rope trawl from the D.D.R. and a large meshed trawl of almost identical dimensions were studied during a cruise of the FRV "Tridens" in which also staff and instruments of the Marine Laboratory, Aberdeen participated. During this cruise also new developed and converted instruments for gear performance measurements were further tested.

In co-operation with the Institut für Fangtechnik, Hamburg model research on models (scale 1:4) of rope trawls was carried out.
Model research on a 1:10 scale model of a Dutch roundfish trawl designed for an area with sandridges was carried out in the flume tank of the Fisheries Training Centre, Hull. In addition the full scale gear was tested during instrumented gear trials in said area.

Experiments with Danish pair seines were carried out and this relatively selective and low-energy fishing method was further introduced in the fishing industry.

Technical research in the field of mussel farming was directed to further improve the hydraulic transport of mussels from the seabed into the hold.

In co-operation with the diving team of the Marine Laboratory, Aberdeen observations of a high-headline roundfish trawl for fishing cod in area's with sandridges and a beamtrawl were recorded on video-tape. Also some reactions of fish to the approaching gear and in the net were observed.

Activities to introduce fish capture technology (gears, methods and vessels) in developing countries were directed to fishery projects in Kenya (Mombasa), Tanzania (Mwanza, Lake Victoria), Cameroon and Cape Verde Islands (Santo Antão).

Norway

(S. Olsen)

Experiments with new types of hooks, line materials and artificial bait for longlining were continued and extended to include line fisheries for tusk and ling. The longline mechanisation system for coastal-vessels was tried out on two commercial boats.

Norwegian made jigging machines where adapted for squid fishing and tested in comparison with a Japanese squid jigging machine.

Studies on the effects of floatation, hanging rate, and mounting on selectivity and catching efficiency of cod gill nets were continued and a new mechanized gill net handling system was tested.

Exploratory Nephrops trap fishing in coastal waters included comparative tests of different trap designs, bait-types and fishing time.

The work on prawn sorting trawls in 1979 included further trials with obliquely mounted sorting panels and initial experiments to evaluate the effects of greatly reduced sweepwirelengths.

A new big blue whiting trawl with very large alongated hexagonal meshes in the front part was developed, measured with regard to towing resistance, and tried out in May during the commercial blue whiting fishery at Faroes. Further trials were carried out in September in the Norwegian Sea.

Pairtrawling experiments for groundfish on different kinds of bottom were conducted in the North Sea.

The special trawl for small mesopelagic fish developed with NORAD funding was tested in the Arabian Sea from the R/V "Dr. Frithjof Nansen".

Full scale experiments were carried out with a new 3-foil midwater otterboard.

An improved hexagonal mesh net with nearly uniform twine thickness in all six bars has been developed and a new large codfish purse seine was constructed from this type of net. Initial tests of the new seine were carried out in October. The first commercial coalfish purse seine of H-net was operative in 1979. Its performance proved very successful

and a number of new H-net seines has subsequently been ordered, including one big combination capelin/mackerel seine.

The mechanized purse seine net stacking system was in 1979 developed further to suite also the large purse seiners with separate, fixed net handling winches.

Development of gear and catch handling methods for coastal combination vessels were continued on 1979 with the aim of minimizing crew size and effort, and reducing the complexity of deck machinery for smaller vessels.

Studies in the field of energy conservation have been intensified to establish more accurately energy consumption in various methods of fishing, to develop energy saving procedures when operating fishing vessels, and to develop more energy efficient machinery systems.

A mathematical model has been developed for estimating average target strength as a function of fish tilt angle.

Further studies have been made of the avoidance reaction of fish to vessels passing above, and how this may effect quantitative echo surveying.

Studies of fish behaviour and reaction relevant to gear technology projects have included underwater TV-studies on the behaviour of ling and tusk towards longlines and baited hooks, and on the behaviour of Nephrops in trap fishing. Other investigations have shown how specific olfactory stimulations release corresponding behaviour patterns in cod.

The studies of migration of smolts away from the home river with the aid of acustic tags have been continued.

The mortality of salmon and sea trout injured by driftnets has been investigated in three Norwegian fjords.

Distribution of fish in relation to bottom topography and structures has been investigated and studies have been made of fish behaviour as factors responsible for the consentration of fish around structures.

The relationship between light intensity, vertical migration and accessibility for pelagic trawling of blue whiting has been investigated in the area South-East of the Faroe Island.

Qualitative contrast comparisons of differently coloured gill nets have been started.

No studies have been undertaken of the effects of force on mesh measurements, nor of mesh shrinkage in nets of new materials (C.Res. 1979/4:2).

Significant changes in the use of different textiles in commercial fishing nets have not been recorded since the report of 1978. Thus, polyamide is the only material used for webbing of gill nets, purse seines and pelagic trawls. Material for bottom trawls (both for fish and for prawns) are 50% polyethylene and 50% polyamide, while North Sea trawls for industrial fish are made of polyester (40%), polyethylene (5%), the rest being of polyamide. Danish seine nets are made of polyethylene (70%) and polyamide (30%).

I.S.O. standards are still not widely applied in the fishing industry

Poland

(S. Richert)

In 1979, model investigations were conducted on the large-sized, rope, large meshed and hexagonal pelagic trawls. Parameters of mouth opening in trawls of different types depending upon their rigging and trawling speed were studied.

Technical comparative tests of 4 large-sized pelagic trawls were carried out on board the R/V "Professor Bogucki" in the Baltic region. Trawls like these are becoming more widely used commercially in the Baltic and deep sea fishery.

Investigations were conducted on squid fishing techniques by means of jiggers using light.

Selectivity investigations

Investigations were conducted on the selectivity of cod-ends used in the Antarctic region. Cod-ends of various constructions and made of different materials, for example, of double twine 7 mm wide, and tape were tested simultaneously.

Portugal

(F. Rebordão)

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

1. On board the R/V "Noruega" : Pelagic trawl experiments using the 200 mm and 1 000 mm trawl nets.

   Experiments with traps in deep sea.

   Gill nets and long-line experiments have been carried out in order to realise the feasibility of further experiments with this gear on board, in the EEZ, including the Açores and Madeira.

   One month exploratory fishing trips to Madeira and the area of the Açores.

2. Using the R/V "Mestre Costeiro" :Experimental fishing complementary work to the study of the Ria de Faro/Olhão.

3. On board the R/V "Tridens" : Participation in the work accomplished with the R/V "Tridens" in the Madeira area (rope trawl measurements compared with standard bottom trawl).

4. On board the "Luis Ferreira de Carvalho" : Using a commercial Portuguese stern trawl "Luis Ferreira de Carvalho" (98 m long, 3 000 tonnes) on an exploratory trip along the Chilean coast, south 50°S, and Falkland (Malviras) area.

Spain

(J. Bravo de Laguna)

The main Spanish activities were carried out by the Instituto Español de Oceanografía during the cruises "SELECTIVIDAD 79" and "CIGALA 79". These activities were selectivity experiments for trawling gears.

The cruise "SELECTIVIDAD 79" was conducted in April 1979 off the NW coasts of Spain. The experiments were conducted with polyamide nets of 55 and 74 mm mesh-size. Results were obtained for hake and horse mackerel. These were affected by the occurrence of big quantities of crabs (Polybius henslowii) in the catches.

During the cruise "CIGALA 79", carried out off the Spanish and Portuguese coasts, the nets were of the same type of textile. In this instance, the mesh sizes were of 60 and 73 mm. Results were obtained for Nephrops norvegicus, hake, blue whiting, horse mackerel, Solea senegalensis, Lepidorhombus whiffiagonis and Lepidorhombus boscii. The occurrence of Polybius henslowii also affected the exercises.

Sweden

(J. K. Lunde)

No work has been carried out in Sweden for the year 1979.

United Kingdom

1. England

Fisheries Laboratory, Lowestoft (G.P. Arnold)

Development work has continued with miniature acoustic tags designed to telemeter the orientation, speed and heart rate 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. Preliminary experiments have been carried out with two plaice fitted with compass tags.

Research into the acoustic estimation of fish abundance continues to be concentrated upon the measurement of fish target strength. An in situ technique using a single beam transducer has been used to determine the target strength of blue whiting. To extend the method to more densely shoaling pelagic species a narrow beam width transducer has been constructed with three 30 kHz transducers to form a 12λ by 6λ array. Single fish echoes from mackerel and sprat have been collected with this transducer and await statistical analysis to produce target strength estimates. Acoustic surveys have been performed on mackerel, sprat and herring, the latter being an exploratory survey on known spawning grounds off NE England. Three MAFF research vessels have been equipped for acoustic survey, all now using towed bodies.

Further work with a 70 mm mesh Nephrops trawl has shown that escapes occur through the wing and belly as well as the codend of the net. The size of the escaping Nephrops increases with the distance back from the groundrope.

White Fish Authority, Industrial Development Unit, Hull (N.C. McDiarmid)

Comparative fishing experiments with electrified beam trawls have produced increases in flatfish catches up to 10% above those with standard beam trawls. The experiments were carried out with two commercial vessels (525 hp, 26 m; 240 hp, 22.5 pm), which normally fish two 4 m beams fitted with 9 tickler chains or chain mats.

A suitably modified shrimp rig replaced one or both chain rigs. Pulse rate frequencies of 6.25 and 4 pps were used and the discharge measured at the electrodes ranged from 170 to 230 V. Trailing s.w.r. electrodes were used on each beam. An economic study indicates that electrified beam trawls should show a saving of 12% in fuel and 15% in gear costs.

A small 'rope trawl' has been developed for use by two 120 HP vessels fishing for pelagic species at speeds up to 4 knots. It is based on a 960 x 200 mm midwater trawl and has longitudinal ropes substituted for meshes in the wings and first body panels. The drag is approximately 15% less than that of the unmodified net and the maximum mouth aperture is 16 x 13 m at 4 knots.

The prototype "Autoclip" fully automated longline baiting and handling system has undergone 12 months successful trials on board a 15 m commercial fishing vessel. The equipment consists of 13 km of 7 mm plaited polyester line and a number of storage racks each capable of holding one hundred 400 x 1.5 mm monofilament nylon snoods and Mustad No 6 eyed straight hooks. The mechanisms are powered by hydraulic pumps and pneumatic rams. Electronic sensors are used to attach the snoods to the line at spacings varying from 1.2 to 4.8 m. Line shooting is usually carried out at 4.5 knots and the line is hauled at 0.37 m/s.

Theoretical investigations of alternative fuels for marine diesel engines suggest that significant fuel savings are unlikely to be achieved by this method in the near future. But immediate savings could be made as a result of operational research. The introduction of paired fishing and the use of lower free running speeds both offer savings in fuel costs.

The Flume Tank has been regularly used to test models of trawls, nets and floats either to improve the design of existing commercial gear or as part of the basic net design programme. This covers two main areas: the development of bottom trawls for vessels of 20 - 75 hp and basic investigations into the design of pelagic trawls.

2. Scotland

(R.E. Craig)

a. Gear Technology

Experimental work has continued relating to the improvement of demersal, and semi-pelagic trawls, and practical studies have been made of shellfish dredges. Some observations by underwater television were made of fish behaviour in relation to baited hooks. Work has continued on the drag of netting and warps.

In conjunction with RIVO IJmuiden, studies have been made of rope trawls, showing the extent to which rope panels can maintain the swept volume, with less drag and so less fuel consumption than conventional trawls.

b. Fish Behaviour

Observations have been made by divers using low light television cameras, of fishing gears in operation, and of special rigs to study the effect on escape of changes in the angle of attack of netting panels. Considerable attention has been given to the belly parts of semi-pelagic trawls, in which the angle of rise and the choice of mesh govern the catching efficiency.

A new controllable unmanned vehicle has been designed to carry television cameras to any part of the gear, thus reducing the demand on divers' time and allowing operation in depths to at least 60 metres.

c. Sonar and Instrumentation

Stock surveys on Blue Whiting, Herring and Sprat were conducted using a Simrad EK38 echosounder coupled to the Aberdeen integrator. Further work on the target strength of gadoids was carried out and preliminary work on herring, the latter being made possible by the use of a special barge to transport the fish from the point of capture. A study of standard acoustic targets has been started.

Fish carrying acoustic tags were successfully tracked in the open sea with sample equipment. New equipment is being developed with more adequate resolution in range and bearing.

A prototype tension cell for fishing gear studies, using a solid-state memory, has been developed and tested. Progress has also be made in the measurement of net speed through the water, and the angle of attack of trawl boards.

d. Other Matters

i. Studies have been made of creel fishing showing that fragments of Nephrops in a creel will reduce the catch of Nephrops and fragments of crab will reduce the catch of crab.

ii. The Scottish fishery uses polyethelene almost exclusively for ground trawls and seine nets, and polyamide for midwater trawls.

iii. ISO standards on fishing net terminology are used in scientific work and publications. They have not been generally adopted by net manufacturers or fishermen.

iv. One member of staff spent 6 weeks in Thailand on an FAO acoustic stock survey. Scientists from Indonesia, Chile and Tanzania spent time in the Marine Laboratory studying gear research.

U.S.A.

(A.J. Kemmerer and J.B. Suomala)

Fish capture activities in the United States during 1979 emphasized conservation engineering and development of new or improved sampling systems. Highlights follow:

Sea Turtle Conservation Shrimp Trawl - The incidental capture of sea turtles in shrimp trawls is a problem of major concern throughout coastal regions of the southeastern United States. In response to this concern a three-year research project was initiated in 1977 to evaluate the incorporation of a large mesh panel across the mouths of shrimp trawls to prevent turtles from entering the nets. A prototype net has been developed and will be tested during the summer of 1980 from cooperating commercial shrimp trawlers and charter vessels. These tests normally will consist of paired tows of nets with and without excluder panels. Design goals are for a net which reduces turtle capture 75% while maintaining a shrimp production efficiency of at least 90%. Preliminary trials with the prototype gear in 1979 indicate that these goals should be achievable if the nets are tended properly.

Tuna Purse Seines - A computer simulation model of a tuna purse seine is being developed as a means to evaluate proposed gear changes to reduce the incidental catch of pelagic porpoises in the Eastern Tropical Pacific tuna fishery. Essentially, the model describes the behavior of a single panel of webbing, although ultimately the model may be expanded to include the entire seine. Currently, the model is being evaluated and tested through gear trials.

Shellfish Dredge - An improved shellfish dredge is being developed and tested for use off the northeastern coast of the United States. The 5.2 meter long, 3175 kilogram dredge has a 1.52 meter cutting knife and uses 22.7 cubic meters of water per minute supplied to a net manifold.

Power is supplied from one of the ship's 150 KW generators to an electrically driven submersible pump as 100 amps of 440 VAC 3-phase current. The dredge has been used successfully during clam surveys along the northeast coast of the United States in water depths to 50 fathoms. Advantages of the system compared to conventional surface supplied hydraulic dredges are ease of handling, consistency of operation, and efficiency in power transmission.

Remote Underwater Fisheries Assessment System - A Remote Underwater Fisheries Assessment System (RUFAS-II) was developed several years ago, but was never used due principally to telemetry problems. The system is designed for towed operation from research vessels to depths of 400 fathoms and is equipped with lights, television, and photographic cameras. Height above the bottom is controlled either manually by an operator aboard the research vessel monitoring returns from an echo sounder on the submersible or automatically through preselected heights entered into an on-board control system. The system was upgraded this past year and underwent two sea trials. The first trial ended prematurely due to an intermittent telemetry problem, while the second satisfied most sea trial objectives.

Juvenile Sea Turtle Tracking - The radio tracking tags reported on last year for juvenile sea turtles were successfully demonstrated during a release of several thousand headstarted Kemp Ridley turtles. Small radio tags (25.3 gms) were attached to a number of the turtles by a short lanyard (approximately the length of the carapace) and then the turtles were tracked with an airplane for 30 days. No significant problems were encountered.

Satellite Tracking of Marine Animals - A Nimbus-6 linked satellite transmitter weighing approximately 2.7 Kgms (including batteries, etc.) was attached to an adult sea turtle in October 1979 for a one-year test. The transmitter operates every 4 days for 8 hours, from which locations accurate to about 4 kilometers can be computed. The system has performed exceptionally well since attachment based on verifications obtained with receivers aboard aircraft and visual sightings. Overall, the turtle has traveled about 1200 kilometers; approximately 6 months of battery life still remains in the transmitter system as of this writing.

A second transmitter system weighing approximately 900 gms was developed for tracking pelagic porpoises. Two tests were conducted in 1979 with prototype transmitters attached to wild animals. The first test was completely unsuccessful due to a failure of its sea-water switch, and the second was only partially successful as only a few uplinks were received by the Nimbus-6 satellite. Additional tests are planned for 1980.

Hydroacoustic Experiment - A joint United States - Norway experiment is being planned for June-July 1980 in the vicinity of Bergen, Norway. The objective of the experiment is to investigate variations in fish

target strength as a function of fish behavior, aggregation, species, size, and aspect angle.

Knowledge of fish target strengths and behavior is essential to fish density estimation, whether accomplished by one of the standard methods of echo counting or integration. Each of these methods requires specification of the acoustically sampled volume. The echo integration method additionally requires knowledge of the mean backscattering strength. These interpretive quantities can be calculated from the system parameters, including threshold level, and acoustical and behavioral characteristics of observed fish.

Fish target strengths have been an object of systematic study for at least twenty years. Generally, these have been obtained in experiments with anesthetized, stunned or killed specimens. The resultant measurements have been used to calculate the acoustically sampled volume and mean backscattering to cross-section. These have been used, in turn, to interpret echo count and integrator measurements of fish density. Thus essentially lifeless fish have been assumed to be representative of living, free-swimming fish in the wild -- with respect to their acoustic properties. In particular, the averaged backscattering cross-sections have been assumed to be identical.

The experimental design is simple in outline. An encaged aggregation of otherwise free-swimming fish will be ensonified and photographed concurrently, if not simultaneously. At the completion of the encaged fish measurements representative specimens will be withdrawn, anesthetized and measured with conventional apparatus to obtain their target strength functions. The expected echo energy or mean backscattering cross-section of the encaged fish will then be computed on the basis of the photographic observation of fish orientation distribution and measurements of single fish target strength functions. Comparison with the corresponding observations should confirm or deny the equivalence of mean backscattering strengths of living and anesthetized fish.

U.S.S.R.

(P. A. Moiseev)

To improve fishing gears and fisheries schemes the following work was carried out in 1979 :

To study fish resources in the coastal zone of Murman the bottom-set long-lines were tested on board a vessel of the RS-300 type from July to December.

Bottom trawl selectivity in relation to Barents and Baltic cod, haddock and redfish was studied.

Pair schemes for fishing pelagic fish were tested on board a vessel of the SRT type (medium trawler).

Underwater observations on fishing with a midwater trawl were carried out.

Survival rate of young flounder from trawl catches released into the sea was determined.

The programme for fishing computer analysis continued to be improved. Fishing capacity of various fishing complexes was ascertained on the background of fished volume method (FVM)

All fishing gears used by the fishing vessels in the Atlantic Ocean were made of polyamid capron fibre.