

FISH CAPTURE COMMITTEE

by

G. Thorsteinsson

BELGIUM

(G. Vanden Broucke)

As in the past the technical parameters influencing the behaviour of the gear during fishing were studied. On board a middleclass vessel a semi-pelagic ottertrawl ("Cascadeur") was tested. The horizontal and the vertical netopening were measured in relation to the towing speed.

A project was set up and carried out to study the use of oval otter boards in the semi-pelagic fishery on middle-class vessels.

By means of net transducers and spreadmeters it was possible to adopt the rigging of the gear when fishing with semi-pelagic nets.

In the field of energy saving different riggings of the electrodes in electrical fishing during beam trawling were studied.

For the coastal fisheries experiments were carried out for sole and shrimps. Special attention was paid to the electrical field strength configuration.

In connection with a study of the twine area of trawl

nets, different methods for the determination of the twine diameter were studied.

The studies on netting materials concerned the influence of bottom sediments on mesh size and abrasion.

A comparative study between different mesh gauges (the NEAFC-gauge, the ICES-gauge and a newly designed EEC-gauge) was carried out.

In Belgium, 66% of the netting yarns used are made of polyethylene and 33% of polyamide.

#### Future work

- With regard to trawls the catchability in relation to the technical parameters will be studied for one-boat semi-pelagic nets, for the coastal and middle-class fisheries and also for the semi-pelagic and pelagic pair trawling.

- Research will be carried out to study the possibility to introduce pair-trawling on flatfish.

- Fuel saving studies will be continued.

- Trials with electrified otter- and beamtrawls are planned.

- Comparative studies on the use of different mesh gauges will be continued.

CANADA  
(P.J.G. Carrothers)

Five organizations report activities related to acoustic methods for fish-stock inventory. The Federal Research group in Newfoundland reports increasing success with redfish surveys, providing better data than do trawl surveys as a result of clumping and diel movements of the fish, and three capelin surveys were completed as a basis for predicting abundance fluctuations and relative distribution. Also, a 3-year program was initiated to generate fish abundance data via the hydroacoustic data acquisition system (HYDAS), including specifications for a modified, dual-beam transducer for data on *in situ* target strengths. The Marine Ecology Laboratory (MEL) in Dartmouth reports continued development of the ECOLOG dual-beam system for demersal fish distribution and abundance surveys. Acoustic results were calibrated against two different trawls on different research vessels, and the field results have been interpreted in keeping with data from an experiment using live cod in a 15-m diameter tank. Good correlations ( $r = 0.72$ ) were obtained between acoustic counts and fish density (number/volume) within 10-cm size classes of haddock, pollock, cod and redfish. Federal Research in St. Andrews reports further work on survey design to account for the variable accessibility of herring to the acoustic system as a result of schooling, diel movement, etc. Further *in situ* measurements of herring aspect were taken by underwater photography and CCTV, observing similar angles in winter and in summer. Also, a new method has been developed and reported for calibrating gain in the total receiver system for more accurate target strength data. Federal Research in Moncton (Gulf of St. Lawrence Region) report surveys of both juvenile and adult herring. The results of the former cannot be interpreted quantitatively as a result of uncertainty concerning fish distribution and confusion with other species, but results from the latter will be used to develop an ongoing (annual) abundance index. The Federal Research group on the Pacific report continued development of computer software. Earlier observations comparing replicate acoustic measurements from different vessels and herring seine catches have been analysed, the feasibility of acoustic assessment of offshore herring is being studied, initially in Hecate Strait, and a cooperative project is being conducted with Field Services toward improving acoustic assessment procedures for real-time management of the herring fishery.

Three organizations report the use of towed bodies and underwater TV for observing fishing gear and fish behaviour. The Federal Development group in Halifax are assessing the performance of new trawl designs in a continuing project. The Federal Research group in Moncton (Gulf of St. Lawrence Region) used an underwater television camera system to evaluate the performance of scallop drags, to observe the behaviour of lobsters in an around lobster traps and to evaluate the density of snow crab on and under sea-bed substrates. They also report using acoustic telemetry to monitor the short-term movements of lobsters and snow crabs, with a full evaluation of acoustic tags planned for 1985. Federal Development on the Pacific report continuing observations of fishing gears and the reactions of fish to the gears.

Three organizations report selectivity experiments with square-mesh codends. The Newfoundland Provincial Government confirms that with 140-mm meshes on a 50-m stern trawler, the square mesh is more effective than diamond meshes in releasing cod shorter than 50 cm. The Federal Development group in Halifax confirm that the amounts of immature fish and debris are considerably less in a square-mesh than in a diamond-mesh codend. Federal Development on the Pacific report construction of knotless, square-mesh codends for evaluation in commercial fishing operations in 1985. Federal Research in Moncton report selectivity experiments with herring gillnets, involving four mesh sizes, three colours and two twine types. Modal herring length was found to be dependent on mesh size but not on colour or twine type. Selection curves were analysed, but further work is planned to obtain more precise curves and to take a deeper look at possible effects of colour and twine type.

Concerning basic fishing-gear engineering studies, the Technical University of Nova Scotia (TUNS) reports completion of the thesis study of trawl doors in a wind tunnel for optimization at high angles of incidence, involving different aspect ratios and tip shapes, and a novel method for comparing different trawl doors. Federal Development on the Pacific report development at the University of British Columbia (UBC), Mechanical Engineering, of a computer-based mathematical model to estimate drags of various trawl-components and of the total trawl.

Concerning development studies of fishing gear, the Newfoundland Provincial Government reports trials with Kevlar, both in netting and in cordage. A groundfish otter trawl made entirely of 2-mm diameter netting twine provided excellent fishing performance and adequate durability, opening the way to fuel savings after the door size has been optimized to the reduced net drag. Kevlar bridles on demersal otter trawls proved to be very suitable in fishing trials and demonstrated a longer life span than steel wire rope. Federal Development in Halifax report development of new-design scallop rakes for reduced damage and increased fuel efficiency, continued work with automated longline systems, and a demonstration of small-boat, pair, shrimp trawling. The fully-powered rope reel for Scottish seining, which had been developed earlier is now in commercial production and prototype, dual-purpose rope reel system for trawling and seining has been designed and is under construction. Federal Development in the Pacific has constructed a prototype, positive, timed-release, escape device to prevent lost blackcod traps from fishing, for trials in 1985.

A beam trawl for plankton fishing has been developed by Federal Development in the Pacific. Fishing trials were successful but further gear improvements are planned. A new-design, vertical, plankton sampler (VPS) was tested and improved by Federal Research in Newfoundland. Despite its complicated nature, it is now functional and enables more reliable field collections. They also report further work on fishing gear to sample age 1-to-4 flatfish, this year with a Yankee 41 shrimp trawl, including efforts to monitor gear performance using the MANTA underwater photographic system rendered only partially successful by poor weather.

Federal Fisheries Research in Quebec report the usual trawl surveys for groundfish inventory and a gillnet survey by fishermen to obtain better catch-per-unit-effort estimates for the herring fishery.

Federal Fisheries Development in the Pacific report contracts for development of 3-dimensional commercial fishing charts and an on-board computer display for tidal current data.

In relation to fishing vessels, Federal Development in Halifax report design of a prototype propeller nozzle for installation on small vessels. Construction and trials are planned for 1985. Studies on antifouling coatings for wooden boats, hold insulation and bulbous bows were completed, and the Energy Information System, which contains over three thousand documents on energy and fish harvesting, has been completely computerized for ready access.

DENMARK

No report received.

Finland

(T. Granberg and P. Suuronen)

At the Wärtsilä Turku Shipyard the major activities in the fishing section in 1984 have been the crab-processing mother ship research and development project, which has continued now over two years and will be under work at least one more year. The efforts have been directed to process design. The ship in question is merely for fish and crab processing.

Possibilities for increasing the leader mesh size in the Baltic herring trapnet has been investigated.

FRANCE

(M.N. Dinèr et M. Portier)

La technologie de la pêche étudie les techniques de capture y compris les engins, les navires et les opérations de pêche.

Ensuite l'assistance technique permet de promouvoir les nouvelles techniques chez les professionnels et d'apporter un soutien dans l'élaboration des règlements aux administratifs.

Enfin des programmes de coopération sont développés avec les pays étrangers.

Engins de pêche, navires, opérations de pêche

Dans ce domaine une campagne d'essais de la THALASSA remotorisée (1900 CV) a permis d'effectuer des mesures sur la géométrie de différents chaluts pélagiques à très grandes mailles et à cordes.

Le bassin d'essai de Boulogne a permis de tester un chalut de fond à crevettes à quatre faces, et celui de Lorient de mettre au point une drague à coquillages à effet hydrodynamique conçue par un industriel breton. Une senne de plage destinée à l'échantillonnage des ressources en estuaire a été dessinée pour les chercheurs de l'Ecole Nationale Supérieure d'Agronomie de Rennes. Les laboratoires de Boulogne et Lorient ont travaillé à l'élaboration d'un logiciel de tracé et de conception des chaluts - par ordinateur.

L'analyse des conditions de travail et de sécurité à la pêche artisanale et semi-industrielle a été effectuée à Lorient en liaison avec l'Institut Universitaire de Technologie de cette ville, dans le cadre d'un contrat Secrétariat d'Etat à la Mer et Agence Nationale pour la valorisation de la Recherche.

L'inventaire de la flottille, de l'organisation du travail et des méthodes de pêche des senneurs sardiniens bretons a été réalisé par un stagiaire au laboratoire de Lorient ; et l'évolution de la flottille artisanale de Boulogne au cours des quinze dernières années a été étudiée par un stagiaire travaillant au laboratoire.

Enfin dans le cadre d'un contrat CEE, les essais comparatifs de différents maillages de culs de chaluts ont été réalisés en Méditerranée. Cela a conduit à la fabrication de deux diaporamas :

- Dans les mailles du chalut ;
- Pêcher demain en Méditerranée.

Dans le domaine des filets calés, après l'étude réalisée en 1983 sur le développement de la flottille des navires artisans pêchant dans les eaux du Pas-de-Calais avec des trémails et des filets maillants, nous avons en 1984 porté l'effort de recherche sur la connaissance des engins.

L'apparition de nouveaux matériaux comme les tresses plombées, les tresses autoflottantes en polyéthylène ou à flotteurs incorporés, les nappes d'alèze en fil tressé ou en multimonofilament a entraîné une grande diversité des types d'engins utilisés. Ainsi, on a relevé dix sept types de trémails différents par une ou plusieurs caractéristiques.

L'originalité de l'utilisation des trémails dans les eaux du Pas-de-Calais tient au calage qui se fait en travers du courant de marée ; visant à la capture des poissons plats et en particulier de la sole, les trémails se couchent plus ou moins sur le fond et se déplacent lentement : le ralingue de lest dérapant lentement entre les deux points d'ancrage du filet.

Les filets maillants sont calés au moment des étales de pleine mer ou basse mer lorsque l'effet des courants tend à s'annuler. Ces filets ne visent qu'une espèce-cible qui est la morue.

#### Assistance technique

L'assistance technique aux professionnels a été fournie par les trois laboratoires de Boulogne, Lorient et Sète : fourniture de plans de chalut, adaptation des engins et des gréements à la force motrice des navires, fourniture de plans de filets maillants et de trémails ainsi que d'engins divers (casiers, lignes, dragues etc...)

Les démonstrations d'engins de pêche dans les bassins de Boulogne et de Lorient ont été poursuivies à l'intention des professionnels (patrons de pêche, fabricants de matériel, écoles de pêche).

L'assistance technique à l'administration a été développée pour l'élaboration de la réglementation CEE sur la mesure des maillages et les dispositifs à ajouter aux culs de chaluts.

### Coopération

Un stage de formation en technologie de la pêche de trois semaines s'est déroulé au laboratoire de Boulogne ; il a réuni des technologistes de nationalités tunisienne, marocaine, sénégalaise, aux côtés de technologistes français.

Dans le cadre de la coopération scientifique dans le domaine de l'océanologie, un programme de travail en commun sur les techniques et engins de pêche a été élaboré avec les spécialistes de l'URSS au cours d'une réunion tenue à Moscou.



Dans Le cadre du thème "technologie instrumentale", la France a plus spécialement porté ses efforts en 1983 sur l'acoustique et la visualisation.

#### Echointégration

Des campagnes d'évaluation acoustique ont été entreprises dans le golfe de Gascogne en avril-mai (anchois, chinchard, sardine), dans le golfe du Lion-Méditerranée en août (anchois, sardine) et en Manche orientale-sud Mer du Nord en novembre (hareng). L'effort a surtout porté en 1984 sur la technique de traitement des données de l'échointégration, mais aussi des chalutages d'identification des détections. Etant dans ces secteurs le plus souvent en présence de concentrations composées de plusieurs espèces, une attention plus particulière est portée à la séparation de la biomasse en ses différentes composantes spécifiques. L'identification directe sur les échogrammes semblant une technique prometteuse, la conception d'un classifieur d'écho est poursuivie.

L'installation en octobre à bord du n/o "Thalassa" d'un sonar omnidirectionnel a permis d'observer en novembre lors de la campagne "hareng", de jour du moins, de très nettes réactions d'évitement au navire. Ce genre d'appareil, dont l'utilisation sera intensifiée, semble très prometteur pour l'observation du comportement des espèces pélagiques.

#### Acoustique passive

En matière d'acoustique passive, l'étude de l'influence du bruit ou plutôt du type de spectre sonore des navires a été poursuivie dans le cadre de la pêche des thonidés (lignes trainantes, pêche à la canne ou à la senne). Les possibilités d'attraction et d'évaluation acoustique des thonidés sont également entreprises notamment à partir de radeaux attracteurs instrumentés.

Visualisation sous-marine

La mise en oeuvre de boîtiers photographiques équipés par du matériel d'amateur a été poursuivie principalement pour la visualisation du fond et des récifs. L'effort sera orienté vers l'observation des espèces pélagiques.

Des caméras TV à bas niveau d'éclairage (SIT) sont également utilisées par exemple pour observer le fonctionnement des dragues sur le fond ou le comportement des espèces en relation avec les méthodes de pêche (dragues, chalut à perche, filets maillants, casiers).

GERMAN DEMOCRATIC REPUBLIC

No report received.

Federal Republic of Germany

(H. Bohl)

Since the beginning of this decade, most of the research and development work done in the Federal Republic is devoted to the introduction and promotion of energy saving fishing methods. In 1984, activities were concentrated on fishing with bottom-set gill and trammel nets as well as on longlining, Danish seining, electrified beam trawling and jigging.

Experiments carried out in the inshore area of the western Baltic have shown that, in autumn, gill nets with mesh sizes of 53 - 55 mm (bar length) yield at least twice as much marketable cod as those with the traditional mesh sizes of 60 - 70 mm. The influence of parameters other than mesh size (e.g. type of netting yarn, height and colour of the net) on the efficiency of gill nets was also studied. To reduce the "pollution" of the nets by weed, jelly-fish etc., it proved advantageous to set the gear only for few hours at dawn and/or dusk. Since cod is known to be most active in the twilight, these short periods are decisive for the success of the fishing operation. Field tests to intensify the activity of cod by means of acoustic stimuli were continued.

Trammel nets with mesh sizes between 45 and 53 mm (bar length) proved again most suitable for catching soles in the German Bight. Within this range, both average catch rate and degree of pollution were shown to increase with decreasing mesh size. Fishing tests with markedly smaller meshes (e.g. 40 mm bar length) resulted in still larger sole catches, but these contained not only an intolerably high proportion of undersized specimens but also an extremely bothersome amount of "rubbish" (mainly crustaceans, starfish and algae). Tests with meshes larger than 53 mm proved also unsatisfactory. In this case serious catch losses were recorded due to the facts that most smaller soles escaped through the meshes and that adequately sized specimens were insufficiently abundant in the German Bight. In addition to normal trammel nets which are 1,20 m high, experimental nets with a height of 0,60 m were tested in 1984 for the first time. They were equally efficient for catching soles, but much easier and quicker to disentangle and to clear than the higher nets.

First attempts were made to catch cod by means of gill and trammel nets off the East Frisian coast. Between September and the end of the year, 45 mm nets originally purchased for fishing soles, were found to be most suitable for taking small cod on which the winterly fishing campaign in the

German Bight is based. It is hoped that German shrimp cutters which are in general too low-powered for otter trawling, will be enabled to participate in this campaign. Up to now, most vessels specialized for shrimp fisheries, are unemployed during the winter months.

Experiments with different types of large-meshed gill nets used for fishing roundfish (near wrecks) or turbot, were continued.

As to longlining, the so-called "monoline" which has been already shown to be superior to conventional types in fishing Baltic cod, was also successfully tested in the eel fishery of the western Baltic. In the North Sea, the effects of gangion floats attached to the snoods of longlines were studied. Due to bad fishing conditions, the question whether bait predation by scavengers can be reduced by lifting the baited hooks from the sea bottom, could not yet be answered. Tests concerning the bait acceptance revealed that herring having been deep-frozen for 24 hours is obviously more attractive for Baltic cod than herring having been stored on ice for the same period. In 1984, an automatic longline system was purchased and successfully tested aboard FRV "Solea". The development of an own semi-mechanized system intended for smaller fishing craft was continued.

Some progress was made in reintroducing Danish seining into German fisheries. As in the preceding year, four cruises of FRV "Solea" were mainly devoted to the exploration of suitable fishing grounds. During these cruises, in addition to the Danish method (anchor-dragging), the Scottish method (fly-dragging) was applied for the first time. By means of a fuel consumption measuring device (econometer), the difference in expenditure of energy between these two methods could be exactly measured. Seining was also performed during four trips of a chartered cutter. The results obtained were so promising that the skipper intends to continue this kind of fishing at his own risk in 1985.

The electrification of the beam trawl has reached a stage which allows its use on commercial vessels. In 1984, it could be demonstrated that a 440 kW cutter which has to exhaust its full engine power in order to tow the conventional gear, needs 185 - 220 kW only when towing the electrified version. The saving of energy was accompanied with flatfish catches which were not only better in quantity and quality but also less mingled with rubbish than those obtained by normal beam trawling.

In the North Sea, experiments with two different types of jigging machines were continued. It could be confirmed that the occurrence of dense fish concentrations, e.g. near wrecks, is prerequisite for the successful employment of these apparatuses.

With regard to the design of fuel saving trawls, the knowledge of the interaction of net shape and water flow has to be improved. For this purpose, mathematical models were developed and subsequently supported by full-scale experiments with a commercial midwater trawl.

To improve the reliability of those groundfish stock assessments which are based on the "fished volume method", the variance of trawl opening parameters was repeatedly measured in combination with that of towing speed and actual fishing time at the bottom. This work was completed in 1984.

Further progress was made in developing an own echointegration system. In the year under review, a 3-frequency-transducer platform was tested in a towing experiment. Furthermore, a monitor used for determination and control of essential echosounder parameters was developed. The existing software for data recording was extended to an evaluation of real time data. The system which up to now has been only used in Antarctic krill research, will be modified for acoustic fish stock assessments in the North Atlantic.

In 1984, a low light level underwater TV camera was used for observations of gill and trammel nets under field conditions.

In order to complement the selection data collected during December 1982 and 1983 in the winterly cod fishery of the German Bight, a third bottom trawl selection experiment was carried out in December 1984. In May of the same year, the selectivity of anchor-dragged Danish seines was investigated for the first time. The data obtained for German Bight dab and cod indicate that the selectivity of this gear is much better than that of bottom trawls.

In the laboratory, polyamide monofilaments with diameters of 1,6-2,0 mm were connected by means of different knots used in fisheries. From about 20 types of knots tested, only two proved suitable for this material.

As in previous years, all midwater trawls and Danish seines 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.

Projects aimed at the promotion of the artisanal fisheries in Sierra Leone and on the Cape Verde Islands were supported in the field of boat construction and gear technology respectively.

#### ICELAND

(G. Thorsteinsson)

Some observations with an underwater television mounted on a towed vehicle were carried out. Most effort was made to observe different designs of shrimp trawls and the behaviour of shrimp and juvenile fish. Some observations were also made on cod-gillnetting, seining and longlining. A few video tapes have been produced and made available for interested parties.

The selectivity of haddock in Danish seines was dealt with in comparative fishing trials. Experiments with covered codends were not feasible as the fish got gilled in wings and square in big quantities. As a result of these experiments the minimum mesh-opening of Danish seines was decreased from 155 mm to 135 mm.

In connection with the Icelandic "groundfish surveys" a bottom trawl design, its rigging and the catching method have been standardized.

Like in previous years mesh breaking strength measurements were made on request by the Marine Research Institute.

Measurements on fuel consumption were carried out to investigate the efficiency of different propulsion machinery, propeller size and the effects of different side thruster mountings and hull fouling. The results of these investigations showed that considerable fuel savings are possible on the Icelandic fishing fleet.

IRELAND

(J.P. Hillis)

An experiment was carried out in September to improve data on escapement of Nephrops from different areas of the trawl and to assess the extent of escapement of large Nephrops during hauling of the trawl when the meshes are not taut. Preliminary indications are that the concentration of escapers at the wing bases is increased with lengthening of haul duration and evidence for the escapement of large Nephrops during hauling was inconclusive, but if anything tended to indicate that such escapement did not occur.

NETHERLANDS

(B. van Marlen)

Salt water electro fishing

The new pulser designed in 1983 has been tested thoroughly in the electronics laboratory and on the FRV "ISIS" prior to tests on a commercial boat (UK 141) for a period of 12 weeks.

The capacitors were build in a specially adapted beam, instead of using a cylindrical housing to be mounted on top of the beam. The fishing net was redesigned to obtain a square stimulation area with electrodes of equal length and tested in the Hirtshals' flume tank before trials at sea.

With the new pulser and the new net, catches in day- and nighttime will be 10-50% higher than those of the conventional tickler chain gear.

The total fuel saving is estimated to be some 20%, taking into account the extra power needed to generate the electric field.

With a better hydrodynamical shape of the beam and a lower optimum fishing speed the gross saving is expected to be even higher.

Research in 1985 will be aimed at the relation between towing speed and catches, with an emphasis on energy savings.

The project enters the phase of commercial introduction, for which the reliability and endurance of the electrode system need to be further improved.

Participation with private companies to overcome financial difficulties will be essential.

Electrical barriers for fresh water fish

Research on the development of electrical barriers for juvenile fresh water fish has been terminated with a final report (TO 84-08).

The major conclusion is that barriers of this type are not to be recommended. The theoretical effect of the barrier is strongly negatively influenced by different natural processes, e.g. wind speed, wind direction, growth of algae and wave formation.

Furthermore, the damage and additional costs caused by fish passing the barriers are small compared to the costs of installation and maintenance of the barrier.

Fresh water electro fishing

Results of experiments done in 1981 and 1982 has been analysed.

Catches of eel were improved 20-fold with a decline in bycatch of bass with a factor 2 to 3 compared to the non-electrified net.

Placing the electrode array 2.5 meter more aft in the net did not improve the selectivity.

Reduction of net heights effects both the catches of eel and bass.

Safety

An inventory of problems concerning safety and possible solutions was send to various organisations with little response. A more direct approach to the industry will follow.

Fish landing

The new method with a separate beam and small winch, reported last year, has been installed on several vessels.

Warp endurance

The life span of warps can be doubled by the usage of especially designed shells on the drums, that guide the warps when coiling up.



#### Storage in refrigerated seawater

This method has been applied on the new vessel UK 173 (3500 hp) resulting in substantially improved labour conditions and easier handling procedures. Quality aspects need to be studied further to come to a final conclusion.

#### Fish sorting

A machine to sort fish using known weights as a reference proved to work well on the UK 173 beamtrawler. The total routing of fish using this machine can still be improved. Possibly the sorting procedure will be done ashore in the future.

#### Noise

Noise was reckoned as an important problem on a conference concerning the integrated safety of fishing vessels held in May 1984 in Lorient and organised by the European Communities. The noise level onboard Dutch vessels will be measured in 1985.

#### Energy costs

Research on heavy fuels has been done on the beamtrawlers GO 38, GO 26, GO 31, UK 67, UK 253 and UK 95. Technical improvements and proper care can reduce the additional costs of maintenance of the auxillary systems needed to treat the heavy fuels. These are estimated on Dfl. 4.000,- per annum.

With a range of fuels varying from 30 mm<sup>2</sup>/s (cSt) to 180 mm<sup>2</sup>/s (cSt) viscosity a skipper can be more flexible in his choice and pick out the cheapest fuel.

A comparison of fuel costs of two nearly identical vessels proves heavy fuel to be beneficial even when there is no price difference with light fuels.

#### Auxillaries

Several machinery-room lay-outs have been compared for a 1300 kW beamtrawler from an economical point of view. Lowest costs will be obtained with one main engine using power-take-offs (pto's) for the winch generator. The generator for the power supply can be driven by a separate auxillary engine and a spare set can be formed by one auxillary engine of half the power of the ship's system and winch generator.

#### Electrical installation

The installation on the HD 22 (1300 kW) has been analysed thoroughly (report TO 84-04). Several user groups of power can be distinguished such as: machinery-room, gear and fish handling, navigation and light and heating. Most boats use D.C.-power substantially. The use of power-take-offs for driving A.C.- and D.C.-generators can be beneficial from an energy point of view.

#### Measurements on machinery installations

Several new fishing boats are using condition monitoring equipment in their machinery installation. Parameters such as temperatures and pressures can be measured and printed out. Satellite transmission of data from the vessel to the office ashore (SATCOM) is becoming popular. RIVO participates in measurements on the UK 173 using a TRACOR condition monitoring computer.

### Towed fishing gear

Research on the big meshes midwater trawl has been extended to circumference sizes of 3600 and 4320 meshes round (nets denoted as GM2 and GM3 respectively).

The development has been started with flume tank trials in Hirtshals on scale 1 to 25 prior to full scale construction.

Comparative fishing trials on net GM2 (3600 meshes) proved good results on herring and mackerel.

The FRV "TRIDENS" could handle this gear easily with shaft powers ranging from 1300 to 1500 hp.

Full scale measurements on drag and geometry of both the GM2 and GM3 and a commercial net of 3060 meshes circumference have been done in Portuguese waters in November and December 1984 and will be analysed and reported during 1985.

A new type of multifoil-door, based on the Süberkrüb design, for both midwater and bottom trawling has been tested successfully in midwater. The spreading power turned out to be insensitive to speed variations. The doors performed very well during shooting and hauling, while the spread fluctuation as usually found with Süberkrübs turned out to be negligible. Performance on the bottom needs still to be investigated.

### New type of beam trawl mechanical stimulation

A beamtrawler bottom scraper to stimulate flatfish, replacing tickler chains, has been tried out in fishery trials on the FRV "ISIS" during several weeks. A number of pins were attached to a second beam in two rows with the possibility of adjusting the pressure on the seabed. Abrasion problems could be avoided by a special hardening layer of tungsten (Wolfram) on the lower part of the pins. Catches were poor at first but gradually improved by modifying and adjusting the gear. The effect was best on soft muddy grounds, which may be a special application for this gear. Further development is needed for a final conclusion. The use of spoilers to press a beam on the bottom and compensate for a smaller weight, t.i. with ticklers removed, turned out to be very effective. Future application in electro fishing may be interesting.

### GOV-model research

The GOV-trawl is extensively used on the International Young Fish Survey, organised by the ICES on several research vessels. In February 1984 a demonstration in the Hirtshals' flume tank was organised for skippers and scientists to show the effect of differences in rigging, such as doors, bridles, footrope arrangement, kites, etc. Several recommendations were drafted to come to a closer standardisation of this sampling gear and doing so to a better comparison of catch results.

### Low energy fishing methods

The idea of using very large meshsizes to herd pelagic fish species inside a net can also be applied in pair trawling. On the boats UK 141 and UK 271 a small number of hauls were done with the 2700 meshes circumference net reported in 1981 (GM1). Results were encouraging and further research will be carried out using a specially designed net for this purpose.

NORWAY

(S. Olsen)

FISH BEHAVIOUR AND REACTION

Studies of fish behaviour and reaction towards smell and taste stimuli have continued, the main objectives being to develop alternative baits for commercial longline fishing and to increase the catching efficiency of gill nets.

For full scale testing different kinds of bait materials, small nylon bags have been found very useful, and a suitable method has been developed for determining the rate of stimuli emission from baits. Species specific differences in the acceptance of different bait types have been demonstrated.

Bait bags attached to gill nets give significantly increased catch rates in bottom gill net fishing for cod, saithe, ling, tusk and Greenland halibut.

Investigations of fish behaviour in relation to different light stimuli have been started, and the establishment of a field facility for fish behaviour studies in general is in progress.

SELECTIVE FISHING

Investigations have been carried out comparing selection properties of Danish seine gears with traditional diamond mesh codend to gears with square mesh codends. Both field experiments and studies in a flume

tank have been done. The results confirm earlier findings of improved selection properties of square mesh codends.

Shrimp-fish separation experiments have been continued with improved versions of belly mounted sorting panels in shrimp trawl. The method works satisfactorily in gears operated at moderate speed, but needs further improvement when applied in high speed off shore shrimp trawling.

Selection experiments in shrimp trawls with square mesh codends have been started and have given promising results. The work will be continued.

A new siamese twin shrimp trawl design has been tested and found to improve the catching efficiency for shrimp with reduced bycatch of small haddock and less towing resistance than the standard shrimp trawl.

Another system for reducing fish bycatch in the shrimp trawl fishery has been tested with encouraging results. This consists of a trawl section made of large square-shaped meshes with two fine meshed tunnels inside, inserted in the aft belly part of the trawl.

An investigation has been started to develop species specific trawl gear/methods, mainly for cod and haddock, by utilizing their differences in vertical reaction movements. Initial trials with a round fish trawler in the Barents Sea suggest that such differences as have been found for various gadoids in the North Sea are also prevalent in the northern areas and may be utilized for species selective trawling of Arctic cod and haddock.

#### IMPROVEMENTS OF FISHING GEAR AND METHODS

Further work on hook design has confirmed the importance of hook form or shape, and has also shown that the dimensions and sharpness of hook point and barb are markedly affecting the catch rate in longline

fishing. Snood floats lifting the baits off bottom reduce bait loss and may contribute to additional improvements in catching efficiency.

A system combining a simple random baiter with a tub-based hook stacking arrangement has been developed and found suitable for mechanized line handling on small vessels.

Measurements of purse seine sinking speed and net depth for various combinations of net types, mesh sizes, lead weights and hanging rates have been continued to provide an empirical base for establishing the relative impact on purse seine sinking performance of the different factors.

A mechanized net stacking system for small purse seiners has been fully developed and tested, and work is in progress on an addition to the net stacking systems currently in use on large seiners, which will totally eliminate man-handling of the heavy lower line.

Work is also in progress with a numerical model for simulating purse seine stereometri during all phases of operation in relation to hydrodynamic and other relevant forces.

A study on bottom trawl as sampling gear for resources assessments has been started. The aim is to develop sampling gear and methods with improved and calibrated selectivity and catching efficiency.

Detailed catch statistics from the Lofoten cod fishery and data and observations of diurnal fish distribution and behaviour in relation to a local gill net fishery in North Norway have given input for the development of a numerical model of gill net fishing, and an evaluation of the catching efficiency of fishing gear in general, and how this is effected by various environmental as well as fish and gear related factors.

A study of the causes of wear and damage in fishing gear has been started with the objective of reducing these through suitable strengthening designs.

## ACOUSTICS AND BEHAVIOUR

Studies on fish behaviour in relation to echosurvey work have been continued, in particular by use of doppler-technique.

In July the impact of a survey vessel on the behaviour of near surface schools of herring was investigated in the North Sea. Direct measurements of sound absorption in high fish density concentrations have been attempted.

Studies of resonance frequencies of swimbladder fish continued with in situ observations of swimbladder compression in herring.

A sound scattering model has been developed, which facilitates computations of target strength of individual fish as a function of aspect angle when the geometry of the swimbladder is known.

In situ target strength measurements of several species including cod and herring, were carried out applying a newly developed echosounder (Simrad ES).

Studies of an acoustic system for measuring plankton and larval fish densities were initiated.

## VESSEL TECHNOLOGY - MARINE ENGINEERING

During 1984 an Inter-Nordic 4 years research program on fuel saving was completed with the main thrust on vessel design and vessel operation.

For dissemination of available knowledge a major information campaign has been prepared and will be implemented during 1985. The campaign employs an array of instruments such as:

- Teaching aids
- Brochures
- Video cassettes
- Practical training courses
- Lectures and seminars.

A new type of bulbous bow has been tested in full scale on the vessel "Kystfangst". Reduction in fuel consumption of 20-30% was achieved.

Model tests have been carried out on hulls for a new generation purse seiners, with excellent results.

A considerable number of vessels have been retro-fitted with new propulsion systems. The changes have included such things as very low speed propellers, high-reduction gearboxes and complete changes of the underwater part of the stern.

A computer model for preliminary vessel design based on operations research has been developed. A number of designs have been prepared in cooperation with fishermen and consulting companies, some of which is now under construction.

To improve the safety and working conditions on fishing vessels a program has been in operation for several years with activities aimed at

- clarifying the reasons for accidents
- developing measures for accident prevention
- analysing consequences of such measures

- practical testing and evaluation of the measures under operating conditions on board fishing vessels.

In order to identify problem areas a major survey is being prepared to determine standards for safety and working conditions in the fishing fleet. The field work is to be carried out in 1985 on about 600 vessels. A pre-test has been carried out in the district of Finnmark.

During 1984 a study was carried out to identify available knowledge on the strain on humans when working on moving platforms and the ergonomics of such work.

Activities concerning testing of accident prevention measures have continued in 1984, such items as emergency stops for winches and haulers, safety boots and "no-skid" deck coverings have been tested.

On selected "project vessels" several measures have been tested simultaneously, such as roll reduction, noise suppression, improvement of gear handling, combined with ergonomic analysis of the work stations.

#### POLAND

(A. Ropelewski)

In 1984 the following investigations were carried out in Poland in the field of fishing techniques:

1. Model and full-scale tests of low-drag pelagic trawls.
2. Theoretical work concerning the design of trawls with emphasis on water flow through the net part.
3. Investigations of the influence of longline positioning with respect to the thermocline and the kind of bait on cpue of tuna and shark in the open waters of the central atlantic.
4. Investigations of the influence of hook size on cpue of cod and flatfish in the longline fishery in the Baltic Sea.
5. Testing coastal herring trap nets in the Baltic.
6. Testing squid jigging equipment for deep-sea vessels.
7. Testing of the influence of various modes of trawler power plant exploitation on fuel consumption.



PORTUGAL

(R. Rebordão)

During 1984, the Department of Fishing Gear and Methods of the Instituto Nacional de Investigacao das Pescas (INIP), Portugal, was involved in the following works:

- Prosecution of fishing essays dedicated to the capture of deep sea species using PA MONO Ø 2,5 mm traditional longlines and vertical drifting longlines.  
In these experiments the occurrence of black scabbard fish (Aphanopus carbo Lowe 1839) was confirmed on the fishing grounds of Banco Unicórnio (Madeira sub-area) and in the areas of S. Vicente, Sines, Cascais, Peniche, Figueira da Foz and Aveiro (continental sub-area), besides the areas formerly searched.
- Participation in the works carried out in the sub-area of Madeira by FRV "TRIDENS" involving the test of pelagic trawl nets of large mesh size.
- Publication in "Relatórios do INIP" of three reports concerning Fish and Oceanography Campaigns in the area of Madeira.

SPAIN

(J. Bravo de-Laguna)

The following investigations on acoustics applied to fisheries research were carried out in 1984.

In April the distribution of pilchard, horse mackerel and mackerel around the Canary Islands was chartered and the biomass estimated by acoustic methods. In August similar investigations were carried out along the Spanish north and northwest coasts between the Spanish borders to France and Portugal down to 500 m depth. During this survey (Saracus 84), the populations of pilchard and blue whiting were chartered and the biomass of the different age groups estimated. During the acoustic survey "Mediterraneo 84" the distribution and biomass of anchovies, sardinellas, horse mackerel, mackerel and other pelagic fish species were investigated off the Spanish continental shelf at the Mediterranean Sea including the Balearic Islands from the Strait of Gibraltar to the border to France down to 200 m depth.

In January the behaviour of pilchard was studied around the island of Tenerife (Canary Islands) and the distribution and fish biomass estimation chartered. These investigations were conducted in collaboration with the Spanish Institute of Oceanography and the National Marine Fisheries Service in Woods Hole. It is intended to report on this subject at a future ICES working group meeting.

SWEDEN

(O. Hagström)

1. Experimental fishing with different types of Nephrops traps was carried out. Full scale fishing with a Scottish Nephrops traps has started in three areas on the Skagerrak coast.
2. Meshing and selectivity experiment with 95 mm and 110 mm meshes in cod trawls were started in the Baltic. The experiment is carried out on commercial vessels during normal fishing.
3. Acoustic assessment surveys were undertaken in Skagerrak/Kattegat and the southwestern part of the Baltic (Subdiv. 22-24) in cooperation with Denmark and in the Baltic in cooperation with Poland and G.D.R. The integration is made with Simrad sounder 38 kHz connected to a computer and the calibration methods include measurement of a standard target (copper spheres). Target species are herring and sprat. A pilot study has started with the objective to evaluate the possibility of acoustic estimates of the spawning cod in the Baltic.
4. A selectivity study of shrimp trawls was brought to an end.

UNITED KINGDOM

1. ENGLAND

(C.P. Arnold)

Two acoustic surveys were undertaken during 1984 using SIMRAD equipment consisting of an EK400 scientific sounder

38 kHz transducer mounted in a towed body. The integrator system consisted of two QM MKII analog units and one QD digital integrator.

The first survey carried out in February investigated the distribution and abundance of spent herring in the eastern English Channel and Southern Bight of the North Sea. The second, in August-early September, assessed the stock of spawning herring off the Yorkshire coast.

The results of these surveys were reported to ICES CM 1984.

Acoustic calibrations were carried out in Staines reservoir during July. Three 38 kHz transducers (one Simrad; two Universal Sonar Ltd) were measured and the SL (Source Level) and SRT (Sensitivity Reception of Transducer) parameters obtained in addition to the beam patterns in one plane. The Universal Sonar transducers had conical beams thus greatly simplifying the calculation of the equivalent "ideal" beam from single plane measurements. Similar measurements were also made for a 120 kHz transducer (Universal Sonar) also with a conical beam.

Investigations have commenced to study the influence of pot selectivity on the size compositions of lobsters and crab measured in the fisheries. Comparative fishing of Yorkshire parlour pots and Norfolk creels is being undertaken on lobster and crab grounds both in Yorkshire and Norfolk to test for significant differences in size composition retained by the two gears.

## 2. SCOTLAND

(D. MacLennan)

Data collected on the panel shapes of a pelagic trawl have been used to develop a computer programme to calculate net shape. Progress has been encouraging and work is continuing to refine the programme. Further measurements on full-

scale nets will be required and these data could also be used to investigate scale modelling techniques.

More comparative fishing experiments have been carried out to assess the selectivity of square mesh codends. The results have supported earlier work on haddock and whiting, using seines and trawls, which found that square mesh codends had higher selection factors and smaller selection ranges than traditional diamond mesh codends. It is planned to extend the work to different species and to investigate methods of further improving the selectivity of square mesh.

Observations have been made on the diurnal variation of gill net height using specially constructed manometers. The limited amount of data collected shows that height can vary dramatically over a tidal cycle. Video-tape records have been made of different types of bottom set gear.

The collection of engineering performance data on demersal pair and single boat trawls has continued. Sweep spread measurements on pair trawls were obtained, enabling swept area to be evaluated. Measurements were also made on groundgear drag, warp shape and otterboard performance. The more accurate instrumentation now available will greatly improve knowledge of otterboard performance. Analysis of the data is continuing.

The performance of standard survey gears (GOV trawl and Isaacs-Kidd midwater trawl) has been investigated and further work is planned. Observations on fish behaviour were made on a small version of the GOV trawl. Small mesh covers and a range of codend attachments (chafers, lifting bags, flappers, etc.) were observed, to assess the effect of these added devices in masking the codend meshes.

Studies have continued using 2 level separator trawls and preliminary results of the separation of Pandalus borealis from pout and immature round fish species show that in

general the shrimp pass to the lower codend and fish to the upper one. Similarly a few observations have shown separation of herring from pout when pout were caught in the lower codend and herring in the upper. The shrimp, pout and herring in these observations were all on the sea bed ahead of the trawl mouth.

Direct observation techniques have also been used to extend studies of the damage to those fish escaping from trawls, the light levels on fishery grounds and the reaction distances of fish in different net visibility. Both diving observations and use of the remote controlled observation vehicle continue to be used as primary sources of observations. Facilities have been developed for the capture, handling and experimenting with mackerel. Various aspects of their reaction ability including swimming performance, schooling behaviour and effect of light level have been studied.

Studies of the properties of baits for line fishing have continued to investigate the chemical constituents necessary for bait ingestion. Experiments are continuing on bait acceptance by cod using synthetic squid components. The nature and concentrations of stimuli necessary for bait acceptance are being studied in the aquarium.

Experiments have continued on the target strength of caged mackerel, herring and sprat. Stereo photography has been used to record fish behaviour and to investigate reasons for the diurnal variation of target strength. In-situ target strength experiments on herring and blue whiting have been conducted using dual beam equipment. Improved calibration techniques have been developed and acoustic calibration errors have been reduced to an acceptable level. The development of a wideband sonar based on a spherical cap transducer has continued. Acoustic surveys have been conducted on North Sea herring, Clyde herring, North Sea sprat and mackerel to the West of Scotland.

USA

(A.J. Kenmerer)

A summary follows of 1984 research on fish finding and capture techniques of the four regions: Northeast, Southeast, Southwest, and Northwest. The summary is not all inclusive, but does provide examples of current interest and activity.

Northeast

The Atlantic Environmental Group of the Northeast Fisheries Center (NEFC), National Marine Fisheries Service (NMFS), has been providing Northeast fishermen with modified versions of NOAA's oceanographic analysis charts which provide offshore sea-surface temperatures. Offshore fishermen use the information on temperature changes associated with ocean fronts and warm-core Gulf Stream rings to save time and fuel in locating swordfish, tunas, sharks, and marlin. Deep-sea red crab fishermen use the information to stay away from the strong currents of the warm-core rings. In the past, the Atlantic Environmental Group and University of Rhode Island have provided inshore sea-surface temperatures on 34 enhanced charts to southern New England fishermen. Now they plan to increase coverage up and down the coast and to decrease the turnaround time from 3 days to 1 day, so fishermen will receive the information in a more timely fashion.

The NEFC, in cooperation with Charles Stark Draper Laboratory, has developed a low-cost, portable, and easily operable, acoustic sensor/processor to quantify volume backscatter from insonified fish. The equipment is designed to provide immediate analysis of acoustically derived data to determine its validity and usefulness for scientific and commercial operations. Field testing has exceeded 700 hours without failure or malfunction. Cooperative field tests have been conducted with Canadian hydroacoustic scientists to estimate herring spawning stocks. Future developments will include automated seabed tracking, automatic threshold signal processing, and simplified routine operation.

The NEFC Fisheries Engineering Group has begun a study of the Northeast's bottom trawl gear. During 1984, visual observation and video recording of Yankee and shrimp trawls and of rectangular and polyvalent doors were conducted. In addition, engineering information is gathered while towing the trawls. This includes fuel use, engine rpm, propeller thrust, vessel speed through the water, and warp load.

The Massachusetts Institute of Technology has developed a net-testing facility at the Navy's David Taylor Model Basin, and in the last year has begun a training program for fishermen at the facility. Also, the New England Fisheries Development Foundation is funding a project to modify commercial scallop gear in order to make the gear more size-selective and to try to eliminate the catch of trash.

## Southeast

Research on the Trawl Efficiency Device (TED) has continued to gain considerable attention. This device was originally developed as a modification for shrimp trawls to prevent incidental captures of sea turtles, a design objective which was fully met. Recent emphasis by gear researchers of the Southeast Fisheries Center, (SEFC) in cooperation with university and industry organizations, have focused on modifying the TED for reductions in unwanted finfish captures and to improve handling characteristics. These modifications have resulted in collapsible and fiberglass versions of the TED, and catch reductions of over 60 percent for most common finfish species. Shrimping efficiency is virtually unaffected by the TED. Emphasis in 1985 is to transfer the TED technology to the shrimp fleet and to develop a smaller version for inshore shrimp nets.

In partnership with Sea Grant, NMFS has developed a technical movie on shrimp trawls. The movie concentrates on the underway characteristics of a number of shrimp trawls in common use in the Southeast, and includes information on how drag and dimensions of nets vary with speed, changes in floats, and a number of other rigging considerations. Most of the filming was underwater and in very clear Bahamian waters. The film is narrated in English although a Spanish version should be available in a few months.

The fall transfer of a stern trawler to the Gulf of Mexico, the NOAA Ship CHAPMAN, has made possible a rapid escalation in research on large mesh pelagic and high opening bottom trawls for capturing coastal herrings. This research is taking full advantage of technical assistance provided by Norway to NMFS several years ago. Initial efforts were directed at a scuba diver's evaluations of several trawls to ensure they were fishing properly. Later efforts will concentrate fish reactions to the trawls and in turn how to optimize gear design and trawling techniques to maximize capture efficiencies, and in the use of satellite-aided techniques for locating concentrations of fish.

Other gear related research in the Southeast has included longlining techniques for reef fish. Most of this work has and is being done by Sea Grant organizations mainly as a means to expand fishing capabilities of economically stressed shrimp fleets. Direct measurements of the efficiency of this gear, however, is being done by NMFS through submersible studies. The techniques being investigated include both the traditional bottom longlining techniques and one which appears to have considerable potential for rough bottom areas, the Kali poles. These are PVC poles weighted on the bottom, floated at the top and longlined together with a floating line. Six or more hooks are attached to each pole. Their main advantage over traditional approaches is they normally do not get hung on bottom obstructions such as coral reefs.

Remote sensing research by NMFS has evolved a method to infer hypoxia from ocean color and temperature data. Hypoxia, which is a condition where bottom oxygen concentrations approach zero, occurs periodically in the northcentral Gulf of Mexico. A major management concern with hypoxia is its effect on shrimp recruiting from estuaries into the offshore fishery. Apparently what happens is relatively warm waters from rivers flow out over the cooler nearshore waters



creating a strong density gradient. The stability of the gradient is intensified by solar heating and nutrients from the fresh river waters stimulate major phytoplankton blooms (chlorophyll  $>40$  mg/m<sup>3</sup>). The plankton settle to the bottom quickly exhausting the supply of oxygen through respiration and decomposition. The remote sensing technique uses data from the Nimbus-7 Coastal Zone Color Scanner to find areas of warm water and high chlorophyll concentrations and then through an algorithm, which requires no surface truth, identifies zones which either are, or have the potential of becoming, hypoxic.

#### Southwest

Results from research conducted at the NMFS Southwest Fisheries Center (SWFC) in La Jolla, California, provide examples of the utility of satellite oceanic remote sensing as a tool in fisheries research. Capabilities have been developed to define the spawning habitat and to describe ocean processes in relation to spawning of the northern anchovy using ocean infrared thermal imagery and ocean color imagery observed by orbiting satellites. Infrared and visible color data from satellites and concurrent albacore catch data have clearly shown that the distribution and catchability of albacore are related to oceanic fronts. Results show that commercially fishable aggregations of albacore are found in warm, blue oceanic waters near temperature and color fronts adjacent to the seaward edge of coastal water masses. Further, studies using satellite imagery in conjunction with field experiments have yielded results suggesting that water clarity as it relates to albacore being able to see food organisms, may be an important mechanism underlying the aggregation of albacore in the warm, blue water associated with oceanic fronts. In studies underway dealing with the ecology of marine mammals, preliminary results indicate that the distributional patterns of selected marine mammals off the coast of southern California are related to oceanic features detectable in infrared and color imagery from satellites.

Infrared temperature and ocean color imagery from satellites have been used to monitor the effects of the recent El Niño along the U.S. Pacific Coast. Infrared thermal imagery showed warm sea surface temperatures with the greatest anomalies near the coast, weakened coastal upwelling and changes in circulation patterns. Phytoplankton pigment images from the Coastal Zone Color Scanner indicate reduced productivity during El Niño, apparently related to weakened coastal upwelling. The satellite images provide direct evidence of meso-scale changes associated with the ocean-wide El Niño event.

#### Northwest

NMFS research in the Northwest, in conjunction with the University of Washington and Sea Grant, has continued to concentrate on hydroacoustics, and especially on the use of acoustical techniques for direct measurements of fish target strength. The dual beam technique for estimates of target strength already has proven successful and now the research has shifted to a split beam approach.

A NMFS researcher spent much of 1984 working with gear experts in Norway. The intent of this cooperative work was to gain experience from Norwegian gear technologists in areas related to large mesh pelagic trawls, trawling systems which are finding widespread adoption in the Northwest, and in other aspects of gear technology.

USSR

(S.A. Studenetsky)

During 1984 studies to substantiate measure for rational and effective exploitation of the cod, haddock and redfish stocks in the Barents and Norwegian Seas and the northwest Atlantic as well as to determine the efficiency of long-line fishery for bottom fish species in the north Atlantic and selectivity of trawls in the Baltic Sea and the Gulf of Riga were conducted:

- the data on selectivity of polyamide trawl codends made of 100-135 mm mesh opening in the fishery for cod, haddock and redfish in the Barents Sea and for redfish in the northwest Atlantic were obtained to study the effect caused by the ICES cover and the whole codend cover on the selectivity.

In the Baltic Sea and the Gulf of Riga selective properties of trawl in the herring fishery of 300 h.p, vessels were determined.

Comparative experimental data on selectivity parameters (length mode, 50% retention length, selectivity coefficient, selectivity range) of trawls made of capron (PA) netting with different mesh form (diamond-shaped and square) were obtained.