



THÜNEN

FISH CAPTURE COMMITTEE

Digitalization sponsored
by Thünen-Institut

by

G. Thorsteinsson

1983

BELGIUM

(R. Fonteyne)

Work was continued on the study of technical parameters of trawling gear. The forces acting upon warps and bridles of a bottom trawl were measured in relation to speed. The effect of different riggings on the net opening of semi-pelagic trawls for cod and pelagic pair trawls for herring were studied by means of a netsonde.

A new semi-pelagic trawl fishing with the warps passing through the boom sheaves was tested. At the same time newly designed cambered and slotted otter boards were used.

In view of energy saving, trials with gill nets fishing for cod on wrecks were continued. The comparative fuel consumption study between rectangular and oval polyvalent otter boards was finished. Data were collected on the reduction of fuel consumption by the application of a nozzle on a 1000 hp beam trawler.

With the aim to increase the catch rate in the daytime shrimp fishery, experiments were carried out with an electrified otter trawl.

The studies on netting materials mainly concerned the effect of sediments on mesh dimensions and the change of mesh size in relation to the drying time of the netting.

In Belgium the use of polyethylene netting yarns has slightly increased detrimental to polyamide. For the moment 45% of the yarns are made of polyethylene, 55% are made of polyamide. ISO standards are still applied by the Fisheries Research Station only.

Future work

- Further study of the catchability in relation to the technical parameters of high opening beam trawls, semi-pelagic and pelagic nets.
- testing of semi-pelagic trawls with a low hydrodynamic resistance.
- Study of the geometric configuration of otter trawls by means of a new developed spread meter.
- Further studies on the stability of mesh size.
- Comparative study on different mesh gauges.
- Further experiments on the application of electrical fishing.
- Continuation of the fuel saving studies.

DENMARK

No report received

CANADA

(P.J.G. Carrothers)

Federal Fisheries Research has commissioned two, new, research stern trawlers for the Atlantic and has retired the old research side trawler A.T. Cameron. The Newfoundland Branch reports that they continue to search for a trawl design that will adequately sample all flatfish species of age one to four. The Yankee 36 shrimp trawl appears to be a highly selective for pre-recruit yellowtail and plaice and is too small to operate effectively with large stern trawlers. Work with a Yankee 41-5 shrimp trawl was hampered by vessel problems but will continue in 1984. Hydroacoustics has been used successfully to evaluate and monitor capelin abundance and attempts are being made to develop acoustic survey techniques for redfish. The hardware and software supporting

HYDAS (Hydroacoustic Data Acquisition System) have been improved, but the deep towed body and target strength data remain problem areas. It is too soon to judge whether the method will prove reliable. Correlations between shrimp catches and tidal cycles have been observed, suggesting that behaviour of the shrimp and/or the trawl is affected by water movements, altering catching efficiency in a way likely also true for groundfish. A modest program better to define this question was hampered by vessel problems in 1983 and is planned for 1984.

The Marine Ecology Laboratory (Halifax) reports continued acoustic surveys with the ECOLOG system. Comparisons have been made between trawl catches and acoustic observations regarding both catch in numbers and size composition. Research for pelagic acoustic surveys has concentrated on herring, investigating the size, geographic distribution and echo characteristics of schools and their implications on the use of the conventional integration model. The Scotia-Fundy Branch (St. Andrews) reports continuing improvement of methods for acoustic fish-stock survey and herring abundance estimates by developing electronic data processing procedures to integrate and summarize abundance and distribution, by measuring in situ tilt angle distributions for target strength estimation, by developing a more accurate procedure for calibrating the TVG function in echo-sounder receivers and by conducting winter and summer surveys. The Gulf Branch (Moncton) reports that a microprocessor-operated, closure trawl is being developed, actuated by pressure sensors and recording temperature profiles. Aerial surveys continue to be used to map fishing effort for lobster (*Homarus americanus*), with refinement of the computer-aided data processing and extending coverage to the whole Gulf (of St. Lawrence) Region. A promising method for stock surveys of snow crab and scallop is being developed, mounting underwater television facing backward on the rake and counting the animals as they are dug out of the sediment and roll over the rake. Statistical

analysis of preliminary data indicates that this technique may provide fast and precise abundance estimates. The Quebec Branch reports that comparative fishing between two sizes of rectangular crab trap and the Japanese-type conical trap in Chaleurs Bay caught 3 times as much in the 1.5 m rectangular traps and 3.5 times as much in the 1.8 m rectangular traps as in the conical trap. The conical traps were more selective for snow crabs with carapace wider than 100 mm whereas the 1.5 m rectangular trap was more selective for snow crab narrower than 100 mm (selectivity of the 1.8 m rectangular trap was not conclusive). Three types of trawl (Yankee 36, Terra-Nova 1500 and Atlantic Western IIA) were tried for biomass estimates of shrimp (*Pandalus borealis*). The Terra-Nova trawl was difficult to handle, prone to damage and performed poorly overall. A joint program is planned for 1984 to observe the reaction of shrimp to fishing operations by an underwater camera attached to multilayered sampling gear. The Pacific Branch (Nanaimo) reports development of computer software to plot, to echo-count, to echo-integrate and to perform in situ target strength analysis on digital acoustic data. Two field comparisons of fish density estimates, one acoustic vs. purse-seine catch and the other between two acoustic measurements, were made, including development of mathematical models to assess their relative biases and variances.

Federal Fisheries Development in Newfoundland report several demonstration trials on new longlining systems to encourage use of this low-energy fishing method. The Sari system failed to bait acceptably; it is being modified and will be tried again. The Mustad mini-line monofilament system gave problems with breakage of kinked lines and unreliable snood removal during retrieval, reducing fishing effort to 4000 hooks per day. Gangbaiter trials were hampered by unfavourable local conditions and were out-fished by handline and jigger vessels, but the method is regarded as generally sound, particularly for small boats, and trials will continue in 1984. A commercial,

middle-distance, longlining demonstration is proving encouraging. The continuous, "triangle", longline system functioned well, but was outfished by handlining, apparently because the fish were not feeding at the time. Shrimp bait was found to be ineffective except to catch very small fish. Cod-trap mesh-selection trials have continued, with 102 mm mesh releasing more undersize fish and gilling more commercial-size than under-size fish. Energy-efficiency projects have included a mobile, computerized demonstration unit to show fishermen how to improve fuel efficiency. The software model uses a data base derived from local vessels and its credibility was demonstrated by making indicated modifications to three vessels with fuel savings of 5% to 30%. Further improvements and tests of the system are planned. Four inshore vessels have been instrumented to determine the impact of throttle usage and fuel warmers on energy consumption and a report is forthcoming. Two inshore longliners, one aluminum and one wood, are under construction, specifically designed for low operating cost and improved catch quality, and will be trialed in 1984. Several demonstrations have been aimed at improved fish quality and more efficient fish-handling on board. Contoured containers have proven successful for trap-boats and improved container designs and manufacturing methods are being developed. Fish-box systems for gillnetters and longliners were satisfactory on deck, but require further development for use in the hold. Insulated containers were used successfully on a 17 m gill-netter and on open handline, longline and jigger vessels. A seawater, spray/fog cooling system for holding crab on board will be tried after correction of mechanical problems. For offshore vessels, both a collapsible container system and a method for removing fish mechanically from the bottom of the pens first will be given further trials. Federal Fisheries Development in Halifax also report work on various longline systems. The Pacific-type, snap-on, halibut longlining equipment was demonstrated with great success in Nova Scotia. Fishing trials with square-mesh codends continue

with confirmed reduction of immature fish and debris in the catch. The original, fully-powered, rope reels were scaled down and demonstrated successfully on a 20 m Scottish-seiner. Improved, herring gillnet haulers and shakers were shown to reduce fish damage. Underwater television continues to be used in an effort to improve scallop rakes for better catches and reduced damage to the animals. A new design of crab trap has been given preliminary studies. The monitoring of energy consumption of inshore and offshore vessels continues. A study on the effect of fuel heaters has been conducted. The initial phase of a study on the feasibility of sail-assisted fishing vessels has been completed and a study is under way to determine the feasibility of manufacturing a low-cost, easily-installed propeller nozzle for retrofitting to small fishing vessels. Federal Fisheries Development in Vancouver report instrumented measurements of bottom-trawl gear simultaneously with observations from the towed, underwater vehicle "Manta", including fish reactions at the trawl mouth and at the codend, both to standard-mesh and square-mesh codends. A computer model for fuel consumption of fishing vessels is being developed, including a program for estimating trawl resistance which involves observations and resistance measurements of model trawls in the local, ship-model, tow tank. Work is commencing on the development of a relatively inexpensive device for measuring the working depths of purse-seines. Video-tapes, both surface and underwater, have been made of attempts by salmon to escape selectively from the bunt of a purse-seine through larger-mesh panels, coloured for attraction. White panels appeared to be most effective and will be tested in the commercial fishery for escapement of juvenile salmon. The selectivity of three mesh sizes of Fraser River, sockeye salmon gillnets was studied for the escapement of chinook salmon.

The Provincial government in Newfoundland reports trials with 2 mm, braided, Kevlar netting in place of 3 mm, polyethylene in a balloon trawl. Preliminary measurements indicate the net is fishing properly and further measure-

ments of drag and fuel consumption will be taken during commercial fishing trials in 1984. Also, Kevlar bottom bridles were substituted for wire rope and performed very satisfactorily; longer-term evaluation will be continued in 1984. They also report participation in the cod-trap mesh-selection experiment where 102 mm mesh improved the proportion of marketable fish. The size of the catch was not significantly less than in nearby, smaller-mesh traps and more of the gilled fish were of marketable size. Refrigerating the hold to nearly 0°C and maintaining high humidity was shown to decrease snow crab mortality. Rough handling was shown to cause a delayed mortality and reduced quality, proportional to the roughness of the handling. The New Brunswick Provincial government report successful demonstration of: a 300-mesh, rock-hopper, bottom trawl for rough terrain; a buoyant rope in place of traditional floats on herring gillnets; and the powered rope reels in place of the hauler and coiler in Scottish-seining to reduce time and labour. The Quebec Provincial government reports trials of: a new type of semi-pelagic, shrimp trawl; different types of bait for lobster pots; artificial lures and a different type of bait for monofilament longlines; and of monofilament and standard longlines, including a comparison of results. They have concluded their project on escape vents for lobster pots.

The Technical University of Nova Scotia (Halifax) reports completion of their thesis project on testing of model trawl-doors in a wind tunnel in search of an efficient but forgiving configuration. Their results with rectangular doors were consistent with the literature, and both circular and Hoerner tips (ends) were found to increase the stall angle of aerofoil-shaped doors at different aspect ratios. Most measurements were on solid doors, with a few on slotted doors.

FINLAND
(M. Törmä)

At the Wärtsilä Turku Shipyards the major activities in the fishing section in 1983 have been the development of a krill factory trawler and a crab-processing mother ship. The main tasks in designing have been the layout and general arrangement. The greatest problems have been posed by the process design.

FRANCE

(M.N. Diner et M. Portier)

TECHNOLOGIE INSTRUMENTALE

Dans le cadre du thème "Technologie instrumentale", la France a plus spécialement porté ses efforts en 1983 sur l'échointégration, l'acoustique passive et la visualisation sous-marine.

. Echointégration.

Dans le cadre d'un programme national "Petits Pélagiques", une première campagne a été effectuée par l'ISTPM sur le n/o "Thalassa" en avril-mai dans la partie sud du golfe de Gascogne. Cette campagne avait pour objectif d'évaluer acoustiquement le stock d'anchois exploités par les pêcheurs basques français, mais également de préciser certains points concernant la méthodologie de l'évaluation des stocks par échointégration. C'est pour cela en particulier que la même zone a été couverte deux fois pour comparaison à huit jours d'intervalle. Si sur les sondes supérieures à 60 m, les résultats sont comparables, par contre, pour la zone côtière, les deux évaluations sont très différentes.

En ce qui concerne l'identification, une technique originale a été utilisée permettant d'accéder aux stocks par espèces et par strate en utilisant les résultats des chalutages d'identification. Parallèlement, une étude a été entreprise pour mieux cerner les possibilités d'identification, totale ou partielle, des espèces détectées, directement à partir des échogrammes. Cette dernière étude se fait dans le cadre de la mise au point, en collaboration avec le CNEXO et l'ORSTOM, d'un classificateur d'écho, prolongement de l'échointégrateur AGENOR déjà conçu par ces organismes.

Pour des raisons d'ordre technique liées au navire, la campagne d'évaluation acoustique du stock de hareng en sud Mer du Nord-Manche est, programmée en novembre, n'a pu se faire. Elle est prévue pour 1984.

. Acoustique passive.

Créée en 1982, le GERBAM, groupement d'intérêt scientifique regroupant notamment le CNRS, le CNEXO et les Universités, s'est fixé pour domaine de travail, l'acoustique passive appliquée à la pêche. C'est dans ce cadre que, en 1983, il a réalisé en particulier une étude sur les caractéristiques spectrales des bruits émis par les thoniers ligneurs français pêchant le germon (*Thunnus alalunga*). Cette étude essaie de faire le parallèle entre les qualités pêchantes des navires et le type de spectre de bruit émis.

Ce groupement travaille encore notamment sur les possibilités d'attraction acoustique des thonidés dans les eaux tropicales africaines en particulier à partir de radeaux instrumentés.

. Visualisation sous-marine.

Pour la photographie sous-marine, les dispositifs mis au point à l'ISTPM et équipés par du matériel d'amateur ont été mis en oeuvre. En ce qui concerne la visualisation du fond, ce matériel utilisé à partir d'une luge trainée sur le fond ou d'un "planeur" est maintenant employé en routine.

Des prises de vue ont ainsi été réalisées en avril-mai autour de la Corse sur des herbiers à posidonies, des fonds recouverts d'algues (*vidalia*) ou sablo-vaseux jusqu'à 300 m de profondeur.

En juillet dans le golfe de Gascogne, des photos de fond (rocheux ou vaseux à langoustine) ont également été réalisées. Au cours de cette campagne, les premiers essais d'une caméra d'un nouveau type, perturbant le milieu au minimum ont été effectués. Ce genre de matériel est destiné à l'identification des organismes pélagiques. Etant donné les conditions de

détection peu favorables (poissons regroupés en bancs de très petites dimensions), uniquement des prises de vue d'organismes planctoniques ont été réussies. L'expérimentation de ce type de matériel sera poursuivie.

Au CNEXO-COB, des caméra-TV à très bas niveau d'éclairément ont été utilisées pour observer in-situ le processus d'attraction de mollusques gastéropodes par des casiers ou encore le comportement de langoustines soumises à un champ électrique impulsionnel.

EVOLUTION DES PECHERIES ET DES TECHNIQUES

Les flottilles hauturières spécialisées dans le chalutage de fond ont tenté de diversifier leurs activités en s'orientant vers l'utilisation de chaluts de fond à très grande ouverture verticale, utilisés avec des panneaux SÜBERKRÜB. Pour faciliter le changement du chalutage strictement benthique au chalutage de type semi-pélagique, les navires ont été pourvus d'un tambour enrouleur. Les chaluts utilisés pour ce nouveau type de pêche possèdent des cordes à l'entête.

Les chalutiers de pêche artisanale (16/24 m) sont également munis de plusieurs tambours enrouleurs - parfois jusqu'à 6-et peuvent pratiquer alternativement la pêche de fond et la pêche pélagique en utilisant des gréments spécialement adaptés. Ces navires sont pratiquement tous munis de tuyères et les plus grands d'entre eux sont conçus avec un bulbe d'étrave.

Ils utilisent, pour la pêche semi-pélagique et la pêche pélagique, des grandes mailles de 400 et 800 mm de côté. Pour la pêche pélagique à 1 ou 2 bateaux, les très grandes mailles (8 m de côté) sont également répandues.

On notera également la mise en service à Dunkerque, port du Nord de la France, de deux chalutiers polyvalents, c'est-à-dire pêchant alternativement au chalut à perche et au chalut à panneaux.

L'augmentation des forces motrices et de la résistance des treuils des chalutiers semi-hauturiers a conduit le Secrétariat d'Etat à la Mer à instituer un Groupe de Travail chargé d'examiner les problèmes posés par la sécurité des appareils de pêche.

En ce qui concerne les pêcheries de thon à la senne tournante, on notera une caractéristique commune aux thoniers travaillant en Méditerranée (navires de 25 m) et aux thoniers océaniques travaillant sur la côte Ouest de l'Afrique et qui ont reporté leur effort sur l'Océan Indien. Cette caractéristique est l'extension des zones de pêche suite à l'utilisation de la prospection aérienne. Les sennes n'ont pas subi de modifications importantes.

Parmi la petite pêche côtière, la pêche aux filets maillants se développe. Les filets sont en nylon câblé ou en multimonofilament. Il faut signaler les essais de trémail à langouste réalisés par l'I.S.T.P.M. Sète sur le plateau continental à l'Est d'Alger où des rendements maximums de 20 kg/100 m de filet ont été obtenus. Par contre, la mise au point de différents systèmes de palangres automatisées rencontre certaines difficultés.

RECHERCHE - ASSISTANCE TECHNIQUE - COOPERATION

- Une campagne d'étude de la sélectivité des chaluts de fond à très grande ouverture verticale a eu lieu dans le Golfe du Lion à bord de l'"Ichthys". Un projet d'étude comparative des maillages à bord de navires professionnels affrétés, sur financement CEE, a été mis sur pied et sera réalisé en 1984.
- Dans le cadre de la réalisation à Boulogne-sur-Mer d'un Centre de Culture Scientifique et Technique de la Mer, un nouveau bassin d'essais à circulation d'eau pour l'expérimentation des maquettes de chalut, a été mis à l'étude. Sa mise en service est envisagée pour 1988.
- Les laboratoires de l'I.S.T.P.M. qui possèdent une section de technologie de la pêche (Boulogne-sur-Mer, Lorient et Sète) ont poursuivi leurs activités de bureau d'étude, principalement dans le domaine de l'adaptation des engins à la force motrice des navires.
- La coopération avec l'Algérie a été poursuivie et des stagiaires venant de différents pays (Maroc, Sénégal, Indonésie, Madagascar) ont été accueillis dans les laboratoires.

GERMAN DEMOCRATIC REPUBLIC

No report received

FEDERAL REPUBLIC OF GERMANY

(H. Bohl)

As in the preceeding three years, a great part of the research and development work was directed towards the introduction and promotion of low energy fishing methods.

The experiments with set nets of different materials and constructions were continued and intensified. In the Baltic, up to now an almost uniform type of trammel net has been used by German set net fishermen for catching cod and flatfish. Now it could be shown that seasonally gill nets are clearly more efficient. In late summer, when jelly-fish occur in large quantities, trammel nets are unsuitable, whereas gill nets are scarcely hampered in taking roundfish. Large-meshed and ca. 3.5 m high gill nets were used with great success during the winterly spawning season of cod. Also in this case, multi-monofilament netting yarns proved superior to traditional ones as far as efficiency and handling of the nets are concerned. When the Baltic is heavily "polluted" with jelly-fish and/or weed, the fishing time of set nets should be reduced to those few hours during which fish is active. This activity can be stimulated by beating the water surface by means of a specially designed club. First steps were made to mechanize this sound-producing device.

In the German Bight, the successful sole fishery of German set netters performed for the first time in 1982, could be repeated in 1983. A decrease in mesh size from 53 mm to 45 mm (length of mesh side) resulted in immediate gains of nearly 100% by weight and at least 50% by value. It has to be emphasized that, in contrast to beam trawl catches taken simultaneously in the same area, no undersized soles (< 24 cm) and very few specimens of just marketable size were caught by these relatively small-meshed nets. Due to the strong tidal

currents, trammel nets (with multimono lints) proved to be most suitable in the German Bight.

In the shallows of the East Frisian coast Grey mullets could be caught in commercially interesting quantities by special gill nets. These fishes do occur regularly in German coastal waters during summer since the early seventies.

The semi-mechanized "monoline" longline system was further developed. In the Baltic, first fishing tests using live bait (sand-eel) led to cod catches about 60% greater than those of a conventional line. A hydrolic-driven line drum was successfully tested.

Progress was also made in reintroducing Danish seining into the German fisheries. In 1983, four cruises of FRV "Solea" were mainly devoted to the exploration of suitable fishing grounds in the central and southern North Sea. From July to October, a semi-commercial seining took place aboard a chartered cutter. The results were rather promising.

In summer 1983, experiments with two different types of jigging machines were carried out in the North Sea as well as in the Baltic. Up to now, good results could only be obtained from tests in the German Bight, where dense concentrations of large-sized cod are at least temporarily attracted by wrecks.

With regard to electrified beam trawling for sole and plaice, activities were continued. A prototype pulse-generator which stood a first test aboard FRV "Solea", but failed on a commercial vessel in 1982, was amended in such a way that its successful application in commercial fisheries can be expected in the near future.

Activities in trawl research concentrated on the development of a mathematical model of the water flow inside and around the towed gear. Theoretical deliberations were supported by measurements carried out in a flume tank.

To determine the influence of various fishing methods on the fuel consumption of the vessel, a fuel

meter was installed on a commercial cutter equipped for both trawling and set netting.

Results of sailing experiments conducted in 1981/82 with a former 80' German standard trawler were evaluated and presented at the International Conference on Sail-Assisted Commercial Fishing Vessels held at Tarpon Springs, Florida, in May 1983.

To study the behaviour of fishing gear and fish at sea as well as in lakes and rivers, a low light-level underwater TV camera was purchased. First observations on the influence of tidal currents on gill nets were made near Heligoland.

A wreckfinder. (Proton Magnetometer) which may be very useful in connection with gill netting around wrecks, was tested with positive results.

It is known that the fish behaviour can be influenced by pressure impulses of high energy. In order to assess the practical applicability in fisheries, an impulse-hydraulic system has been constructed which transforms a constant oilstream of 200 bar into pressure impulses of variable amplitudes, frequencies and envelopes. First test-runs of the system proved satisfactory.

For the purpose of concentrating commercially valuable fishes, the submersion of artificial reefs is intended in German coastal waters. Three types of different sizes made of steel gridshells were developed. The single modules can be combined to reefs of any size desired. Each reef is constructed in such a way that it can be easily removed at any time.

Bottom trawl selection experiments on cod were carried out in December 1983 off the North and East Frisian coast.

As in previous years, all midwater trawls and set nets as well as about 95% of the bottom trawls used in German fisheries are made of polyamide. - ISO standards are still strictly observed by scientific institutions only.

A photographic method for determining the thickness

of netting yarns was developed and published in the Study Group's Report on Twine Thickness Measurement (C.M. 1983/B:26).

Because stock assessments for a certain species by means of echointegration are not reliable when other species occur in the same area, basic studies in this respect were carried out in Antarctic waters where the biomass in the midwater consists almost entirely of Krill. Aboard the new Polar Research Vessel "Polarstern" an echo survey was conducted in the Bransfield Strait.

As already in 1982, a project to improve the artisanal fisheries of Sierra Leone was supported especially in the field of boat construction.

ICELAND

(G. Thorsteinsson)

In 1983 the first trials with an underwater television camera were conducted. The first trials were restricted to Pandalus trawl designs and gave useful hints regarding the rigging of the different trawl types. The television system and the towed rotor controlled vehicle were working satisfactory.

In the winter fishing season some new types of cod gillnets produced by an Icelandic factory were tested in commercial fishing. The results were interesting but not easy to interpret. They will be continued in 1984 and it is intended to observe different net types and fish behaviour with the underwater television camera.

A short experiment was carried out with a selective Nephrops trawl, divided longitudinally. As more than 1/4 of the Nephrops was caught in the upper part of the trawl this trial was discontinued.

In 1983 some work was done on standardization of the bottom trawl used by the research vessels.

Some testing on netting and netting yarn were carried out in 1983.

The ISO-standards on netting technology are to some extent used by Icelandic netmakers.

The cooperation on fuel consumption of fishing vessels within Nordforsk was continued. The main result is that a considerable overall fuel reduction can be obtained. Consequently many vessel owners have already taken measures to reduce the fuel consumption of their boats. Among the projects dealt with the following are the most important:

Efficiency of propulsion machinery, effect of hull-fouling, use of waste heat, use of power from ashore when in harbour and the usefulness of fuel consumption recorders already used by one third of the Icelandic fishing fleet.

IRELAND

(J.P. Hillis)

A Nephrops experimental cruise was undertaken in August using an experimental Nephrops trawl with two cod ends, upper and lower slightly modified from those used in 1982, to study separation of Whiting from Nephrops in the catch. In some hauls, access to the lower cod end was discouraged by parallel longitudinal cords running from the line of division to points on the lower half of the belly about 2 m forward. Whiting of age group 1 or older and Nephrops were found to separate well in most cases with Whiting in the upper cod end and Nephrops in the lower, but better in 1 hour than in 3 hour hauls. 0 group whiting occurred in quantity in both cod ends. Use of the longitudinal cords tended to increase the proportion of both species in the upper cod end as well as a size differential, the upper cod end having on average larger individuals of both species.

NETHERLANDS

(B. van Marlen)

The development of an electrified beamtrawl was continued. The last experiments in 1982 resulted in a great progress as the catches of the electrified beamtrawl increased by some 50% compared with the year before. In 1983 a new pulsgenerator was designed by technicians of the Technical Research Department, which can supply the demand of higher electric fields for fishing in the daytime. The experiments in 1984 will be used to collect sufficient data to be able to make a definite conclusion whether electric

beamtrawling is a good alternative to mechanical trawling. It will also be tried to solve the problem of electrode-corrosion.

Research on square mesh cod-end, similar to those investigated at the Marine Laboratory in Aberdeen-Scotland (Report ICES by J.H.B. Robertson, 1982) indicated form stability problems when applying existing knotted netting, due to the different loads on the bars. The use of knotless material seems to be of advantage from this point of view. Further research is needed.

Comparative fishing trials on a pelagic net with very large diamond shaped meshes (2700 meshes circumference) showed a distinct herding effect by such a construction. Catches, compared with surrounding vessels of the commercial fleet, were quite promising. The gear has been tried out on a commercial vessel, the "Alida" SCH 6 for several weeks on mackerel and herring. The results were most promising and a stimulus for the development of larger pelagic trawls based on the same concept.

As is usually the case, a 1/25 scale model was tested of a new design of 3600 meshes circumference midwater trawl, prior to full scale tests. The expectations from these tests are that the full scale net will have considerably less drag than comparable commercial nets in use. The aim is for 20-30% difference. The research programme for 1984 will include geometry and drag measurements and comparative fishing trials with this new gear.

An extended research programme on bottom trawl geometry and resistance has been carried out to complete the tests of 1982. The nets tested will cover a wide range of trawls used in the Dutch fleet: loggernets, bobbin trawls and pair trawls. Data will be analysed throughout 1984 and reported with the 1982-trials.

Pair seining experiments were continued in 1983 on the UK 50 and UK 52 during six weeks. Details of the rigging and the hauling procedure were varied throughout the period. Finally the rigging used in previous years seemed to be the best.

The fuel oil consumption turned out to be 4000 liters per week on average, a substantial decrease compared to the amount of 12000 liters commonly used by such vessels when fishing with beam trawls. Species fished for were mostly plaice and some roundfish. Pair seining seems to be a suitable alternative when other kinds of fishing operations give poor returns.

Most beam trawlers in the Dutch fleet are heavily over-powered ships, cruising at speeds higher than their economical speed. In order to decrease the energy costs of this fishing method the wave making resistance of the trawlers may be reduced by a greater length. Preliminary calculations indicate room for improvement of the ship hulls. The cost of adding a midship section of some meters are comparable to the savings in energy costs over a life-time period of the vessel. Further study has to be done to come to more definite recommendations.

The fuel-oil consumption of auxiliary machinery will possibly be decreased by driving generators from the gear box or the propeller shaft directly instead of having self-driven generators. Detailed research will be done in the future.

A report suggests that fishing operations are more accident prone than most land-based operations. Especially the weather conditions, resulting in motions of the vessels, the use of ropes and cables, the heavy loads on the materials in use and fatigue play an important role. Safety is related to working conditions in general. Improvement of these conditions may be regarded as a first step to improve safety. Research in this field has been case-orientated in 1983.

A study has been done on the use of refrigerated seawater for storage and transportation of plaice. Catch handling procedures can be enlightened with this application resulting in less strenuous work for crew members. Unloading of fish boxes with large wooden shelves turned out to be hazardous. A new method with a boom and a remote controlled winch has been developed and tried out

on a commercial vessel (KW 221). Results are promising and will be reported in detail in the next year. The problem of the safety of fishing operations, including gear handling procedure, cutting and storing of fish, unloading in the fish docks, will be studied in a more comprehensive way.

Three ships were added to the project concerning the use of heavier fuels, the UK 95, UK 253 and the GO 26. The results of 9000 hours of operation of the vessel KW 137 using a blend with 20% heavy fuel were very promising. Maintenance costs did not increase compared with the original fuel used, while the total fuel costs decreased by some 7%. A fall-back in the overall quality of the fuel oil did not occur, as may be expected in the near future when new CIMAC-specifications will come in use. It is essential to apply the right lubricant. A number of parameters such as temperature, pressure, viscosity, will be monitored and reported on questionnaires.

On the whole a total gross-saving of 17% in fuel costs has been obtained over 1983. Heavy fuels are now in use on some twenty vessels.

Programme of the Technical Research Department IJmuiden

During a number of subsequent periods the newly developed pulse-generator for electrified beam trawling will be tested on board of the new research vessel "Isis" of the institute, after which a period of 10 weeks is planned on a commercial boat, the UK 141. Hopefully it will be able to produce a set-up, that can operate throughout a long period of commercial fishing. There are technical snags however, that need to be solved in order to achieve this goal, such as the fast corrosion of the electrodes.

The use of heavy and blended fuels on commercial fishing vessels has been introduced successfully and will be extended throughout 1984. Engine pressures and temperatures will be monitored for a number of vessels through weekly gathered information noted by the skippers on a questionnaire.

A start will be made to measure the flow of energy used for different operations such as shooting, hauling, fishing or processing on board of commercial boats with the aim to determine possible ways of energy saving.

Projects on the safety of fishing operations including working conditions on board and landing catches in port run for several years now. Some case studies such as the design of a safer method for unloading vessels than using heavy wooden shelves and the winchhead will be carried out and tested in practice on a commercial boat.

Storage of plaice in refrigerated seawater will enable to delete a few physically unfavourable steps in the processing chain of fish on board. A preliminary report has been made the previous year and possibly some further research will be done on this topic.

Tests on a commercial vessel with a 2700 meshes trawl with very large (18.0 m) meshes in the front part were successful to such an extent that it was decided to continue this development with tests of bigger nets based on similar design. Model research on a 5000 meshes trawl will be done in May 1984 at the Hirtshals Tank (Denmark), while a full scale test programme on a 3600 meshes net will run throughout March, June and November/December this year on "Tridens". A model of possibly a one half scale of the 5000 meshes trawl will also be tested on last mentioned "Tridens"-cruise.

Data-acquisition will be extended and improved by digitising the analogue signals received from the various echo-sounders in use. A data-logger will be installed on "Tridens". Analyses programmes for trawl research will be extended using the PASCAL programming language.

The use of the computer in fishing gear research will be extended. As an example a net plot routine will be developed, written in PASCAL. A data-base for ships, nets and test-values will be the next goal.

It is intended to incorporate direct observation techniques in the future research programmes by using a sort of remotely controlled vehicle, similar to the one in use at the Marine Laboratory of Aberdeen. The aim is to start towards the end of 1984.

NORWAY

(S. Olsen)

Hook and line

Further experiments with new designs have been conducted, to develop more effective hooks that also are adaptable to mechanized longline systems.

To reduce the problem of bait predation, a new type of gangion float is developed. The performance of the floats was studied in a flume tank, and in the field by a remote operated TV-vehicle and their overall effects have been tested in experimental fishing. The floats give significantly lower bait loss, and increased catch rates for ling.

A new type of longline (Quick Snap) were tested with good results - the main benefits being the swivel connected snoods and easier gear handling and repair.

New types of artificial bait have been developed, but not yet tested in fishing trials.

Several new systems for mechanized longlining have been tested, including precise baiting machines and random baiters. Full scale trials with a random baiting system were done during the winter season 1982/83.

Gillnets

A new float line for gillnets was tested at different depth.

Experiments were carried out in the gillnet fishery for blue ling to study the effects of hanging ratio on catch rate and size selectivity.

Initial comparative studies of catch efficiency in longline, gillnet and Danish seine have been carried out.

Experiments were started to evaluate the catch rate effect of baiting gillnets. Further tests were carried

out with the mechanical gillnet handling system, operated for nets with different float lines.

Trawls

A double symmetrical shrimp trawl was designed and tested with regard to efficiency for shrimp and bycatch of undersized fish. Results were encouraging and a modified version was designed, and 1:5 and 1:10 models of this trawl were tested in the Hirtshals flumetank.

Experiments with modified versions of a sorting panel in the aft belly of a shrimp trawl with regard to the loss of shrimp and the escapement of undersized fish were continued and finalized in 1983.

A high opening demersal/semipelagic trawl with 1600 mm meshes in the front belly and 400 mm meshes in the wings was tested in experimental fishing for blue whiting and silver smelt in the Norwegian Trench.

Mesh selection

Experiments to study mesh selection of cod and haddock in Danish seine were carried out in North Norway coastal waters. Subsequently, comparisons were conducted of standard and square mesh codends in Danish seine.

Purse seines

A new improved power block for coastal purse seiners, which greatly reduces the problem of skewness during net hauling has been successfully tested.

Net stacking systems for large purse seiners, with separate netwinch have been installed onboard approximately 50 Norwegian vessels.

The trials with air-filled floats for purse seines have continued. A few capelin nets have been fitted with such floats only, and tested with encouraging results.

The Institute of Fishery Technology Research has continued work on a numerical purse seine simulation model originally developed by NFMS, La Jolla, USA. The model is very general and will presumably also facilitate simulation of other types of gear (i.e. gillnets, longlines etc.).

Vessel technology

The program of energy conservation has been continued at the same level of activity as in 1982.

A series of model tests on a 60' experimental vessel has resulted in a new bulb being added to the vessels. Fuel saving of 25-30% are reported when steaming.

A hydrostatic propulsion system has been installed in a 41 ft. vessel, to investigate the suitability and fuel economy of such systems for propulsive duty.

A number of commercial fishing vessels have been fitted with new gear and propeller-systems and the resulting reductions in fuel consumption when steaming have been found to be in the order 20-30%. A simulator for fuel usage simulation has been developed as a teaching aid for correct utilization of engine and propeller, for use in training fishermen and skippers.

Work is continuing on an onboard information and decision-making system. The storage and retrieval system is now implemented on our computer system, and is being tested for function.

Full scale measurements of vessel resistance in a seaway has revealed that the present knowledge of speed loss and resistance increase is incomplete.

In 1984 considerable effort has been directed towards developing procedures and instrumentation for such measurements.

The activities on safety and working conditions have continued and a program for improving safety and working conditions on the fishing vessels in a locality in Northern Norway is carried out in cooperation with the local health authorities. Various organizational and technological approaches are being tested.

Fish behaviour and reaction

Different chemical stimuli and artificial baits were tested in behaviour studies on cod in laboratory experiments. Similar fieldstudies were conducted in the North Sea (Ekofish), mainly on cod and haddock - using underwater TV equipment.

Fish behaviour in relation to acoustic observations

Continued investigation have been undertaken to study and quantify the reaction of fish surveying vessels. This is to establish relationships between the observed acoustic density of fish compared to the true fish density in the area to be surveyed. Doppler analysis of sonar signals appears to provide information about the escape-swimming speed of fish.

Fish sizing from resonance echo observations has stimulated physiological studies of swimbladder in relation to different behaviour modes of the fish. Strong correlations between depth/ambient pressure, swimbladder volume and the condition of the fish are established and may be used to improve existing sound scattering models of fish also at ordinary applied echo sounding frequencies.

Acoustic methods

Mathematical sound scattering models of fish based on fish and swimbladder physiology and geometry are established. Data from cut surfaces of shock frozen fish are used as part of the input data to the models.

From a project of acoustic observation of zooplankton it was concluded that a multi-frequency sonar system could yield reliable estimates of zooplankton size distribution and biomass.

Comparative studies were carried out on different ways of establishing conversion functions of echo abundance into fish abundance. The results showed varying and some times minor accordance between conversion functions being estimated in different ways for the same species.

Sound absorption of vertically sound transmission through fish layers were investigated for moderate fish densities. No observable absorption was found.

Towed echo sounder transducers are regularly used in acoustic observation of fish abundance. Especially during bad weather conditions they have improved the quality of the observations.

POLAND

No report received

PORTUGAL

No report received

SPAIN

(J. Bravo de Laguna)

Spanish activities have been related to acoustics applied to fisheries research. These activities have been carried out by the Instituto Espanol de Oceanografia.

This acoustic research was done during a cruise of RV. Cornide de Saavedra off the north and northwest coasts off Spain (ICES areas VIIIC and IX) in August 1983. The main objective of the cruise was to assess the biomass of the different year classes of pilchard present in the area and to chart the fish densities of this species.

The cruise was done in cooperation with Portugal. Calibration was carried out with copper balls and the calibration constant was obtained by intercalibration with the RV. Noruega (Portugal).

SWEDEN

(O. Hagström)

Selectivity experiments on shrimp in bottom trawls with cod-end meshopenings of 16, 18, 20 and 24 mm were carried out and will be continued.

The effect of using 40 mm meshopening in pelagic herring trawls has been studied and compared with the most common meshopening of 32 mm.

Comparative fishing trials with different types of Nephrops traps and different kinds of bait are running. The traps are of Scottish and Norwegian origin. A fishing experiment on a commercial scale with 1600 traps has started to evaluate the possibilities for catching Nephrops in the Swedish coastal fisheries.

UNITED KINGDOM

1. ENGLAND

Fisheries Laboratory, Lowestoft

(G.P. Arnold)

The laboratory participated in the ICES Co-ordinated acoustic survey for sprat in the southern North Sea in January 1983. Four more acoustic surveys were carried out during the year, two for spawning herring and one for spent herring in the North Sea and English Channel, and one for pelagic species generally in the western English Channel. From May 1983 all acoustic surveys were conducted at a frequency of 38 kHz and a digital echo integrator was used in parallel with the analogue systems. A precise transducer calibration is carried out annually in a large freshwater reservoir and routine checks of equipment performance made during each cruise.

The following species were caught in sufficient numbers during inshore groundfish surveys in the Irish Sea during 1983 to provide mesh selection data: pout whiting (T. luscus), poor cod (T. minutus), whiting (M. Merlangus), dab (L. limanda), grey gurnard (E. gurnardus) and tub gurnard (L. lucerna).

2. SCOTLAND

(D.N. MacLennan)

Further work has been done on the selectivity of square mesh cod-ends, on both trawls and seine nets. Work on trawls confirmed earlier results showing that square mesh cod-ends had higher selection factors than normal diamond mesh cod-ends. Similar results were obtained on a seine net.

The development of mathematical models of trawls has concentrated on the production of a computer programme to calculate net shapes. Detailed data have been collected on the netting panel shapes and mesh angles of a pelagic trawl to provide a basis for further development of the model. An off-shoot of this project has been the writing of a program for net design.

Further measurements on the performance of gill-nets in a flume tank have been made. Using these data, more exact equations to predict net drag and headline height have been derived. To investigate the predictive accuracy of these formulae, measurements are being made on full scale nets in the sea. Selectivity measurements have been made using nets constructed from different types of twine. The results suggest that monofilament netting is the most selective for cod.

Data are being collected on trawl drag to enable empirical equations to be derived for various designs of two panel nets. This is part of a longterm programme of measurements and the aim is to collect sufficient data on demersal trawls to enable generalised equations to be evaluated.

Further work has been done on gear development using behavioural information collected within the Laboratory. Gears have also been constructed with a very large overhang on the square to restrict fish escape routes, and of black and white netting to give maximum contrast and possibly more efficient herding. No conclusive results have been obtained with these nets.

Studies have continued with a two level trawl for fish separation from Nephrops using a 70 mm mesh separation panel to complement the previous 50 mm and 85 mm experiments. Good preliminary results have been obtained in separating herring from pout using the two level separating technique in a commercial trawl. Studies including underwater observations have been conducted on escapes of Nephrops through the lower net panels including the codend of a commercial trawl and retained in small mesh covers.

Young fish, cod, haddock, whiting and hake have been caught whilst escaping from the codend to investigate the external damages to these fish. Experiments with rising ropes within the trawl for selectivity have been conducted so far on saithe, herring, sprat and sandeels with encouraging results. Reactions of fish to both light and heavy ground ropes, including a rockhopper ground gear,

have been studied taking into account both visual and noise stimuli. Sound recordings have been made of the various components of these gears under normal towing conditions.

Work is continuing on fish swimming and the light level required for fish to react, in relation to the visibility of materials used in gears.

Investigations into line fishing have continued to focus on the chemical constituents of baits. Experiments are being conducted into bait acceptance by cod using natural and synthetic squid components. Stimulus concentrations necessary for bait acceptance are being studied in the laboratory.

Further experiments have been conducted on the target strength of caged mackerel, herring and sprat. Stereo cameras have been used to relate the fish behaviour to the echo strength. Measurements of beam patterns have shown that significant errors can arise if the nominal equivalent beam angle is assumed to apply to acoustic survey transducers. Improved calibration techniques have been developed, notably a remote controlled three wire suspension for standard targets to calibrate transducers in a towed body. Experiments have shown that the presence of the towed body can significantly alter the beam pattern in comparison to that of an isolated transducer. A spherical cap transducer has been constructed as the first step in the development of a wideband constant beamwidth echosounder for fish stock surveys.

U S A

(J.B. Suomala)

The development of the NEFC/CSDL low-cost acoustic sensor/processor is continuing. At-sea operations have included experimental survey cruises, e.g. rv. Oregon I (Blake Plateau), rv. Delaware II (George Bank) and rv. Islas Canarias (Tenerife). The equipment has operated without failure or malfunction for over 1500 hours, including 468 hours at sea. User groups have expressed satisfaction with operation and realtime results produced to date. Modifications to include automatic sea bed tracking and normalized sampling volumes are in process.

USSR

(S.A. Studenetsky)

During 1983 the following experiments were conducted to substantiate measures for reasonable and effective exploitation of commercial fish stocks in the Barents Sea and the Norwegian Sea and to develop the coastal fisheries in the Northern basin:

- Data on selectivity of trawl codends with 120-140 mm meshopening were obtained for the Barents Sea cod and haddock.
- A container enabling studies of fish survival and a device for the automatic detachment of fish during hauling have been elaborated. These devices for estimating fish survival were tested and their serviceability was confirmed.
- Comparative fishing experiments with longline, bottom trawls and bottom set gillnets were undertaken. The high efficiency of longlining when fishing on scattered bottom fish species was confirmed.