

International Council for the
Exploration of the Sea

CM 1985/K:1
Report of Activities

SHELLFISH COMMITTEE

by

James Mason

1984

MOLLUSCA

Belgium

(Reporting only on Crustacea)

Canada

(G P Ennis)

Illex illecebrosus

Research cruises were conducted during January-March in the Gulf Stream/Slope Water Frontal Zone from an area east of Scotian Shelf southward to an area east of Florida to determine the distribution and abundance of larval and juvenile squid in the area and the influence of the Gulf Stream on their northeastward transport. This was part of an ongoing research programme aimed at elucidating the early life history of this species that combines oceanographic sampling with plankton and midwater trawl fishing. Results indicated a low level of larval and juvenile abundance.

Another in an ongoing series of annual surveys was conducted on the southwest slope of the Grand Bank during June. Catches indicated a low level of abundance despite favourable temperatures throughout much of the survey area. A poor inshore squid fishery at Newfoundland was forecast and later realised. The low level of abundance curtailed biological studies in the Newfoundland inshore area, however, analyses of accrued data demonstrated considerable year to year variability in squid biology and ecology in relation to relative abundance. Considerable progress was made towards improving the accuracy and efficiency of ageing squid using daily growth increment in statoliths by employing chemical (eg strontium and tetracycline), "time" markers and laboratory-reared animals of known age for validation.

Placopecten magellanicus

A study of reproductive ecology of scallops in the Bay of Fundy was conducted. Synoptic coverage of the scallop distributional area was achieved over three months (September, October and November). A study of the critical settlement and metamorphosis stage is providing results on the temporal contraction of settlement relative to the duration of egg and larval production. Analysis of enzyme characteristics and other biological indices of several spatially discrete adult scallop aggregations was completed. Although growth and morphometric differences between areas are evident, there are very little differences in the enzyme characteristics. The analytical assessment of the Georges Bank scallops has been significantly improved. Application of sequential population analysis generated estimates of historical trends in fishing mortality at each age. The impact on yield and biomass of two different meat count regulations was evaluated.

Resource status in the Northumberland Strait area of the Southern Gulf of St Lawrence was assessed on the basis of surveys conducted in three important fishing areas during the 1984 season and statistics from commercial fishing. A direct biomass estimate indicated a continued low level of scallop abundance around Magdalen Islands. Studies dealing with space-time variations of reproductive cycles, allometric relationships, growth, effect of current direction on growth, and population genetics were carried out. Efforts were made to assess drag efficiency using an underwater video camera.

Sea scallop spatfall monitoring continued at two inshore locations in Newfoundland. A scallop resource enhancement project is well underway in Port au Port Bay on the west coast of Newfoundland. Seed scallops procured from natural spawnings are being used to stock depleted grounds.

Stock assessments in each of two areas of St Pierre Bank where active fisheries were underway in 1982 and 1983 carried out in 1984. The assessments were based on estimates of biomass, relative age frequencies and changes in catch per unit of effort. For the second consecutive year landings from the area have decreased. Reduced catches of sea scallops have encouraged vessels to target for the smaller Iceland scallop (*Chlamys islandica*), the latter contributing approximately 80% of the 413 tonnes of meats removed from St Pierre Bank.

Denmark

(Reporting only on Crustacea)

France

(D Latrouite)

Pecten maximus

Le suivi des principaux stocks de coquille Saint-Jacques du littoral Atlantique et de la Manche s'est poursuivi en 1984, soit part des campagnes des navires océanographiques d'IFREMER (baie de Saint-Brieuc, Manche-Est), soit à bord de bateaux de pêche.

Les ressources en coquille Saint-Jacques restent exploitées de façon très intensive. D'une manière générale, les captures françaises restent faibles en raison de recrutements médiocres ou moyens et d'une absence de reliquat en classes d'âge âgées. La production française a été d'environ 12 000 tonnes.

En baie de Saint-Brieuc, les observations ont été faites à bord du NO "Roselys" et de bateaux de pêche et les échantillonnages ont été réalisés par plusieurs techniques (dragages expérimentaux, vidéo et plongée sous-marine). Elles suggèrent une classe d'âge plus abondante qui devrait être partiellement recrutée durant la saison de pêche 1984-1985. La classe d'âge suivante s'annonce plus moyenne. Cette situation doit permettre de maintenir une production de 4 à 5 000 tonnes pour les deux années futures, et une action commune avec les pêcheurs est tentée pour augmenter la taille marchande minimale.

En Manche-Est, les captures restent au niveau des années passées et la production de cette zone serait de 5 300 tonnes. Cette stabilité est le fait de deux situations opposées: un appauvrissement de la baie de Seine proprement dite et une légère amélioration de la partie centrale.

Sur le plan des recherches, la coquille Saint-Jacques est suivie dans le cadre d'un programme quinquennal depuis 1983. Celui-ci vise à assurer le repeuplement du gisement de la rade de Brest et à mettre au point en baie de Saint-Brieuc de nouvelles formules d'exploitation qui combinent la pêche et l'aquaculture par semis de juvéniles. Le développement de ce programme est limité du fait de la faible disponibilité en naissain de cette espèce. Cependant, les progrès réalisés en aquaculture ont permis de disposer de près d'un million de juvéniles en 1984, quantité annuelle nécessaire pour les essais de repeuplement. En tant que contribution plus fondamentale à la maîtrise de l'exploitation de cette espèce, un programme sur le Déterminisme du recrutement vient d'être initié par IFREMER et les laboratoires universitaires français.

Chlamys varia

Le pétoncle noir (*Chlamys varia*) fait l'objet d'une exploitation spécifique en rade de Brest et le gisement a produit 330 tonnes. Il donne lieu à un début d'aménagement basé sur une rotation de zones de pêche, chaque secteur recevant au préalable des juvéniles issus du captage de naissain ainsi que des supports favorisant la fixation et la sédentarité des animaux. Environ 40 millions de juvéniles ont été captés en 1984 et doivent être semés dès la fin de l'hiver.

Mytilus edulis

L'étude des moulières en eau profonde de l'Est Cotentin (secteur 7D) a débuté en octobre 1981 et s'est poursuivie en 1984 par la prospection des principaux gisements (Barfleur, Ravenoville et Reville) au cours de deux campagnes océanographiques du ROSELYS II.

Ces campagnes réalisées au printemps (7-15 mai) et à l'automne (15-25 septembre), au cours desquelles ont été effectués respectivement 175 et 115 dragages, permettent d'estimer d'une part l'état du stock en place avant l'ouverture de la saison de pêche, d'autre part l'intensité du recrutement annuel.

Les rendements (kg/mn) en moules commerciales (cf Tableau) observés en 1984 montrent une diminution importante des stocks de moules essentiellement due à la faiblesse du recrutement observé en 1983 et 1984. Les densités de juvéniles observées lors des campagnes automnales décroissent, entre 1982 et 1984, de 11 000 à 300 individus par 100 m².

GISEMENTS	1982		1983		1984	
	mai	oct	mai	oct	mai	oct
Barfleur	63	71,8	103,8	38,2	49	30
Ravenoville	161,6	54,7	120,2	390,1	44,3	
Reville	186,4	104,4	85,0	46,1		

Cela s'est traduit au cours de la même période par une diminution de la production en moules de la pêche artisanale (cf Tableau). Il convient toutefois de noter que cette diminution est non seulement due à l'appauvrissement des stocks mais aussi à des facteurs de commercialisation (demandés sur le marché, concurrence des moules de bouchots et d'importation, ...).

	1982	1983	1984
Production en tonnes	15 000	5 000	3 600

Venus verrucosa (L.)

La pêche de praires du golfe normano-breton qui a culminé à 4 400 tonnes en 1981 est en déclin (2 515 tonnes en 1984).

Les estimations des structures démographiques des captures réalisées depuis 1978 mettent en évidence de très faibles niveaux de recrutement pour les classes d'âge nées après 1971.

Les études particulières sur le prérecrutement réalisées en 1984 indiquent une quasi absence des pré-recrues. Il faut donc s'attendre dans les prochaines années à une nouvelle diminution des apports. Ainsi depuis 1983, des études ont débuté sur les populations de bivalves associées à la praire qui pourraient faire l'objet d'une exploitation.

Buccinum undatum

Avec 3 860 tonnes débarquées en 1983, la côte Ouest-Cotentin assure 99% Nde la production française de buccins. Depuis 1977, malgré une progression soutenue de l'effort de pêche, les apports se trouvent stabilisés aux environs de 4 000 tonnes.

Le suivi de cette pêcherie est assuré depuis 1982 par l'IFREMER. Les paramètres biologiques de l'espèce (reproduction, mortalité, croissance) ont été étudiés sur ce secteur pour être utilisés dans le modèle analytique de RICKER.

Ce travail, associé à l'analyse des captures, des rendements et de l'effort de pêche développé, devrait contribuer à l'élaboration d'une réglementation adaptée. Les premières mesures d'aménagement de la pêcherie de buccins ont été mises en place par la profession en 1983.

Federal Republic of Germany

(K Tiews)

Mytilus edulis

Monitoring of mussel beds along the German North Sea coast and in the Flensburg Fjord has been continued by the Institut für Küsten- und Binnenfischerei.

Cardium (= Cerastoderma) edule

Cockle beds along the German Wadden coast of Niedersachsen and Schleswig-Holstein were again surveyed by the Institut für Küsten- und Binnenfischerei.

Iceland

(U Skúladóttir and H Eiríksson)

Chlamys islandica

Three Iceland scallop surveys were carried out off the west, north and east coasts of Iceland. Exploratory fishing revealed valuable new beds in Húnaflói, North Iceland, and off East Iceland.

Scallop landings in 1984 remained stable at about 15000 m tons or similar to the 1983 landings. However, a slight drop was observed in cpue in many areas.

Scallop surveys in 1985 will include exploratory fishing at Southeast Iceland and assessments of the most heavily fished stocks off the west and northwest coasts.

Ireland

(J P Hillis)

Pecten maximus

A dredge survey in Bantry Bay was conducted during October. The scarcity of the 1981 year-class observed to the north of Whiddy Island may have been due to the concentration of Gyrodinium aureolum in the bay during the summer of 1981, which was most concentrated in this region. Other areas of the bay dredged, south of Whiddy Island and Bere Haven, demonstrated a good representation of the 1981 year-class.

During 1984, settlement in Mulroy Bay failed to occur, but in Lough Hyne moderate settlement density was recorded.

Mytilus edulis

The meat yield of mussels from Mornington (Boyne estuary, east coast) was monitored monthly in 1984 and was found to realise extremely low levels, around 10% over long periods and descending to an extreme of 6%. The reason for this is not clear but may have been local pollution. There were no reports of depressed meat yield levels from elsewhere in Ireland.

Ostrea edulis

No work to report in 1984.

The Netherlands

(A C Drinkwaard)

Ostrea edulis

The research concerning the oyster population in the non-tidal marine Lake Grevelingen was continued. Spatfall was monitored and amounted to about 2 spat per mussel shell. The ample 8000 m² of mussel shells used as clutch about to about 750 million shells. This means that at most 1500 million spats are collected, apart from the spatfall in the wild area. However, a part of the shells always disappear in the bottom and are lost for spat collection, while the more exposed shells, which may have collected more spat, are dredged more efficiently.

The growth of the fallen spat was very poor through poor ingestion of the necessary food ingredients. The mortality was high, up to more than 90% in the month of December, as observed by direct estimates. The still very small dimensions of the surviving spat just before the winter bode ill for the yearclass 1984. In normal situations it is still fair, if after the winter- and spring mortality 15 spats per 100 shells can be found. On the other hand the yearclass 1983 was doing well and is now the hope of the future.

The intensity of the spatfall has been followed also on a weekly basis, using regularly exchanged lime-coated perspex sheets. In this way the spatfall could be noticed per dm², in July up to 40 and in August up to 10 spats per week.

During a short period in the beginning of July the mean concentration of larvae fluctuated between 200 and 600 per sample of 100 litres of water in the Lake Grevelingen. In the Oosterschelde an average of 43 larvae per 100 litres observed on July 24.

For ongrowing and disease control 300,000 Lake Grevelingen oysters of about 50 grams were planted in April on six locations of "the oyster banks" in the eastern part of the Oosterschelde. They increased in weight till 75-80 grams. Experiments with 25000 oysters off bottom, grown in lanternnets, showed an increase in weight to 85-90 grams. This took place in the mouth of the Oosterschelde, behind the storm-surge-barrier under construction.

It was not possible to use other parts of the Oosterschelde for relaying flat oysters, since the eradication policy against the Bonamia ostreae disease was continued. The same prohibition can be expected yet for 1985.

Some millions of adult oysters were collected from the Lake Grevelingen to supply the commercial market. The surveys to assess the oyster stock will be continued in 1985 in common with the spatfall prediction service and the spatfall monitoring programme. Following the endorsed ICES Shellfish Committee recommendations, direct estimates of natural mortality in oysters will be carried out in the different situations.

The environmental conditions were studied. It is a pity that firm conclusions concerning the scope of managing the Lake Grevelingen as an oyster spat collection pond can be yet be given. More knowledge has to be gained concerning the primary production and other nutrimental sources as well as the transportation of the food.

The feasibility study on large scale oyster nursery exploitation in the Zeeland waters by the Project group MARIOS has been published. Oyster nurseries can be of help to save the ongrowing of oyster spat and in this way to stabilise the yearly supply of seed oysters. In this case the endorsed recommendation by the ICES Mariculture Committee, to set up strategies for bivalve cultures, especially new technologies, has been followed already.

Crassostrea gigas

Larvae of the Pacific or Japanese oyster were encountered in the Oosterschelde after July 24 in varying concentrations between 5 and 15 per sample of 100 litres of water. The extent of the reproduction in 1983 has been very significant. One year old spat has also been observed on shallow intertidal mussel plots and along the foot of the dike in the western part of the Oosterschelde.

Commercial operation increased on a small scale.

Mytilus edulis

The storms in winter and spring in the beginning of the year 1984 hampered the normal production of mussels in the season 1984-1985. A lot of mussel plots in the Wadden Sea were cleaned up by the rough dash of the waves. The traffic in mussels expanded especially to Germany and Denmark, to compensate the lost market supply. In this way the importation of mussels doubled to keep the sales on the same level as in the last year.

The production of mussels in the Oosterschelde has not been affected by natural disasters and finished on a level of 30000 tonnes as in the previous year.

The mussel canneries were served with about 25000 tonnes, which can be taken as a stabilised situation. The fresh market is more affected by the ups and downs in the landings. The average meat content of the mussels brought down to the auction at Yerseke was 24.9%.

In May the free fishing for seed to relay on the empty mussel plots in the Wadden Sea was very intensive and also in autumn it was still possible to continue the seed collection reasonably.

The research concerning the functioning of the mussel plots in the Oosterschelde was continued, acting together with the Delta Division of the Ministry of Transport and Public works. This research is focussed on the re-arrangement of the mussel plots after the construction of the storm-surge-barrier is finished in 1986. New concepts can be introduced by utilising several available detailed hydraulic models. Otherwise attention is paid to the possibilities in distinguishing the origin of decline in production, which may be caused by natural circumstances or by the changing environmental situation related to the construction and functioning of the storm-surge-barrier during and after 1986. The commercial landings of mussels were followed for stock assessment purposes. In this research project, called MOKWE

(MUCUL), a lot of obtained figures have to be evaluated by statistical analysis. Afterwards the information has to be simplified to be useful in the contacts with the mussel growers, bringing in their own experiences.

The same research group is now entrusted with the tracing of changes in the functioning of the mussel rewatering places in the eastern part of the Oosterschelde.

Cerastoderma edule

Within the context of an exploratory survey concerning all filter feeders in the Oosterschelde, carried out by the project group BALANS (BALANCE), routine sampling of the scattered cockle population took place as in the previous years. Some growth gradients are detected.

This long-term stock assessment work can be helpful to get an idea of the sensitiveness of the different animal groups for the expected decrease in carrying-capacity. Thoughts of the possibility and necessity of taking steps in stimulating the several commercial groups are under discussion.

The total Dutch landings of fresh cockles amounted to 55000 tonnes or 8500 tonnes shucked meat.

Environmental conditions

Hydrographic baseline studies in the Oosterschelde were continued. Close attention was paid to the tidal current velocities along the bottom of the experimental new oyster layings. These activities will be continued during 1985 and 1986.

The package of parameters under control was extended with the total number of aerobic heterotrophic bacteria. Direct enumeration was carried out by epifluorescence microscopy. This is the beginning of a quantitative approach of the ecological role of bacteria in the several aquatic systems for mollusc culture as well as for mollusc storage in basins, tanks etc.

Most of these bacteria are free-living, but they are also attached to particles like detritus, forming part of the food ingredients for grazers. A lot of interactions between bacteria, phytoplankton and bacteriovorous protozoa are possible in the euphotic zone.

The mean number of aerobic heterotrophic bacteria was found to fluctuate between 4.10^5 and 4.10^6 per ml, very dependent on water temperature.

Molluscan shellfish toxicity and sanitary control

Regular control of the molluscan shellfish culture areas showed a good sanitary quality of the shellfish and the water. Diarrhetic Shellfish Poisoning did not occur. In the Dutch coastal waters the toxic dinoflagellate Dinophysis acuminata was observed sporadically.

Diseases and pests

The challenge test on the presence of the oyster pathogen Bonamia ostreae in the Oosterschelde has been continued. In April for the first time since 1980 the

commercial planting of 300000 Lake Grevelingen oysters on six plots of the Yerseke Bank was allowed. Half of them were collected this year in the Lake Grevelingen and the others were the carry over from former years, partly stored up in oyster pits.

Three foci of infection were still observed, but not on the plots used for the straight out relaid oysters. This was a positive sign that the control measures in the previous years have proved to be effective.

Norway

(Bjørn Bøhle)

Todarodes sagittatus

Samples from commercial catches and specimens collected on research vessels in North Sea were analysed. The size and age composition was similar to previous years. The amount of squids coming to the Norwegian Coast was less than the year before. The total catch in the 1984 reached 7 000 tons.

Oysters

For commercial cultivation purposes, oyster spat of both Ostrea edulis and Crassostrea gigas was set out for ongrowth on several localities along the Norwegian coast and in the fjords. Oyster spat (O. edulis) from Ostretjern was in October transplanted to Strengereid (South Coast) for growth and mortality studies. Oyster spat (O. edulis) from 5 different breeding polls were transplanted to the same locality at Austevoll (West Coast) for studying differences in growth and mortality on oysters deriving from the breeding polls.

Total biological and environmental study of poll Selvaggpollen (West Coast) were performed. the study included environmental conditions, variations in production of oyster spat and histological investigation of gonads during the spawning process. One of the features is to find bottlenecks for optimal production.

Iceland scallops (Chlamys islandica)

On the West Coast the growth of scallops was studied in two localities where these lamelibranchs are relicts. In a costal area in Troms County (Northern Norway) biological parameters were studied, ie ecological and population dynamics on scallops on natural beds.

Scallops (Pecten maximus)

At localities at the West Coast the growth of scallops was studied.

Mussels (Mytilus edulis)

On seven localities in the outer Oslo Fjord and along the Skagerrack coast settlement of larvae and growth of the spat were studied from May to September. Observations were also made on temperature, salinity, predation by starfish and fouling of algae on the spat collectors.

In the counties of Hordaland and Rogaland (West Coast) spatfall, growth and fouling were studied in 80 different localities to record suitable localities for mussel cultivation.

Poisonous mussels

In October, mussels in the outer Oslo Fjord and along the Skagerrack Coast became unsuitable for human consumption owing to DSP (Diarrhetic Shellfish Poisoning), caused by *Dinophysis acuta*. Some people (ca 100) were poisoned. Six months later (March 1985) mussels were still poisonous and production of mussels was closed in all this period. Considerable activity took place, including collecting water samples for studying the possible cause, ie the algae, (Biological Station Flødevigen), routine sampling of mussels from cultivation plants (local health authorities), performing biotests (Department of Food Hygiene, The Veterinary College of Norway) and biological research on this algae related to environmental conditions (Biological Station Flødevigen, Directorate of Fisheries).

The activity also included considerations on methods for monitoring and "early warning" of algae and poisonous mussels - to prevent consumers from being poisoned.

Poland

(J Porębski and Z Witek)

Cephalopods

Taxonomical and zoogeographical investigations on squids, caught with small-mesh pelagic trawl, were conducted on board RV "Professor Siedlecki" in August-October 1984 in the region between Portugal and Azores.

Other molluscs

Ecophysiological problems - oxygen consumption, activity patterns, calorific value, lipid content, filtration rate - and gametogenesis in *Mytilus edulis*, *Cardium glaucum*, *C. hauniense* and *Macoma baltica*, from the Gdańsk Bay were studied in the Department of Biological Oceanography, University of Gdańsk.

Portugal

(A Cascalho and M J Figueiredo)

Octopus vulgaris and Loligo vulgaris

A sampling programme at the fishing ports of Viana do Castelo, Matosinhos, Peniche and Porto, was carried out during 1984.

Numbers sampled:

Octopus vulgaris: 314 samples, 5778 individuals.

Loligo vulgaris: 117 samples, 5443 individuals.

Crassostrea angulata

The settlement of a bed of Crassostrea angulata in an experimental plant of Instituto Nacional de Investigacao deas Pescas (Rai Formosa) was carried out.

Venerupis decussata

Studies on growth of Venerupis decussata were pursued.

Spisula solida

Natural beds were surveyed along the oceanic littoral adjacent to the Ria Formosa.

Spain

(A Perez Camacho)

Bivalves

During 1984 the research on biology and abundance of the more commercially important species (Venerupis pullastra, V. decussata, Cardium edule, etc.) continued, as well as the study on the possibilities of production of Ruditapes philippinarum on rafts and on beaches.

Cephalopods

Studies on different aspects of the biology of Sepia elegans and S. officinalis were carried out.

Sweden

(H Hallbäck)

Cultivation of Mytilus edulis is still increasing. During the autumn 1984 all production of mussels along the Swedish west coast was stopped because of toxin from, probably, some species of Dinophysis. Tests from mussels during February 1985 showed no change which means that they are still toxic. The same tests were carried out on Ostrea edulis and no toxin was found, they were all "clean".

United Kingdom

1. England and Wales

(R C A Bannister)

Pecten maximus

Work continued to collate the results of historical surveys to identify the most regularly settled areas for scallops in the western Channel.

The distribution and density of scallops by size and age was examined by fine-meshed dredge and diver survey on two study areas off south-west Cornwall.

Experiments commenced to study Pecten settlement on hydroids offshore in the same area.

Ostrea edulis

Dredge surveys were carried out to measure the abundance of natural stocks in the River Fal, River Blackwater and in the Solent. Field work commenced to study the distribution and abundance of oyster larvae in the Beaulieu River area of the Solent.

Sampling of Ostrea edulis for the parasite Bonamia ostreae continued. There were no new areas of infection, and oysters in the Solent and at Poole remained free of the parasite, as did oysters in the area of natural settlement in the River Fal. However, the original sites of infection in the Fal area have been devastated, and on currently infected beds in Essex, prevalence intensified, despite there being a reduced level of cultivation. The policy is being maintained of licensing deposits from approved disease-free areas only, and of recommending a reduced density and duration of cultivation.

Mytilus edulis

The annual quadrat survey of the Wash area showed a further decline in the abundance of both marketable stock and seed. Although less abundant than in 1983, mussel larvae on collectors peaked in June, but there was again no local settlement on the beds. Historical data suggest in fact that there is no relation between the abundance of Wash stocks and the level of local recruitment.

2. Scotland

(J Mason)

Pecten maximus and Chlamys opercularis

Monitoring of the fisheries and assessment of the state of, and effect of fishing on, the principal stocks were maintained. Scallop landings increased from 5076 t in 1983 to 5995 t in 1984, with little change in landings per unit effort in any of the fisheries. Queen landings decreased slightly from 4431 t to 4170 t, again with little change in cpue.

Studies of settlement and early growth of both species continued. Spat collectors were placed in previously studied areas - Gairloch, Applecross, Loch Carron and Loch Nevis. Numbers of *Pecten* settling were lower than in the previous year, but Loch Nevis yielded a mean number of 311 per collector bag. Similar collectors were placed in a number of areas in the Sound of Jura, Islay and Clyde areas, but results were comparatively poor, the best area being the south end of Gigha, which yielded an average of 62 scallops per bag. Collectors were put out at intervals in Loch Torridon but only those placed in July received any settlement.

Growing on of both species continued in suspended cages in Loch Ardvar. By December 1984 the scallops settled in 1982 had grown to a mean length of 57.4 mm and the queens had reached 52.3 mm. Animals were also placed on the bottom, both loose and in cages. Mortalities were variable but mostly high, and starfish which were found in some cages are thought to be the main predators.

An underwater television survey of Loch Teacuis - a small inlet off Loch Simart, was undertaken jointly with the Sea Fish Industry Authority (SFIA), Ardtoe. Some suitable areas for future bottom experiments were located.

In 1985 the monitoring of fisheries and assessment of stocks will continue. The settlement experiments will be repeated in the Jura-Islay area in an attempt to link settlement on artificial substrata with later recruitment to the fishable stocks. Further intensive studies of settlement will be made in Loch Nevis and animals will be grown on for use in later bottom cultivation and stock enhancement experiments.

Loligo forbesi and Todarodes sagittatus

Landings of both species were monitored and length frequency data were obtained from landings of *L. forbesi*. The study of the biology and distribution of *T. sagittatus* was continued.

Pests and diseases of molluscs

Samples of molluscs imported or exported for relaying were examined for pests and diseases prior to licensing or certification. Samples of oysters showing thickening and chambering of the shell were analysed for unusually high levels of tin from tributyl tin compounds in antifoulants.

USA

(Stephen H Clark and Michael Castagna)

The Northeast Fisheries Center (NEFC) of the National Marine Fisheries Service (NMFS) conducted three inshore-offshore bottom trawl surveys and one gear comparison survey totalling 126 vessel days at sea which provided data for bivalves and squids. Surveys were also conducted for sea scallops (Placopecten magellanicus) and Iceland scallops (Chlamys islandica), surf clams (Spisula solidissima), and ocean quahogs (Arctica islandica) totalling 63 days at sea. The Massachusetts Division of Marine Fisheries (DMF) and the Rhode Island Department of Environmental Management (DEM) also conducted inshore bottom trawl surveys. The North Carolina DMF and the South Carolina Wildlife and Marine Resources Department (WMRD) conducted surveys for calico scallops (Argopecten gibbus) and the South Carolina WMRD also conducted gear evaluation cruises and exploratory surveys for squid (Loligo pealei). NEFC personnel also collected commercial samples at dockside and performed 2 417 age determinations for sea scallops, surf clams, and ocean quahogs. Research continued at NEFC on ageing of other molluscs (Crepidula sp., Mesodesma sp., and Corbicula sp.).

NEFC and Southeast Fisheries Center (SEFC) personnel continued stock assessment studies. Several state agencies conducted resource inventory and monitoring work, transplanting and stocking programs, and monitoring for paralytic shellfish poisoning (PSP). University of North Carolina researchers evaluated methods for detecting hepatitis A virus and studied uptake and elimination rates under different environmental conditions.

American Oyster (*Crassostrea virginica*)

Several state agencies including those of Maine, New Jersey, Maryland, Delaware, and South Carolina monitored incidence of disease and parasites. The Maryland Department of Natural Resources (DNR) completed studies to determine the extent of infestation by the salinity-dependent pathogen, Haplosporidium nelsoni (MSX) in Chesapeake Bay. (Incidence peaked during the drought years of 1981-82, but fell off rapidly in subsequent years as salinities declined.) The Delaware DNR and the New Jersey Department of Environmental Protection (DEP) investigated population density and recruitment trends. Studies on pathology, depuration, and elimination rates of indicator organisms at different temperatures continued at the Virginia Institute of Marine Science (VIMS). The North Carolina DMF monitored spat set rates and assessed growth and survival of transplanted seed oysters. The South Carolina WMRD continued resource inventory work, studied gametogenesis in subtidal and intertidal populations to establish recruitment trends, and completed studies to assess environmental impacts of mechanical harvesting in cooperation with Clemson University. The Georgia DNR monitored contaminant levels.

Sea Scallop (*Placopecten magellanicus*)

The NEFC and the Maine Department of Marine Resources (DMR) continued stock assessment work; the Maine DMR also studied growth, mortality, and fecundity and investigated feeding ecology and energy flow in inshore and offshore populations.

Bay Scallop (*Argopecten irradians*)

The Rhode Island DEM continued research on spawning success and juvenile survival. The State University of New York (SUNY) conducted growth and fecundity studies, and the North Carolina DMF continued seasonal sampling to evaluate biological parameters, population size composition, distribution, and trends in abundance. The South Carolina WMRD continued growout studies in coastal impoundments.

Calico Scallop (*Argopecten gibbus*)

The North Carolina DMF, the Florida DNR and the SEFC performed cooperative sampling gear evaluation work. The South Carolina WMRD studied gametogenesis in inshore populations to evaluate recruitment trends.

Iceland Scallop (*Chlamys islandica*)

The NEFC evaluated distribution, abundance, size composition, and growth rates for populations off the New England coast.

Hard Clam (*Mercenaria mercenaria*)

Researchers at St John's University in New Jersey studied depuration techniques. Life history studies (including larval settlement and recruitment and growth and survival of juvenile and adult clams) continued under the University of Connecticut Sea Grant Program. The Rhode Island DEM cooperated with the US Environmental Protection Agency in monitoring contaminants and continued various assessment and management-related projects. Several state agencies, including those of New York, New Jersey, and Delaware, continued monitoring programs to evaluate resource trends. The North Carolina DMF studied distribution and initiated collection of catch/effort data for the mechanical harvest segment of the fishery. The South Carolina WMRD continued genetic research, conducted cooperative studies on depuration, gametogenesis and fecundity with Clemson University, and investigated growth differences in geographically distinct populations with George Mason University and the College of Charleston.

Ocean Quahog (*Arctica islandica*)

The NEFC continued stock assessments and related research; the Maine DMR initiated collection of landings data and biological information. NEFC scientists also completed age validation studies.

Surf Clam (*Spisula solidissima*)

The NEFC continued stock assessments and related research. A major effort was made in 1984 to evaluate potential yield for the Georges Bank region based on exploratory fishing and research vessel survey data and commercial catch/effort and biological sampling data collected at dockside. The Delaware DNR conducted surveys to determine age structure and population densities. The South Carolina WMRD conducted growout studies in ponds and intertidal areas.

Softshell Clam (*Mya arenaria*)

The University of Connecticut Sea Grant program conducted resource surveys and life history studies and studied population dynamics under different harvesting strategies. The Maine DMR monitored pollution and predator population levels and collected landings data and biological samples. Normandeau Associates continued studies on growth and survival, population levels and spatfall density in New Hampshire waters.

Several state agencies have documented the existence of a neoplastic condition which is associated with widespread mortalities. Studies by the Maryland DNR in 1983 indicated a drastic increase in incidence of this disease (apparently viral-related) and in the majority of observed cases effects were considered terminal. A crisis-response investigation has been initiated to study seasonality, distribution, and severity of this and other diseases in more detail.

Short-finned Squid (*Illex illecebrosus*)

Long-finned Squid (*Loligo pealeii*)

NEFC personnel continued biological research and stock assessment work including detailed analyses of yield in relation to different harvest strategies for Loligo. Studies continued on the distribution of Illex squid along the continental shelf-slope water front off the northeast coast of the USA. Stock identification studies were also initiated on Loligo by the Marine Biological Laboratory, Woods Hole in cooperation with NEFC.

USSR

(S A Studenetsky)

Squids

In March-May 1984 PINRO investigated abundant squid species from the Norwegian Sea and North-East Atlantic on RV "Kokshaik". Fifty-five samples were taken by midwater trawls. In spring 1984 abundance of squids was much lower than in 1983.

In April-May investigations of abundant squid stocks were conducted by RV "Akhil" in the Irminger Sea and near Middle Atlantic Ridge. Ninety-five samples were taken. In June the same vessel investigated squids in the Greenland and Norwegian Seas. Ninety-two samples were taken. Two concentrations of young Gonatus fabricii were discovered in the south Irminger Sea, Greenland and Norwegian Seas. Supposed spawning areas were defined basing on the young squid drift.

The young squid survey was conducted by RV "Ayaks" in the northern of the Middle Atlantic Ridge in December. Thirty samples were taken. The reproduction area of arrow-squid (Todarodes sagittatus) of winter generation was discovered.

CRUSTACEA

Belgium

(F Redant)

Crangon crangon

Biannual sampling (in spring and autumn) of the brown shrimp stock and its predators off the Belgian coast was continued in 1984 to obtain a continuous set of estimates on egg production, recruitment, production and mortality.

The investigations on long term population dynamics of the shrimp stock and on competitive and predatory interactions with other epibenthic and demersal species were also continued. Within this framework a study on the food composition of Gobiid fishes was started. Preliminary results, referring to the early summer months, showed that only 5% of the Pomatoschistus minutus and 0% of the P. lozanoi stomachs contained shrimp remains.

Finally a re-evaluation of the evidence on the sex change and growth of the brown shrimp, complemented with histological investigations on male and female shrimps, was started.

Nephrops norvegicus

The sampling of commercial Norway lobster landings was continued in order to monitor possible long term changes in the catch composition and the exploitation pattern of the Nephrops stock in the Central North Sea (Botney Gut - Silver Pit area).

A study on seasonal variations in landings, effort, CPUE, length composition and sex-ratio of the catches was started. Possible explanations of these variations, in relation to growth and reproductive cycle, are being investigated.

Canada

(G P Ennis)

Homarus americanus

Increased emphasis has been directed toward analysis of descriptive aspects of the lobster fishery in Nova Scotia and New Brunswick. The distribution of fishing effort and of sustainable yield were estimated for the eastern and southern shores of Nova Scotia. An analysis of the application of a yield- and egg-per-recruit model to the fishery in the Bay of Fundy was completed. Particular emphasis has been directed toward understanding the effort changes in Lobster District 4A and their impact on the fishery. The accumulated Canadian tagging results of lobsters in the Gulf of Maine area have been analysed. The results indicate much more extensive migration of mature lobsters than has previously been concluded. The importance of a nemertean on lobster fecundity in the Grand Manan area in particular has been evaluated. Between 60-93% of the lobsters were infested with Pseudocarcinonemertes homari. Research continued on larval lobster distributions both within a coastal embayment and offshore in the Gulf of Maine. The most significant results were on the vertical distribution of the four larval stages. The larvae are distributed much deeper in the water column than previously reported, with evidence for vertical migration. Current routine sampling methods which are restricted to the upper several meters are inappropriate.

As part of studies of lobster-sea urchin-kelp interactions along eastern Nova Scotia, an extensive survey of 2 900 km of shoreline revealed that 511 km² of rocky bottom was released to seaweeds by urchin mass mortalities. This area is expected to support seaweed biomass and annual production of 1.8 and 7 million tons, respectively. Recovery of the sea urchin population through larval settlement has already begun. It has been demonstrated experimentally that a sea urchin pathogen can be transferred from the laboratory to a natural population.

Lobster research in the Gulf of St Lawrence included an aerial survey of fishing effort, tagging, sampling in the southern area, extensive at-sea sampling of commercial catches, and an exploratory cruise off western Newfoundland. Behaviour of lobsters in and around traps was observed using underwater television and studies of small-scale movements and population genetics were carried out. At the Magdalen Islands sampling of juvenile lobsters was conducted and data on fecundity and larval ecology were analysed.

Long-term monitoring of the lobster fishery and studies of various aspects of lobster population biology and dynamics were continued in three localities around Newfoundland. Analyses of the time-series of data from two localities demonstrate that recruitment to the standing stocks increased substantially during the 1970's and subsequently declined. Landings over large areas coincided with these trends in recruitment.

Cement gland staging of pleopods from field sampling in Newfoundland was used as a basis for egg extrusion predictions from which functional size-maturity relationships were developed. Comparison with physiological size-maturity relationships for the same areas demonstrated that substantial numbers of physiologically mature females fail to extrude eggs in a given spawning season. For one

population it was demonstrated that the incidence of moulting and spawning by individual lobsters during the same season decreased from 100 to 0% over the size range where functional maturity increased from 0 to 50%.

Pandalus borealis

As a basis for management advice, commercial catch and effort statistics and size frequencies were analysed and direct estimates of biomass obtained for five stocks in the Gulf of St Lawrence.

Biological investigations included an analysis of stomach contents of potential shrimp predators and the collection of samples for a study of intermoult growth.

Data on the shrimp fishery off Labrador in 1984 were obtained primarily from logbook records. The observer programme for this fishery was considerably reduced and data were obtained only for the last three months of the year. A research cruise was carried out in Divisions 3K2IJ from July 5 to July 30.

The survey in Division 3K produced data on the distribution, abundance and biological characteristics of shrimp in that area, providing a basis for assessment of the resource and advice on its management. Data on the growth of adult shrimp obtained during this survey were analysed along with other data on growth of larvae (from plankton sampling) and juvenile (from stomachs of Atlantic cod). Results conformed to the theory of organic growth but data on moulting frequency of juveniles and adults were lacking.

Chionoecetes opilio

Research on snow crab in the southern Gulf of St Lawrence included an evaluation of the suitability of *Nephrops* trawl for sampling, testing of an underwater television system to be used for estimating abundance, and biological sampling to provide data on sexual maturity and moulting.

Status of the fisheries in the estuary and northern Gulf of St Lawrence was assessed on the basis of analyses of commercial catch and effort statistics and size frequencies. In the estuary area, over 11 000 crabs were tagged with small magnetic tags. Samples of muscle tissue, hemolymph and cuticle were obtained as a basis for describing the moulting period in an exploited population and a histological study of the x-organ, sinus gland and Y-organ was conducted. Data on larval and juvenile ecology in the Gulf were analysed and new data on larval distribution, duration and survival and on juvenile habitat, growth and predation by groundfish obtained.

In the Newfoundland fishery, sampling of commercial catches continued. Catch and CPUE data for the various management areas were analysed and biomass estimates based on 1983 and 1984 data derived. Landings have declined dramatically in the southern zone apparently because of sustained recruitment failure since 1982. In 1982 there was a sharp reduction in the level of moulting activity in the population that has persisted and appears to be related to lower bottom temperatures throughout the area over this period. Studies of various aspects of moulting and egg development were continued. A breeding migration of snow crab into shallow water during April-May was discovered in Bonnie Bayon the west coast of Newfoundland in 1982. Research aimed at fully documenting behavioural, ecological and biological aspects of the phenomenon continued during the 1984 migration.

Denmark

(S Munch-Petersen and Dan M Carlsson)

Greenland

Pandalus borealis

Research on the West Greenland offshore stocks was continued. Catch-effort data based on logbook information were obtained from the commercial fishery. Biological samples were collected from both commercial and research fishery. Bottom photography was carried out from a research vessel in July-August on the offshore shrimp grounds to assess the density of shrimp. Density data from the offshore area have been collected since 1977 and are used in a model on the relationship between biomass of shrimp and latitude, longitude, depth, bottom temperature and year.

Catch-effort data were obtained from the commercial shrimp fishery in the offshore East Greenland area.

France

(D Latrouite)

Homarus gammarus

Le bilan des expériences de marquage-recapture conduites dans les divisions VII e et VIII a a été établi et les données ont été utilisées pour une étude de la croissance. Les résultats fournissent un schéma satisfaisant pour les six premières années de la vie des homards.

Une étude de la fécondité individuelle et de la fécondité par recrue du homard européen (communication CIEM 1984, K:38) établit les diverses relations entre la taille ou le poids des femelles et le nombre des oeufs au début et en fin d'incubation, le taux de perte d'oeufs en cours d'incubation et évalue, sous diverses hypothèses, les niveaux de fécondité de stocks exploités par rapport à un stock vierge.

L'étude de faisabilité du sea-ranching dont l'objectif est d'apprécier l'impact sur les stocks de l'addition de homards "fabriqués" en écloserie s'est traduite par l'immersion sur un site aménagé avec des abris artificiels de 8 500 juvéniles d'un an marqués magnétiquement; le suivi des animaux immergés a été assuré pendant quatre semaines. Parallèlement, des observations en laboratoire sont menées sur l'éthologie du homard et sur la tenue des marques magnétiques.

Cancer pagurus

Les études sur la croissance et les déplacements dans le 7E1 ont été poursuivies par le marquage sur différents sites de Bretagne Nord de 1 958 tourteaux. Les recaptures réalisées en 1985 permettront de compléter les observations disponibles et d'établir le schéma de croissance pour la partie méridionale de la Manche.

Dans le même temps, le suivi de l'exploitation pour les principales pêcheries de Manche et Atlantique a été assuré au travers de la collecte des données de capture et d'effort déployé. Le réseau de collecte des informations de base demeure imparfait et une attention particulière est accordée à sa mise en place sur le littoral de la Manche et de l'Atlantique. Des échantillonnages au débarquement sont effectués pour les flottilles travaillant et 7E1 et 7F1.

Maia squinado

Une étude de cette espèce devant aboutir à l'aménagement de son exploitation a été entreprise en fin d'année 1984 dans la partie méridionale de la Manche-Est. Pas de résultats disponibles actuellement.

Federal Republic of Germany

(K Tiews)

Crangon crangon

Long-term investigations by the Institut für Küsten- und Binnenfischerei to assess the shares of undersized protected fish species in the catch of the German brown shrimp fishery were continued. This research work also takes into account the fluctuations in the abundance of fish species found on the shrimp fishing grounds.

Assessment work on the dynamics of brown shrimp populations along the German North Sea coast went on, as well as the continuous study to monitor the predator-prey relationship in the German Crangon fishery.

Cooperative young fish and brown shrimp surveys in the Wadden Sea areas of Belgium, the Netherlands and the Federal Republic of Germany were continued.

Iceland

(U Skúladóttir and H Eiríksson)

Nephrops norvegicus

As usual two research vessel surveys were carried out during the Nephrops season (May-August).

Landings of Norway lobster were according to the seasonal quota, approximately 2400 m tons, compared with 2700 tons in 1983. As predicted cpue again dropped slightly, from 48 kg per hour in 1983 to 46 kg per hour in 1984, owing to below average recruitment. In view of this the proposed TAC for 1985 will remain at somewhat lower level than in 1981-1983.

Stock assessments based on catch per unit effort and VPA on length groups will be continued in 1985 and two Nephrops surveys are planned during the summer season.

Pandalus

Research vessel surveys were carried out as usual for sampling Pandalus and obtaining information on bycatch. Included in the sexing of the specimens is now the detection of sternal spines. Of the 6300 shrimps that were tagged in 1983 a few were retained for 9 months, being ovigerous all the time. In spring 1984 about 4000 shrimps were tagged. Of those no recoveries were obtained after a period of 1 month. No migrations were detected either in ovigerous or in ovigerous shrimps.

The effort in the offshore fishery was doubled. Along with this a few fields were found and the old fields expanded a bit. Moreover a small fishery was started in the waters off the east coast.

Quotas were decided for all inshore areas, but offshore areas have no catch quota as yet.

In 1985 research will be carried out along similar lines. An increased interest is now in the field predator-prey relationship of cod and shrimp.

Ireland

(J P Hillis)

Nephrops norvegicus

Sampling of catch landings and discards was carried on in Division VIIa on a much increased scale throughout the year and samples were also taken during the short season fishery on the Porcupine Bank, Division VIIc and VIIk.

Numbers sampled were as follows:-

Division	Quarter	No of samples	Sex	Catch	Landings	Discards	Total
VIIa	1	4	Male	1 382	926	576	2 878
			Female	876	298	611	1 785
			Unsexed		283		283
			Total	2 258	1 501	1 187	4 946
	2	7	Male	1 002	789	453	2 244
			Female	1 132	164	604	1 906
			Unsexed		844		844
			Total	2 134	1 797	1 057	4 988
	3	3	Male	727	175	414	1 316
			Female	951	65	694	1 710
			Unsexed		484		484
			Total	1 678	724	1 108	3 510
	4		Male	721	138	834	1 693
			Female	611	10	943	1 564
			Unsexed		1 038		1 038
			Total	1 332	1 186	1 777	4 295
	Total	18	Male	3 832	2 022	2 277	8 131
			Female	3 570	537	2 852	6 959
			Unsexed		2 649		2 649
			Total	7 402	5 208	5 129	17 739
VIIc/k	Total (all 2)	3	Male	472	629		1 101
			Female	183	256		439
			Total	655	885		1 540
Overall Total		21	Male	4 304	2 651	2 277	9 232
			Female	3 753	793	2 852	7 398
			Unsexed		2 649		2 649
			Total	8 057	6 093	5 129	19 279

An examination of the mud substrate on Irish Sea *Nephrops* grounds was carried out in May in order to acquire information for relating to distribution density,

Nephrops mean size etc. This work is to continue. The mean mud particle diameter was found to be in the approximate region of 50-100 μ m over most of the grounds.

In July 940 Nephrops were tagged with binary coded magnetic micro-tags and 24 of these were recovered in August, after which a further 1 400 were tagged and released.

A brief selectivity experiment was undertaken in September to improve data on escape from various areas of the trawl and to attempt to assess escapement during hauling.

In December a series of experimental hauls was undertaken to augment information on the effect of sea bed illumination on Nephrops catches; this was largely successful though slightly marred by weather conditions.

Hommarus gammarus

No work to report in 1984.

The Netherlands

(R Boddeke)

Crangon crangon

Population dynamics

Three surveys were carried out along the Netherlands west coast with shrimp trawls provided with a fine mesh codend (1.5 x 1.5 mm mesh) to collect data on the nursery function of coastal areas.

The results, combined with simultaneous observations in the beach zone, data on predation of adults and larvae, and stock recruitment calculations based on the relation between the production of ripe eggs and the consequent production of consumption shrimps, will be compiled in a publication in 1985.

Market sampling

The monthly sampling of consumption shrimps in all important shrimp harbours continued. In this sampling, body length, presence and development stage of the eggs and the number of shrimps per kilogram are defined.

Landing statistics

The availability of landing statistics split up by rectangles was speeded up very considerably. These data, on a weekly basis, are available now within one month.

Norway

(Bjørn Bøhle)

Lobster (Homarus vulgaris)

The monitoring programme for the CPUE of lobsters was continued. In the Skagerrack area the slightly increasing tendency from last year continued. Nearly 100 000 small lobsters, reared in warm water for one year, were released around some islands on the west coast of Norway.

Shrimps (Pandalus borealis)

In the Norwegian Channel the catches of shrimps was alarmingly low during the spring months. However, a comparatively rich year class recruited to the fishery during the fall season.

A research programme to achieve better knowledge about the shrimp stock(s) in the Norwegian Channel was started. It includes a yearly cruise with research vessel and samples and logbooks obtained from the commercial fishery.

In the Northern areas, the two main surveys for abundance and stock estimations were done in April and May (The Barents Sea) and in July-August (The Spitzbergen area). Biological data were collected from the hauls.

Besides this, continuous analysis of by-catches by the trawlers was done to give advice to open or close trawling areas for protecting 0-group fish.

Poland

(J Porębski and Z Witek)

Ecophysiological studies were made in the Department of Biological Oceanography, University of Gdańsk, on Crangon crangon, Palaemon adspersus, Mesidotea entomon and Neomysis integer.

Portugal

(A Cascalho and M J Figueiredo)

Nephrops norvegicus

Four cruises on board the research vessels "Noruega" and "Mestre Costeiro" were carried out during 1984. The main purpose of two of these cruises was the prospection of new Nephrops grounds off the south Portuguese coast. In the whole 23420 individuals were measured.

The sampling programme at the fishing ports of Cascais and Setubal (west coast) was carried out as in previous years, in average twice a week in each port. A total of 9577 individuals was measured.

Biological studies have been carried out in terms of reproduction, fecundity, age at first maturity, growth and natural mortality for the two main Portuguese stocks, Algarve and Alentejo.

Parapenaeus longirostris and Aristeus antennatus

Two cruises on board the research vessel "Mestre Costeiro" were carried out during 1984. The purposes of these cruises were the studies on distribution and abundance, and selectivity.

The port sampling programme at Olhao (south coast) was carried out as in previous years. Sampling was done twice a week for each species.

Biological studies were carried out mainly about stocks composition by lengths and sexes and maturity stages. Some attempts on ageing P. longirostris were made.

Numbers sampled:

	Cruises	Fishing Ports	
	Individuals	Samples	Individuals
<u>Parapenaeus longirostris</u>	20566	75	7697
<u>Aristeus antennatus</u>	1766	100	6143

Spain

(A Perez Camacho)

Liocarcinus puber

Experimental fishing of this species was carried out, testing different types of pots, bait and escape holes.

Nephrops norvegicus

Laboratory experiments on the growth of this species were performed.

Palaemon adspersus, P. serratus and P. varians

Researches on feeding, growth, reproduction and larval development of these species were carried out.

Polibius henslowi

Different aspects of its biological cycle were studied in the Ria of Vigo.

Nephrops norvegicus

Sampling data for 1984

MARKET SAMPLES

		No samples	No fish measured
VII ck	1	6	1 992
	2	7	2 022
	3	1	132
	4	9	2 137
VIII c	1	6	764
	2	2	319
	3	-	-
	4	6	594
IX a	1	7	1 363
	2	8	1 351
	3	7	1 991
	4	3	1 089

Sweden

(H Hallbäck)

Nephrops norvegicus

The trawl fishery for Nephrops has increased and is now the third most valuable Swedish fishery. New fishing areas, close to the coast, will be opened in February 1985. Commercial fishing with creels has started in inshore waters and seems to be quite successful. Collection of catch data continued.

Pandalus borealis

Experiments with different mesh sizes in the codend and daily reporting of catches were continued. A population study on stocks in the biggest fjord of Sweden started to find out whether there is any degree of exchange with the stocks in the Skagerrack.

Homarus vulgaris

Collection of catch data continued. There will probably be new regulations for the lobster fishery during 1985.

Cancer pagurus

Collection of catch data continued.

United Kingdom

1. England and Wales

(R C A Bannister)

Crustacean stock monitoring took place as indicated in the following table.

ICES Area	Number measured by species					
	<u>Cancer pagurus</u>		<u>Homarus gammarus</u>		<u>Nephrops norvegicus</u>	
	1984	1983	1984	1983	1984	1983
IVb	7497	4109	5792	5223	6089	8276
IVc	140	438	-	182	-	-
VIIId	446	443	1630	1105	-	-
VIIf	2473	4870	-	1285	-	-
VIIa/g	467	611	1764	3663	-	-
VIIa	-	-	-	-	7382	8105

Homarus gammarus

The stock assessment for coastal fisheries was extended to study how various assumptions about the stock-recruit relationship would affect the relation between equilibrium yield and fishing mortality (ICES CM 1984/K:11).

Field experiments commenced to measure the size composition bias introduced by the size selectivity of pots. The first experiment aims to compare size compositions for Yorkshire parlour pots and traditional Norfolk creels.

Studies of the survival and recruitment of juvenile lobsters continued with the release of 8700 microtagged juveniles at the study site in Yorkshire.

Cancer pagurus

Concentrations of spawning females, supporting autumn fisheries for crabs in the eastern Channel, have been identified as being at risk from plans to extend the extraction of sea bed gravel to these areas.

Nephrops norvegicus

In the Irish Sea the main emphasis has been upon technical management measures (mesh and minimum landing sizes), predation studies, cod - Nephrops interactions, and the distribution, survival and abundance of larvae. The North Sea studies have included biometric observations, investigations of discarding and by-catch levels, and the use of market sampling data for length cohort analysis.

2. Scotland

(J Mason)

Nephrops

Sampling of commercial trawl and creel landings continued in most fishing areas. Research vessel surveys using small mesh trawls were conducted in the Clyde, Sound of Jura, Moray Firth and North Minch. Monthly sampling was undertaken in the Firth of Forth in order to estimate growth rates by Petersen's method.

A sledge carrying television and photographic cameras was used to estimate densities in the North Minch and Moray Firth. Further observations were made on the swimming behaviour of Nephrops and their orientation to water currents and ground ropes.

Further observations were made on the effects of light on the eyes of Nephrops in collaboration with Dr P Shelton, Leicester University. Threshold exposure times and light intensities causing retinal damage were determined. Batches of Nephrops with and without eye damage were released during September 1984 in Loch Torridon to see whether eye damage influences survival and whether there is any recovery of vision after one year.

Pandalus borealis

Long-term monitoring of the North Sea fishery was continued. Data on catch per unit effort, deepwater shrimp and by-catch landings were obtained.

Crangon crangon

Monitoring the Solway Firth fishery was continued, and additional data on the by-catch of the fishery were obtained.

Homarus gammarus

Sampling of commercial catches continued in all the main fishing areas. Catch and fishing effort data were collected from selected fishermen. Efforts are being made to substantially increase the number of observers.

The number of undersized lobsters being returned to the sea remained similar to the 1983 figures.

Recorded landings of legal sized lobsters increased in almost all areas, exceeding a total of 600 t, one of the highest levels for 20 years.

Comparative tagging trials using streamer tags and toggle tags were carried out in the Laboratory during 1984. Streamer tags proved to be highly effective, none being lost either during or after casting compared with a 60% tag loss incurred with the toggle tags.

The new streamer tags were field tested during a lobster tagging programme situated around the Summer Isles (northwest Scotland). Results so far are encouraging.

Exploratory diving was carried out around the Summer Isles in an attempt to test the feasibility of using diving techniques to evaluate lobster populations, especially juveniles. Although limited success was achieved, the method is very time consuming and other methods are to be evaluated in 1985 including various types of static "collectors".

An artificial reef was constructed in the Firth of Forth using natural stone from industrial excavations on shore. The reef contains approximately 200000 tonnes of rock and covers an area of 1000 m x 200 m in approximately 15-20 m of water. It consists of 60 small discrete reefs each containing around 2000 tonnes of material, each unit being no more than 2 m high. The reef was completed by August 1984 and has been left to settle over winter. A photographic and sampling survey will be conducted early in 1985.

Cancer pagurus

Sampling of commercial landings was continued. Collection of catch and fishing effort data is being increased.

Liocarcinus puber

Sampling of this species is sporadic owing to the nature of the fishery. Fecundity measurements showed that egg loss can be as high as 80% before hatching. Catch per unit effort data are being collected from selected fishermen.

USA

(Stephen H Clark and Michael Castagna)

The Northeast Fisheries Center (NEFC) conducted three inshore-offshore bottom-trawl surveys and one gear comparison survey totalling 126 vessel-days at sea which provided data for crustacean species. Personnel from NEFC, Maine, New Hampshire, and Massachusetts also conducted a bottom-trawl survey for northern shrimp (Pandalus borealis). The Massachusetts Division of Marine Fisheries (DMF) and the Rhode Island Department of Environmental Management (DEM) also conducted inshore bottom trawl surveys. The South Carolina Wildlife and Marine Resources Department (WMRD) conducted exploratory surveys for crabs (Geryon fenneri and Cancer borealis) and slipper lobster (Scyllarides nodifer). NEFC and Southeast Fisheries Center (SEFC) personnel and researchers in several state agencies also continued stock assessment work and related studies.

Northern Shrimp (Pandalus borealis)

The Maine Department of Marine Resources (DMR) continued larval physiology and ecology studies to evaluate factors affecting recruitment and development of separator trawls for reducing incidental harvest and discard of juvenile groundfish. State agencies in Maine, New Hampshire, Massachusetts, and the NEFC continued cooperative stock assessment work.

White Shrimp (*Penaeus setiferus*)

Pink Shrimp (*P. duorarum*)

Brown Shrimp (*P. aztecus*)

Several state agencies, including the North Carolina DMF, the South Carolina WMRD and the Georgia Department of Natural Resources (DNR) sampled inshore areas to evaluate species and size/sex composition and trends in abundance. North Carolina DMF personnel also studied pink shrimp size distribution relative to habitat type and initiated mark-recapture studies on brown shrimp. The Georgia DNR conducted mark-recapture studies on white shrimp to evaluate migration patterns and resulting management implications. The SEFC continued stock assessment research.

American Lobster (*Homarus americanus*)

Several state agencies including those of Maine, New Hampshire, Massachusetts, Connecticut, New York, and New Jersey initiated or continued commercial sampling programs, biological research (eg, growth, molting and mortality), studies on migrations and distribution, and stock assessment work. University of Maine researchers also studied growth and movement patterns, and the NEFC and the Maine DMR studied behavior, movements, and spatial/temporal relationships in offshore areas by tagging and use of manned submersibles. The Massachusetts DMF continued studies of sexual dimorphism and trends in population size and sex composition and monitored incidence of disease organisms. The Connecticut Department of Environmental Protection (DEP) studied larval distribution and biology of juvenile lobsters and continued research to determine effects of trawling on lobster resources. The NEFC continued larval sampling and assessment studies for offshore populations.

Blue Crab (*Callinectes sapidus*)

Several state agencies including those of New Jersey, Maryland, Delaware, North and South Carolina and Georgia continued various monitoring activities to evaluate population size and sex composition, molting stage, and relative abundance and distribution. Studies of inshore dispersal of post-larvae continued at the University of Maryland, and researchers at Old Dominion University investigated management strategies to increase yield. The New Jersey DEP continued stock identification studies and investigations on migration and seasonal movements.

Crabs (*Cancer* and *Carcinus* spp.)

The Maine DMR studied biological parameters and monitored trends in abundance.

USSR

(S A Studenetsky)

Deep-water prawn *Pandalus borealis* in April-July 1984 Polar Research Institute of Marine Fisheries and Oceanography (PINRO) conducted a complex plankton survey on RV "Alaid" in the north-eastern Norwegian Sea and the south-western Barents Sea. One thousand and two hundred samples were taken. Data on the scope and the dominant direction of *Pandalus borealis* larval drift were collected.

In accordance with the Soviet-Norwegian agreement PINRO in April-May conducted the survey of the Barents Sea deep-water prawn stocks on RV "Menzelinsk". Two hundred trawlings were made. In June RV "Khadyzhensk" carried out the survey of deep-water prawn stocks off Spitsbergen. Ninety trawlings were made. The biomass and the abundance of deep-water prawn commercial stocks over the examined area were estimated.