

International Council for the
Exploration of the Sea

C.M. 1984/K:1
Report of
Activities

SHELLFISH COMMITTEE

by

James Mason

1983

MOLLUSCA

Belgium

(Reporting only on Crustacea)

Canada

(G P Ennis)

Illex illecebrosus

A research survey was conducted (January–February 1983) on the RV "Alfred Needler" to determine the distribution of larval and juvenile Illex illecebrosus in the area between Chesapeake Bay and northern Florida and the possible influence of the Gulf Stream on their northeastward transport. The program combined oceanographic sampling with plankton and midwater trawl fishing in the Gulf Stream/Slope Water Frontal Zone between Cape Hatteras and Jacksonville, Florida.

Further Soviet–Canadian studies of Illex illecebrosus were carried out on the RV "Gizhiga" from March to June 1983. During the first months of the survey, the program consisted of oceanographic sampling and plankton and midwater trawl fishing in the area between the Gulf Stream and the Scotian Shelf from 65° W to 55° W and in an area southeast of the Grand Banks. In June a bottom trawl survey of the Scottish Shelf was conducted to study the distribution of Illex during the early on-shelf migration period.

Ongoing July and October groundfish research cruises and samples and data received from the International Observer Program provided information on abundance, distribution, and biology of squids as well as on hydrographic conditions on the Scotian Shelf.

A six-week (August to October 1983) joint squid research survey was conducted with France to investigate abundance, distribution and biology of squid during their period of residency on the Scotian Shelf. During September a Canadian research survey was carried out to study the population structure and distribution of squid at the Scotian Shelf edge and seaward to the Gulf Stream and also to conduct a mark and recapture experiment to study migration patterns.

Studies on maturation and fecundity were continued in cooperation with Dalhousie University. A Canadian squid research survey was conducted during January–February 1983 within the Gulf Stream System between Chesapeake Bay and Florida to investigate spawning ground and aspects of larval and juvenile Illex distribution. The program combined oceanographic survey with plankton and trawl fishing on the Shelf edge and off the Shelf to the Gulf Stream. A special squid cruise was also conducted on the Grand Banks and in the Slope Water south of the Grand Banks from late May to mid June to provide information on abundance, biology and distribution in relation to hydrographic conditions.

Biological studies were not carried out at Newfoundland during 1983 owing to the virtual absence of squid in inshore areas during the commercial fishing season.

Placopecten magellanicus

Three new studies were initiated during 1983. A joint study with L Zouros of Dalhousie University on the biological characteristics of several discrete scallop aggregations was carried out (including life

history, morphological, and biochemical measures). Preliminary results suggest that the aggregations are very similar with respect to enzyme characteristics but differ in other characteristics, such as growth and morphology. The second study deals with the larval phase of a small aggregation of scallops within a semi-enclosed bay near Halifax, Nova Scotia. Plankton sampling was carried out from prior to spawning to approximately two months after spawning. This preliminary study aims to develop expertise in sampling the larval population as well as in sorting and identification. During 1984 the larval ecology of a major offshore commercial aggregation will be studied. The third study, again preliminary, deals with the juvenile pre-recruit phase (from settlement to recruitment to the fishery). During 1983 the major aim, as with the larval study, was to gain familiarity with experimental techniques, in this case using artificial substrata for scallop settlement.

In addition to these new research initiatives, ongoing assessment-related activities were carried out. Scallop surveys were conducted on the northern edge and northeast peak of Georges Bank, on the Scotian Shelf, in the Bay of Fundy near Digby and Brier Island, and off Grand Manan. Data on age-specific abundance, growth, and meat yield characteristics were collected.

Research surveys were conducted on St Pierre Bank in January and September 1983. Commercial catches were sampled at sea and landings were sampled at ports. Landings from St Pierre Bank dropped to 594 t (meats) from the record level of 717 t in 1982 despite a comparable level of effort.

Arctica islandica, Spisula polynyma, Cryptodaria siliqua

Work continued on the processing and analysis of samples and data from the ocean quahog/benthic studies undertaken between 1980-83. Preliminary findings were published. A further survey was directed at locating and estimating the stock size of underutilized molluscs in the St Ann's Bank area of Cape Breton Island. In addition, previously marked quahogs on Sable Island Bank were recaptured for growth analysis. A further 21 261 Arctica and 9 809 Spisula were marked on Sable Island and Banquereux Banks. An update of the 1983 survey. Tagged Arctica are being monitored in a continuing study of growth and maturation in inshore populations.

Mya arenaria, Crassostrea virginica

Soft-shell clam inventory surveys were carried out on 140 hectares in Charlotte County, New Brunswick, and 160 hectares in the Annapolis Basin, Nova Scotia. Data are being analyzed.

A five-year data base (1968-1972) on oyster size and abundance is being processed to determine in situ rates of growth and mortality of pre-recruit oysters (spat to 75 mm) in the Dunk River, Prince Edward Island. In addition, nine years of oyster population structure data were summarized and will soon be reported.

Denmark

(Reporting only on Crustacea)

France

(D Latrouite)

Pecten maximus

L'étude des principaux stocks de coquilles Saint-Jacques du littoral se poursuit sur le littoral Atlantique et en Manche. En 1983, la production de la baie de Saint-Brieuc est passée de 4 000 à 4 200 tonnes pour une réduction de l'effort de pêche de 20%. Pour 1984, il faut s'attendre à des résultats très voisins. Le prérecrutement n'a pu être correctement estimé en raison de la faible taille des individus. Cependant quelques observations ponctuelles réalisées en fin d'année laissent penser que le recrutement pour la saison de pêche 1984/1985 sera supérieur à celui observé pour la campagne en cours.

Les observations réalisées en septembre 1983 avec le N° "La Pelagia" de l'ISTPM ont confirmé la baisse du recrutement en Baie de Seine, la production de cette zone serait de l'ordre de 2 000 tonnes pour la campagne en cours (septembre 1983-mai 1984). Sur les autres gisements de la Manche Centrale, le recrutement demeure faible.

En 1983, les études ont également porté sur la sélectivité du maillage des tabliers de dragues; elles ont permis de distinguer la part de sélectivité due à l'écartement des dents et celle qui dépend du tablier. Enfin l'évolution de la flottille des dragueurs travaillant la coquille Saint-Jacques en baie de Saint-Brieuc a été définie de 1975 à 1983. Ce facteur devra être pris en compte pour l'estimation de l'effort de pêche.

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 Kusten- und Binnenfischerei.

Cardium (= Cerastoderma) edule

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

Iceland

(U Skúladóttir and H Eiríksson)

Chlamys islandica

Two Iceland scallop surveys were carried out off the west and north coasts of Iceland. In the latter area new scallop beds were located in Húnaflói.

Scallop landings continued to rise and amounted to a total of approximately 15 000m tons as compared with about 12 000 tons in 1982. On the whole cpue has remained stable in all the major fishing areas.

Two scallop surveys are planned for 1984. These will include assessment of the state of the more heavily fished stocks off the west and north-west coasts and exploratory fishing at East Iceland.

Ireland

(J P Hillis)

Mytilus edulis

Studies carried out on the Boyne Estuary (east coast) stock showed the mean meat yield to be very low at 10%; investigations into the cause of this, including the possibility of its being pollution-related, were carried out. Stocks were also investigated in Clonakilty Bay (south coast) and Castlemaine Harbour (south-west) where mean meat yields of 13% and 20% respectively were found.

Ostrea edulis

Pecten maximus

No work to report in 1983.

The Netherlands

(A C Drinkwaard)

Ostrea edulis

For the most part the applied research concerned the development and exploitation of the oyster population in the Lake Grevelingen. The stock was growing to such an extent that during the oyster-shipment season 1983-1984 the withdrawing of ten million consumption-size oysters could be allowed. At the end of the year 8.5 million oysters had already been dredged up by a small group of vessels working in concerted action for the merchants at Yerseke.

In this 580 million m³ large spatting pond 9 000m³ mussel shells from the canneries were discharged in the beginning of July as clutch for spat collecting. This quantity is six times the 1979 amount, but it covers both the private (leased) plots and the wild banks.

The concentration of oyster larvae larger than 247µ showed only one peak in the middle of July, reaching more than 250 samples per 100l. An abundant spatfall was the result, followed by a nice growing season of nearly three months till October. On the other hand, it was also observed that the shell disease made a good chance at several locations, favoured by a very long period of sea-water temperatures above 20°C.

In October a long-term survey commenced for estimating directly the growth and natural mortality in this new year-class. It is necessary to get a clear picture of the Lake Grevelingen possibilities in relation to depth and bottom differences. A shift of the well-being of oysters towards shallower areas could not be ascribed only to a tremendous increase of sea-squirts competing for food and space in the deeper ranges. The surveys to assess the oyster stock will be continued in 1984, in common with the spatfall prediction service and spatfall monitoring programme. For this monitoring programme small lime-coated hard plastic plates are in use for continuous control of the settlement. At several stations these plates are exchanged twice a week during the summer period.

In the dam which separates the Lake Grevelingen at the east side from the rear of the Oosterschelde estuary a discharge-slue has been built with an average capacity of 80m³ s⁻¹. This sluice will function as a one-way siphon in the direction of the Oosterschelde. The siphon is so constructed that the water shed between the Lake Grevelingen and the Oosterschelde remains unchanged. Since the dam at the west side of the Lake Grevelingen is provided with a sluice by which it is possible to let in sea water from the North Sea with a capacity of 100m³ s⁻¹, in principle it became possible to control the quality of the water in Lake Grevelingen. This guarantees a sufficiently high average salinity of 16g Cl l⁻¹ for using this basin as a large scale spatting pond.

Except for the pathological research not much attention has been paid to the situation in the Oosterschelde. The supply of flat oysters for on-growing and fattening from abroad was nil and will be nil in the future to safeguard the local prospects for a new industry from introduction of diseases.

Some consumption oysters were imported late in autumn, stored in separate pits and bound direct for the market. For the third year, it was not permitted to use parts of the Oosterschelde bottom for relaying of flat oysters. This was based on the management policy to give the Bonamia ostreae disease no chance. This policy will be continued for 1984. Only some controlled culture experiments for the reseeding of the Yerseke Bank will start on six different plots, using seed oysters from Lake Grevelingen.

The feasibility study of large-scale nursery exploitation in the Zeeland waters was continued and will be published in 1984. This system competes with the Lake Grevelingen seed oysters supply to restore the oyster culture in the Oosterschelde to a level of 30 million consumption-size oysters per year.

Crassostrea gigas

The artificial rocky slopes of the dikes around the Oosterschelde and other parts of the littoral zone add up to a good place for the natural settlement of the Pacific or Japanese oyster. This non-indigenous oyster is now accepted as belonging to the Zeeland fauna and commercialising is going on. In the beginning of August spat was collected also on mussel shells, spread over some tidal flats.

The observations and the restricted spat fall monitoring on the Yerseke Bank, using lime-coated plates, was just enough to follow the broad outlines of this progressive, dynamic population development.

Mytilus edulis

The mussel culture activities in 1983-1984 showed a quite different result from the previous year with a top production of 150 000 tons. During this season the Dutch landings remained below 100 000 tons. The gap in the market supply however could be filled up by importation of consumption-size mussels from the German and Danish Wadden Sea. In the majority of cases these mussels achieved better keeping quality during their stay on the rewatering places of the Yerseke Bank. In this way, this area showed again its function as an international transit-trade harbour.

Mussel seed settlement between consumption-size mussels and stormy weather in spring were not the only misfortunes this year. Caused by the prolonged period of high sea water temperatures till far into the autumn, the required energy for the relatively high basic metabolism in September and October exceeded the supply of energy by the food intake. After a successful growing period in summer, the mussels rapidly lost weight through not reaching their maintenance ration in consumption, so using their own reserves from the somatic part. This could not be compensated for in time before the winter. This drop in condition appeared not only in the Oosterschelde but also in large parts of the Wadden Sea from Den Helder to Esbjerg and other European culture areas. Only in some eutrophic zones of the Wadden Sea was the availability of food and intake by the mussels enough to compensate for the enlarged energy expenditure caused by the high metabolic rate for the time of the year.

Exact figures of this phenomenon are obtained from physical and ecological surveys on mussel plots in the middle and western parts of the Oosterschelde. These surveys aim to describe the functioning of the mussel culture plots before and after the completion of the storm-surge barrier across the mouth of the Oosterschelde when the production will have to be tailored to the new situation resulting from the reduced horizontal and vertical tide. These surveys on several selected plots are focussed on bottom configuration, current velocities, transport of sand and silt along the bottom, food and oxygen supply, shell growth, biomass development etc., to learn more about the limits for a remunerative, intensive production of mussels.

During these surveys side-scanning sonar apparatus has been used for mapping the mussel locations and bare grounds in close cooperation with the Delta Division of the Rijkswaterstaat (Ministry of Transport and Public Works).

The studies concerning the functioning of the mussel rewatering places at the Yerseke Bank entered into the phase of discussion after the conclusions became available. A careful examination has been made of the erosion factors, such as tidal currents, wave action and periodical dredging of mussels on the plots. It is expected that after the completion of the storm-surge barrier the erosion forces - averting deposition of faeces by the mussels - will decrease slightly.

Cerastoderma edule

The cockle fishery is rather stable after the boom of some years ago. The interest for semi-culture of cockles decreased after the adaptation to the possibilities of the natural resources made great progress.

An assessment of the cockle stock in the Oosterschelde was carried out, especially to get better acquainted with the proportion of the whole population, like those of other molluscs, for carrying capacity studies. These studies in the Oosterschelde are conducted by the Delta Institute for Hydrobiological Research and concern also the food supply from the North Sea and the primary production in the Oosterschelde itself, continuing the studies on the organic carbon flux and food web.

Environmental conditions

Attention was paid to the pattern and velocity of wind driven flows in the Lake Grevelingen. This 'stagnant' sea water lake exhibits signs of a very simple hydrographic pattern. In slow motion, however, the signs are very unpredictable. For this reason the Dutch Hydraulic Laboratory constructed some water circulation models for different wind circumstances depending on the position of the island and shallows and the gulleys between them.

The common hydrographic baseline studies in the Oosterschelde, related to the nearby environment of cultured and stored molluscs, were continued.

Studies to determine the essential measures and financial consequences of the re-establishment of the former oyster plots, now partly covered with (moving) sand, are prepared and proposed. Soil exploration and model prognosis will help.

Diseases and pests

The field studies on the Yerseke Bank to estimate the presence and activity of the Bonamia ostreae oyster disease continued. As in former years, the 1983 experiments were carried out with infection-free oysters of Lake Grevelingen origin and planted on six sites of the earlier infected Yerseke Bank in the Oosterschelde. These indicator oysters were sampled each month during the period April to December and histologically checked for the presence of Bonamia infection.

In the previous years the field studies showed decreasing characteristics of the presence of the oyster pathogen since the 1981 measures to control the Bonamia disease by ceasing all culture activities in the Oosterschelde estuary.

This year, however, proved to be the first year in which all experimental oyster sites of the Yerseke Bank remained free of the Bonamia infection. With this result an experimental oyster restocking programme for the Yerseke Bank is possible for 1984. Pathological examination of the oysters, used for this activity, will be necessary for some more years.

Molluscan shellfish toxicity and sanitary control

From May to October a weekly monitoring programme on phytoplankton toxins was carried out on mussels from the Oosterschelde and Wadden Sea. The concentration of Dinophysis acuminata in Dutch coastal waters was extraordinarily low. Mussels from the culture sites appeared to be free of a diarrhetic toxin as determined by rat bioassay.

The sanitary quality of water and mussels from the culture and re-watering sites in the areas mentioned was found correct.

A case of red discolouration in oysters by the symbiotic ciliate Mesodinium rubrum (Lohmann) was observed in Lake Grevelingen. This phenomenon disappeared within three days.

Norway

(K R Gundersen)

Cephalopods

Todarodes sagittatus

Materials were collected from research vessels and the commercial fishery during January-November. Off the west coast of Norway the fishery on squid from the 1982 invasion continued during January-February, but the increasing sizes, with DML lengths of the females 31-42cm (mean 36cm) made the fishery unprofitable. Still larger squid, DML mean length 40cm, maximum 45cm, appeared in June.

The autumn invasion started with small squid, DML 20-25cm, appearing near Shetland at the end of July. During August-November, new waves of squid entered the coastal waters of Norway from Bergen to North Cape.

Off the west coast, the mean DML of the females was about 23cm in July, and 25-28cm in August-October. Further north, the squid at the beginning of November had a mean length of about 35cm.

Age determinations based on ring counts in the statoliths once more confirmed spawning periods in winter, spring and summer as indicated in earlier investigations. Squid sampled in January-February derived from spawnings in January-May 1982, those taken in the Hebrides-Rockall-Porcupine area in April had been hatched in April-July 1982, and squid caught at the coast of Norway in June originated from spawning in June-August, mostly in August. Of importance for the commercial fishery were spawnings in November 1982-January 1983 for catches in July-August, and spawnings in December-February for those fished in September-November.

Two hundred and fifty-six squid were tagged on the west coast in September-October. Two of them were recaptured after respectively 24 and 54 days at liberty near the tagging localities.

The commercial fishery yielded about 20 000 metric tons of squid.

Gonatus fabricii (gonatus)

Materials were collected during surveys with pelagic trawl for post-larval and 0-group fish during June-September, in the Norwegian and Barents Seas and west of West-Spitzbergen. Most of the hauls were taken in the upper 50m, yielding mainly juveniles with DML 10-80mm, but in deeper hauls, 200-450m, a few larger animals, DML 80-200mm, were taken. As in 1982, juvenile Gonatus were most abundant on the Tromsøflaket Bank in July, maximum 1 800 squid per hour of trawling.

Based on ring counts in the statoliths, Gonatus caught in July-August were possibly spawned in February-March, and those caught in September derived from spawning in April. Gonatus with DML 11-28mm had 60-80 growth rings in the statoliths, those with DML 30-200mm, averaging 135-155 growth rings. It is supposed that Gonatus may live as juveniles in the upper layers up to 6-7 months.

Large Gonatus were identified in stomach contents of blue ling caught at 490-600m on the continental slope west of Norway (Storegga) in April-May 1981 and in black halibut from the same area in May-June 1983. The Gonatus measured 95-255mm, with averages of 168mm and 193mm respectively.

Poland

(J Porebski)

No research activity on cephalopods to report in 1983.

Portugal

(M J Figueiredo and A Cascalho)

Cephalopoda

Studies on distribution and abundance of the most important commercial species were carried out, based on results of cruises on board R V 'Noruega'.

Biological studies on Loligo vulgaris, Loligo forbesi and Illex coindetii were continued.

Studies on the biology of Eledone cirrosa were started.

A study of the chemical constitution of squids Loligo vulgaris and Loligo forbesi was started.

Bivalvia

Studies on maturation periods of mussels were continued and observations on parasitism were started in a coast lagoon of the northern coast of Portugal.

Trials were continued on the settlement of oyster larvae and undertaken on the settlement of clam larvae in an experimental plant in Tavira (south coast); growth rates in both species were followed.

Spain

(A Perez Camacho)

Bivalves

Studies on bivalve natural beds are being carried out in the north and south Atlantic coasts of Spain, focussed on the knowledge of distribution, abundance and biology of the commercially important species (Venerupis rhombooides, V. decussata, V. pullastra, Cardium edule, Venus gallina, Donax trunculus and D. vittatus) in order to achieve an exploitation strategy.

The possible introduction of Ruditapes philippinarum into Galicia is being studied. In the Ria de Arosa, growth and mortality of small individuals produced in a hatchery was evaluated, as well as growth, mortality and sexual maturity of commercial sized individuals.

Cephalopods

Over 190 experimental trawls were realised in the Ria de Vigo during 1983, in order to determine the life cycles of the commercially important species Sepia officinalis, S. elegans, Alloteuthis subulata, Loligo vulgaris and Octopus vulgaris.

Sweden

(H Hallbäck)

The numbers of cultures of Mytilus edulis are still increasing. The total production during 1984 will be about 5 000 tons. During 1983 some experimental cultures of Ostrea edulis were started.

United Kingdom

1. England and Wales

(R C A Bannister)

Pecten maximus

Checks were made on the sampling efficiency of the Newhaven dredge by means of a mark-recapture experiment carried out in Cornwall in June. Efficiency was estimated to be 25% for medium ground, 18% for smooth ground and 7% for stony ground.

A diver survey was carried out on a series of transects on an inshore site at Veryan Bay, Cornwall, with a view to mounting a regular monitoring by diver of population changes in the area. Density, distribution and age composition were estimated, and a special survey for young scallops was completed, with some success.

Ostrea edulis

Dredge surveys were carried out to measure abundance of natural stocks in the River Fal and in the Solent.

Past trends in the Solent stock were analysed using dredge survey data for 1974 to 1983. These show that the recruitment of 1974-1976 has not been replaced.

Sampling of oysters from the fisheries and cultivators' plots for the parasite Bonamia ostreae continued. Results showed the expected intensification of the parasite on already infected beds in Cornwall and Essex but the main fishery in the River Fal, and the stocks in the Solent and at Poole remained free of the parasite. Experiments showed Bonamia to be transmitted to disease-free oysters placed on infected beds, or held in trays above these beds. However, there were no major new areas of infection. The policy is being maintained of licensing deposits from approved disease-free areas only.

Mitilus edulis

The annual survey of the Wash beds took place as usual. Marketable stock has declined substantially and there was no significant spatfall. However, spat collectors showed that at two main sites there were abundant spat in the water, and the seasonality was well shown. Attempts to develop the use of aerial survey techniques continue. A long time series of abundance and spatfall data has now been assembled for stock assessment purposes.

Cerastoderma edule

A detailed quadrat survey was undertaken on the Burry Inlet in November. Dense areas of second winter cockles were found and there was an abundant settlement of first winter animals. Numbers of predatory oyster catchers were rather low.

Mercenaria mercenaria

A grab survey of the clam stocks in Southampton Water in February highlighted the continuing decline in the abundance of marketable clams, which in the absence of spatfall are not being replaced.

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 were down from 6 532t in 1982 to 5 076t in 1983, though there was little change in landings per unit effort in any of the fisheries. Queen landings increased from 3 699t in 1982 to 4 431t in 1983, again with little change in pue.

Studies of settlement and early growth of both species continued, concentrating on the collection of large numbers of Pecten spat. A study was made of those areas found to be best in 1982. In Loch Nevis, Loch Carron and Applecross the 1983 results were particularly good, and Pecten outnumbered Chlamys. The average numbers of Pecten collected per bag in these areas were Loch Nevis - 724; Loch Carron - 1 376; Applecross - 1 281. The size of Pecten spat ranged from 2 to 26mm and that of Chlamys from 3 to 24mm.

Suspended cultivation was continued in Loch Ardvar. It was found that an initial density of Chlamys spat of 440/m² gave the best survival and growth. Spat from the 1981 settlement had reached a mean size of over 60mm by November 1983.

Pecten spat of the 1982 settlement reached a mean size of 45mm by November 1983.

Experiments on different method of transporting spat suggest that, provided the temperature is low, survival is as good using containers without water as when the animals are kept in aerated water.

In 1984 the settlement experiments are being extended to include the south-west of Scotland and on-growing experiments will include determination of meat weights and further trials on the sea bed.

Loligo forbesi and Todarodes sagittatus

Landings of both species were monitored. Length frequency data were obtained for L. forbesi from market sampling of landed catches.

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. The tests were extended to cover histological examination for Bonamia.

USA

(Stephen H Clark and Michael Castagna)

General

This report summarises research activities on commercially important mollusk and crustacean species during 1983 by US federal and state agencies and academic institutions.

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 153 vessel days at sea which provided data for shellfish species. Specialised surveys were conducted for sea scallops (Placopecten magellanicus), surf clams (Spisula solidissima), ocean quahogs (Arctica islandica), and northern shrimp (Pandalus borealis), totalling 70 days at sea. The NEFC also continued work on design and testing of a new shrimp research trawl and participated in a cooperative shellfish survey with Canada. The Massachusetts Division of Marine Fisheries (DMF) and the Rhode Island Department of Environmental Management (DEM) conducted inshore bottom trawl surveys which provided data for shellfish species. Several state agencies conducted resource inventory work and collected statistical data and biological samples. NEFC personnel also collected commercial samples at dockside and performed age determinations on sea scallops, surf clams, and ocean quahogs.

NEFC and Southeast Fisheries Center (SEFC) personnel continued stock assessment research for major shellfish resources and completed other reports and manuscripts dealing with biology and distribution. The Manned Undersea Research Team (MURT) of the National Oceanic and Atmospheric Administration (NOAA) continued monitoring of key shellfish species in oil and gas drilling lease areas on Georges Bank and in adjacent submarine canyons. Studies on a variety of parasites and pathogens continued at the NEFC Oxford Laboratory.

Several state agencies continued stock assessment work and related research. The Maine Department of Marine Resources (DMR) continued surveys to determine types and sources of pollutants affecting shellfish resources and impacts on production potential. The New York Department of Environmental Conservation (DEC) continued inventories of shellfish resources, studies of pollution incidence and shellfish transplanting programs. The Massachusetts DMR continued its Shellfish Technical Assistance Program in support of industry and local municipalities. The Maryland Department of Natural Resources (DNR) and the Delaware DNR studied the distribution and intensity of shellfish diseases in Chesapeake Bay.

American oyster (*Crassostrea virginica*)

Several academic institutions and state agencies, including those of Maine, New Jersey, Maryland, Delaware, and Virginia, monitored incidence and intensity of disease in natural populations. The New Jersey Department of Environmental Protection (DEP) and the Delaware DNR investigated population density and recruitment trends in Delaware Bay, and the Maryland DNR conducted studies to determine factors responsible for mortality and reductions in yield in Chesapeake Bay. The Virginia Institute of Marine Science and the North Carolina Division of Marine Fisheries (DMF) monitored cultch plantings to determine spatset rates and to evaluate growth and survival. The South Carolina Wildlife and Marine Resources Department (WMRD) conducted surveys

of intertidal populations and evaluated mechanical harvesting machines in cooperation with Clemson University.

Sea scallop (*Placopecten magellanicus*)

The NEFC and the Maine DMR conducted stock assessment work and biological evaluations of Gulf of Maine populations (eg growth and mortality studies). The Rhode Island Department of Environmental Management (DEM) conducted specialised sampling programs to monitor diseases in Narragansett Bay.

Bay scallop (*Argopecten irradians*)

The Rhode Island DEM evaluated factors contributing to variability in recruitment. The North Carolina DMF conducted seasonal sampling to evaluate biological parameters, size composition and distribution.

Calico scallop (*Argopecten gibbus*)

The South Carolina WMRD conducted resource surveys and performed genetic studies.

Hard clam (*Mercenaria mercenaria*)

The New York DEC continued assessment-related studies including development of a population index to evaluate resource trends. The Marine Science Research Center, the State University of New York and local municipalities continued ongoing research and management activities. The New Jersey DEP and the Delaware DNR continued resource assessment and recruitment monitoring work.

Ocean quahog (*Arctica islandica*)

The NEFC continued stock assessment work and growth and maturation studies. Several state agencies continued monitoring of various contaminants including cyanide and heavy metals. Research on growth, reproductive biology and early life history continued at several academic institutions, including Rutgers University, the Woods Hole Oceanographic Institution (WHOI), and the University of Maine.

Surf clam (*Spisula solidissima*)

The NEFC and personnel from several state agencies including those of Massachusetts, New Jersey and Delaware continued stock assessment work. The NEFC also continued ageing studies in collaboration with the University of Maryland (Eastern Shore). Rutgers University conducted assessment studies in cooperation with the New Jersey DEP. The Maine DMR evaluated pollution impacts. The South Carolina WMRD studied growth and survival of surf clam seed in cooperation with the NEFC's Milford Laboratory.

Softshell clam (*Mya arenaria*)

The Maine DMR and the Massachusetts DMF continued assessment-related studies and monitored pollution levels.

Short-finned squid (*Illex illecebrosus*)
Long-finned squid (*Loligo pealei*)

NEFC personnel continued biological research and stock assessment work including detailed analyses of yield in relation to differing harvest strategies for Loligo.

USSR

(S A Studenetsky)

Todarodes

The distribution and abundance of arrow squid (Todarodes sagittatus) were studied in the Barents and Norwegian Seas and open areas of the north-east Atlantic. R V 'Kokshajsk' conducted research in February-April, R V 'Persey 3' in March-June, scouting research vessel 'Onega' - in September and October. Three hundred and eighty-four tows were conducted, 452 light stations were made. The biological analysis of about 4 800 specimens was done. It was pointed out that food supply of squids was good. Under these conditions feeding concentrations of squid did not spread so far northeastwards as they did in 1980-1982.

CRUSTACEA

Belgium

(F Redant)

Crangon crangon

Biannual sampling of the shrimp stock and its predators off the Belgian coast was continued in 1983 in order to obtain a continuous set of data on egg production, natality, recruitment, production and mortality. The study of long-term population dynamics of the shrimp stock and competitive and predatory interactions with epibenthic and demersal species was also continued.

The regular samplings on other epibenthic organisms were continued to evaluate long-term changes in epibenthos species composition and in the abundance and biomass of dominant species. The epibenthic fauna was classified according to origin and abundance (dominant, abundant and rare autochthonous species, migrating allochthonous species and wandering species, some of which have an Atlantic origin).

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 state of exploitation of the Nephrops stock in the Central North Sea.

A study on diurnal variations in cpue and length composition of the catches in the Belgian Nephrops fishery was started. This study included a detailed analysis of log-book data of several commercial Nephrops trawlers and length-frequency distributions of Nephrops in individual hauls. Peak cpues were observed just after dawn and just before dusk. Significant changes in the length composition of the Nephrops catches with the time of the day could not be demonstrated.

Canada

(G P Ennis)

Homarus americanus

The lobster larval ecology project has two components; 1) seasonal distribution of larvae in a coastal embayment (St Margarets Bay to the southwest of Halifax) and 2) spatial distribution of larvae in the offshore Gulf of Maine area. Weekly sampling was carried out during the summer and early-autumn period within St Margarets Bay. The larval abundances are low, but with higher abundances observed in surface than in subsurface tows. The exploratory survey of the offshore bank located high concentrations of larvae in the frontal zone along the northern edge of Georges Bank.

A large-scale tagging program on the offshore lobster fishery continued in 1983 with 3 000 lobsters tagged (bringing the total to approximately 7 000). Tagging began in late May with some deep-water releases. Berried female and sublegal-length lobsters caught by fishermen were measured and returned to the water with tags in place. This resulted in movement and growth data from the multiple recapture of individual lobsters. The high degree of cooperation from the fishermen resulted in a large and growing data set on movement, growth and reproductive frequency of offshore lobsters. Seasonal shifts in percentage of berried females and of mean size were described from sampling at sea. Egg samples were taken (600 samples in total) to determine mean hatching time and its variance. The hatching period was protracted for Georges Bank, showing an earlier peak period than Browns Bank. BRUTIV (Bottom Referencing Underwater Towed Instrument Vehicle) was employed to assess lobster distribution and density within a closure area to the fishery on Browns Bank. Over 7500 pictures were taken during 11 tows. Lobsters were most abundant in the small, rocky shoal area of northwest Browns Bank, with fewer in the more open sandy regions.

A field and laboratory study of the ecology of juvenile lobsters was initiated. Sampling by SCUBA of juvenile lobsters off Shelburn, Nova Scotia continued on a bi-monthly basis to describe changes in population density, size frequencies and seasonal growth. A complementary laboratory study was initiated to evaluate how biotic and abiotic factors modify juvenile lobster activity and feeding behaviour.

In addition to the above research programs, particular attention was directed toward a better description of the inshore lobster fishery in the Scotia-Fundy Region from Cape Breton to the Bay of Fundy (its geographic distribution and effort characteristics).

Long-term monitoring of the lobster fishery and studies of various aspects of lobster population biology and dynamics were continued in three localities around the coast of Newfoundland. This included commercial catch sampling, obtaining logs from individual fishermen, collecting tags from previous year's tagging operations, carrying out additional tagging and shell condition sampling. Studies of larval distribution and ecology in a near-shore area were continued. A tag-recapture study of an unfished lobster population around a small island continued.

Pandalus borealis

Monitoring of the shrimp fishery on Scotian Shelf continued. Research surveys were conducted in May and November. Biomass estimates indicate a substantial increase in abundance over 1980-82 levels.

Data on the shrimp fishery off Labrador were obtained through the observer program and from vessel logbooks. A research survey was carried out in NAFO Divisions 2HJ during July. Biomass estimates indicate declining abundance.

Chionoecetes opilio

Sampling of the snow crab fishery at sea and at ports around the Atlantic coast of Cape Breton Island continued to provide information on catch size-frequency and shell-stage. Assessments of the 1983 fishery indicate continued low stock levels.

In the Newfoundland fishery sampling of commercial catches at sea and at processing plants continued. Catch and cpue data for the various management areas were analyzed and biomass estimates based on 1982 data derived. Tagging studies to determine movement and fishing mortality continued and analyses of data from previous studies were carried out. Additional methods of population estimation including random stratified trapping surveys, the use of cpue with area fished per trap and area of fishing grounds are being tried. New studies into various aspects of moulting and egg development were initiated.

Denmark

(S Munch-Petersen)

Nephrops norvegicus

Mesh selection experiments and by-catch investigations were undertaken.

France

(A Charauau)

Nephrops norvegicus

L'étude des pêcheries de langoustines et d'espèces associées, a été poursuivie en particulier en ce qui concerne les plans d'échantillonnage pour les pêcheries de Mer Celtique et du Golfe de Gascogne. Pour l'étude de la croissance, 3 000 marquages ont été effectués sur la fosse des Smalls (division CIEM VIIg). Le nombre de recaptures pour les marquages effectués en 1982 dans la même division est très décevant et n'excède pas 1%. Si les résultats sont aussi médiocres pour les marquages 1983 l'expérience ne sera pas renouvelée.

Enfin, sur ces deux pêcheries un chalut dit "sélectif" à nappe séparatrice horizontale a été expérimenté. Dans le Golfe de Gascogne, son efficacité est particulièrement grande puisqu'il peut séparer 85% de la langoustine et 85% du merlu, espèce associée la plus importante, dans les poches basse et haute. Par contre, en Mer Celtique où la capture accessoire est surtout composée de baudroie, chien, cardine et morue se nourrissant au niveau du fond, la séparation langoustine-poisson est mauvaise et l'utilisation du chalut sélectif semble totalement inutile.

Homarus gammarus

Les expériences de marquage-recapture et les observations sur la relation entre la taille et le taux de femelles ovigères ont été poursuivies dans les divisions VIIe et VIIIa. L'évolution des apports et l'échantillonnage des captures ont été réalisés sur quelques pêcheries.

Des analyses de cohorte ont été faites sur les données de la période 1975-1982 et une attention particulière a été accordée au problème de la capturabilité.

Des observations sur le taux de perte de marques (type sphyrion) ont été conduites en laboratoire.

Parallèlement à l'immersion de post-larves et de juvéniles produits en écloserie, des recherches sur l'éco-éthologie ont permis de préciser les relations entre post-larves ou juvéniles et le substrat, les caractéristiques des abus ainsi que le comportement de creusement du jeune homard. Les modalités pratiques de mise en oeuvre dès 1984 d'un programme destiné à apprécier l'impact de l'immersion de juvéniles sur la ressource ont été définies.

Cancer pagurus

Les travaux ont porté principalement sur l'étude de la croissance et des déplacements dans le VIIIa et sur l'acquisition des paramètres à exploitation pour les flottilles travaillant en VIIIa, VIIe et VIIf.

Le nombre de données disponibles étant jugé insuffisant pour établir la courbe de croissance, de nouveaux marquages ont été réalisés dans le Golfe de Gascogne et en Mer d'Iroise.

Les apports, les efforts et les cpue ont été évalués pour les secteurs où existent des données statistiques satisfaisantes. Dans les autres cas, l'effort pour mettre en place un réseau de collecte de l'information a été poursuivi. Des échantillonnages de captures ont été réalisés sur les principales pêcheries.

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. In 1983 a scientific analysis of the data series 1954-1981 was published in the Archiv für Fischereiwissenschaft.

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

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

Iceland

(U Skúladóttir and H Eiríksson)

Pandalus

Research vessel surveys were carried out as usual for sampling and information on bycatch. A three weeks ban on shrimping was enforced in one area because of young cod. Larval collection was carried out in the north-west of Iceland. 6 300 shrimps were tagged in several localities during the year in two fjords and one bay. The method of Tiews was used but the tags were slightly different, of enamel copper wire with a numbered vinyl flag. Recapture has been up to 6% in one locality of tagged ovigerous females. No migrations were detected and some tags were retained for four months.

Quotas were decided for all inshore areas but the offshore areas which are now becoming more and more important have no catch quota as yet.

In 1983 research will be carried out along similar lines with an emphasis on improving the methods of divisions into year-classes. Tagging will be continued.

Nephrops norvegicus

Two research vessels surveys were carried out during the Nephrops season (May-July). The work included general sampling of males and females, amount of bycatch and selective-trawl experiments.

Landings of Norway lobster were according to the seasonal quota or approximately 2 700 m tons. As predicted, however, the average catch rate went down slightly from 52kg/hour in 1982 to about 48kg/hour in 1983. The drop in cpue is considered to be due to below average recruitment and it is feared that a downward trend in catch rates may continue in 1984.

Stock assessments work will continue in 1984 and two Nephrops surveys are planned during the summer season.

Ireland

(J P Hillis)

Nephrops norvegicus

The programme of sampling catch, landings and discards of Nephrops and classifying length-frequency in each category by sex and females by sexual condition continued in Division VIIa, and a sample of landings was also obtained from the recently initiated Irish fishery on the Porcupine Bank, Division VIIb.

Numbers sampled were as follows:-

Division	Quarter	Sex	Catch	Landings	Discards	Total
VIIa	2	M	241	160	196	597
		F	360	265	288	913
		Total	601	425	484	1 510
	3	M	165	271	69	505
		F	132	146	119	397
		Total	297	417	188	902
	4	M	332	-	-	332
		F	143	-	-	148
		Total	480	-	-	480
	Total	M	738	431	265	1 434
		F	640	411	407	1 458
		Total	1 378	842	672	2 892
VIIb	3	M	-	241	-	241
		F	-	8	-	8
		Total	-	249	-	249
National Total			1 378	1 091	672	3 141

A cruise using an experimental trawl with cod-ends (upper and lower) which yielded mainly Nephrops in the lower cod-end, with the substantial whiting bycatch mainly in the upper, is further reported to the Fish Capture Committee.

Homarus gammarus

No work to report in 1983.

The Netherlands

(R Boddeke)

Crangon crangon

Population Dynamics

Research on the nowadays important stock of Crangon crangon along the Dutch west coast continued.

The pattern of the fluctuations in the stock was similar to that in 1982 with a sudden increase in the stock of small, post-larval shrimps in June-July, followed by a sharp rise in commercial catches in September-November.

Stock recruitment relations in two brown shrimp stocks with "protected" nursery areas and one with an "exposed" nursery area were compared for the period 1978-1982.

This work will continue in 1984 and extended with an analysis of predator abundance based on the data of the International Young Flatfish and Brown Shrimp Survey carried out since 1969 within the ICES framework.

Bycatch problems

In summer and autumn comparative experiments were carried out with the rotating sieve and a new type of shaking sieve. The latter was characterised by a smooth surface of the upper sieve. Both machines proved to be equally harmless to undersized plaice when shrimp catches were sorted.

Norway

(K R Gundersen)

Pandalus borealis

Stratified random bottom trawl surveys were carried out in the Barents Sea in April-May 1983 and in Spitzbergen areas in 1983. The objectives of the cruises were to study the structure of the shrimp stock and the bycatches of fish and to estimate the abundance of shrimps.

In the fjords in Nordland in northern Norway fishing experiments were carried out using a shrimp trawler for three weeks twice a year in order to find the ecological relation between the prawn stock and the amount of fish.

Poland

(Reporting only on Mollusca)

Portugal

(M J Figueiredo and A Cascalho)

Nephrops norvegicus

A sampling programme was carried out, as in previous years, at several ports of the Portuguese west and south coasts, in order to determine length and sex composition of the catches.

A sampling programme on board a commercial trawler was started in May 1983 in order to obtain length and sex composition of Nephrops, bycatch composition and yields. Two main populations were spotted off the south coast, differing in size composition, maturity curves and sex ratio. Migrations are supposed to occur from nursery grounds (300-500m) to deeper waters where larger animals are always found.

Two research cruises for selectivity purposes took place in July and October 1983 on board the research vessel "Mestre Costeiro", using the cover cod-end method.

Cod-ends of different materials and mesh size were used: nylon and polyethylene of 40, 60 and 80mm mesh size.

Parapenaeus longirostris and Aristeus antennatus

The sampling programme started in 1981 was continued, in order to determine length and sex composition of commercial catches.

More biological data and abundance and distribution information have been obtained from two short research cruises.

Spain

(A Perez Camacho)

Nephrops norvegicus

Control of catches and size distribution in relation to sex in the W Ireland, NW Spain and W Portugal fisheries was continued throughout 1983. Laboratory experiences on the growth of this species are being carried out.

Spain

Sampling data for 1983 Species Nephrops norvegicus

Area	Season	RESEARCH VESSEL SAMPLES		MARKET SAMPLES	
		No. of samples	No. of ind. measured	No. of samples	No. of ind. measured
VII	1			6	1 591
	2			7	1 963
	3			7	2 581
	4			5	1 424
VIIIc	1	38	888	7	818
	2			14	1 948
	3			13	2 144
	4	8	19	6	1 039
IX2	1			12	2 118
	2			6	2 204
	3	46	728	7	1 444
	4			5	927

Liocarcinus puber

Data on the maintenance of this species in commercial installations were collected.

Other species

The study of the life cycles of commercially important species (Macropipus puber, Maia squinado, Palaemon serratus and P. adpersus) was made.

Sweden

(H Hallbäck)

Nephrops norvegicus

Trawling, close to the coast, on unexploited stocks was carried out. In the same areas a new experimental fishery with different types of creels has started and will continue during 1984 in a larger scale. Collection of catch data continued.

Pandalus borealis

Experiments with different mesh sizes in the cod-end and daily reports of catches were continued.

Homarus vulgaris

Tagging and trials with escape openings continued together with collection of catch data.

Cancer pagurus

Collection of catch data continued.

United Kingdom

1. England and Wales

(R C A Bannister)

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

Species	ICES Area	English coastal fishery	Season	No. of measurements	
				Market	Total pot content
<u>Homarus gammarus</u> (L)	IVb	Northumberland	Apr-Oct	3 271	
	IVb	Yorkshire	Apr-Oct	2 121	
	IVc	Norfolk	Jul-Aug	182	
	VIId	South Coast	Apr-Oct	1 105	
	VIIe,				
	VIIf	South West	August	1 287	
	VIIg	South Wales	May-Aug	732	
	VIIa	Cardigan Bay	May-Sep	1 582	359
	VIIa	North Wales	May-Aug	1 240	
<u>Palinurus elephas</u> (Fabricius)	VIIe	South West	August	14	
<u>Nephrops norvegicus</u> (L)	IVb	Farn Deep	Feb-Dec	7 310	
	VIIa	Irish Sea	Apr-Oct	7 885	
<u>Cancer pagurus</u>	IVb	Northumberland	Apr-Dec	2 498	
	IVb	Yorkshire	Apr-Aug	1 611	
	IVc	Norfolk	Apr-Aug	497	
	VIId	South Coast	Apr-Oct	383	
	VIIe,				
	VIIf	South West	Apr-Nov	4 496	
	VIIg	South Wales	May-Sep	611	
<u>Maia squinado</u> (Herbst)	VIId	South Coast	Jun-Oct	106	
	VIIe	South West	August	44	

Homarus gammarus

In 1983 a stock assessment was carried out for eight coastal fisheries in England and Wales using data for 1972 to 1981. Catch per unit effort data were analysed, fishing mortality estimated using length cohort analysis, and an assessment made of the effect on yield per recruit and stock biomass per recruit of changes in both fishing mortality and size of first capture (which was varied between 85 and 110mm carapace length). For $M = 0.1$, F ranged from 0.2-0.3 (two fisheries) through 0.5-0.8 (five fisheries) to 1.8 (one fishery). The fisheries would benefit from reducing F substantially, or further increasing minimum carapace length above 85mm. At this stage there are no clear cut conclusions about stock and recruitment. The question of enforcing a ban on the landing of berried hens was examined by pleopod staining. First results suggested it would be difficult to distinguish between scrubbed lobster and those which had recently shed eggs naturally.

In July and October a total of 3 560 micro-tagged juvenile lobsters from the Conwy hatchery were released successfully onto the reefs at Hornsea with a view to measuring their subsequent survival and recruitment to the fishery.

Crangon crangon

A limited survey for Crangon was carried out on the English east coast between the Humber and Thames during the autumn. Catch per haul, size composition and sex ratio were recorded by depth zone, and data were obtained on length-weight and total length-carapace length.

Nephrops norvegicus

The main area of progress has been in bringing together the data on population characteristics, spawning stock biomass and predation in Nephrops so that a start can be made on modelling technical and biological interactions. A Nephrops Irish Sea stock assessment was carried out (ICES Irish Sea Working Group). Papers on biometrics, predation, biomass estimates from larval surveys, and modelling were presented at ICES CM 1983 and further studies are continuing. Nephrops market sampling at Fleetwood was revived; it continued at North Shields.

2. Scotland

(J Mason)

Nephrops

Regular sampling of commercial trawl and creel landings continued in most fishing areas. Monthly research vessel surveys using a small mesh trawl were conducted in the Clyde and Sound of Jura. These studies confirmed that the growth of Nephrops is retarded in the high density population of the Sound of Jura compared with the Clyde. Growth differences in these two areas may be linked to differences in the available food supply in that samples of mud from the Clyde area possessed a richer and more varied fauna and contained about three times as much organic carbon as samples from the Sound of Jura.

Nephrops tagged with streamer tags in 1978 are still being recaptured in Loch Torridon. These long-term survivors are all females, suggesting a lower rate of mortality in females than in males.

Observations were made on the eye damage caused by high light intensities in relation to the discarding of Nephrops at sea. This work was done in collaboration with Dr P Shelton at the University of Leicester. Preliminary results show that the extent of damage varies with the state of dark/light adaptation of the eye. In the worst case (dark adapted eye) a few seconds of sunlight exposure is sufficient to cause breakdown of the rhabdomes in the eye.

Television and photographic observations were made on the reactions of Nephrops to different types of ground rope stretched between the runners of a bottom sledge. This work was supplemented by aquarium studies of swimming behaviour.

Pandalus borealis

Monitoring the North Sea fishery continued. Data on mesh selectivity obtained from experiments on shrimp trawls gave a selectivity factor of 0.45, compared with a value of 0.43 ± 0.02 previously obtained.

Dichelopandalus bonnieri

TV and photographic studies carried out in the Firth of Clyde showed that a relationship existed between Dichelopandalus bonnieri and the sea anemone Bolocera tuediae, similar to that previously found between the anemone and P. borealis.

Crangon crangon

Monitoring the Solway Firth fishery continued, and further information on the bycatch of the fishery was obtained.

Homarus gammarus

Sampling of commercial landings was continued in all the main fishing areas and catch and fishing effort data were collected from selected fishermen. There has been a substantial increase in the number of undersized lobsters caught, especially in the south-east fishery, where the number of "smalls" (less than 80mm carapace length) returned to the sea has virtually doubled since 1979 (see table below).

Numbers of rejects (lobsters less than 80mm carapace length) per 100 pot hauls from two vessels from 1979 to 1983

(1) "FV Sunrise" - Fishing, Firth of Forth (2) "FV Village Belle" - Eyemouth

	August		September		October		November	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
1979	13.4	2.1	27.5	5.3	11.1	5.9	13.1	5.6
1980	26.0	6.1	N.A.	11.7	N.A.	3.2	N.A.	5.2
1981	36.7	9.7	40.5	9.8	N.A.	12.7	N.A.	9.4
1982	60.0	30.1	46.0	26.2	34.0	16.5	28.4	8.2
1983	48.6	10.4	43.5	13.9	34.0	8.8	N.A.	7.5

Recorded landings of legal sized lobsters also increased in 1983 in most areas, partly owing to better data collection by Fishery Officers.

Tag loss and tag induced mortality experiments using toggle tags were completed. No lobsters died during the trial period (1½ years) but tag loss after moult was higher than expected. New trials using 'streamer' tags are now in progress and a comparative tagging trial will be made.

The use of pleopod staging to identify lobsters close to the moult proved successful in the Laboratory. The technique will now be tried in the field.

Cancer pagurus

Sampling of commercial landings was continued. Catch and fishing effort data were maintained and improved.

Trials using bait containers to protect the bait and reduce the amount required per pot were not successful. Pots baited normally using bait strings to hold the fish caught up to four times as many crabs as pots using containers to hold the same amount of bait.

Liocarcinus puber

Monitoring of this fishery continued. Monthly samples are being sent to the Laboratory for analysis.

USA

(Stephen H Clark and Michael Castagna)

General

This report summarises research activities on commercially important mollusk and crustacean species during 1983 by US federal and state agencies and academic institutions.

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 153 vessel-days at sea which provided data for shellfish species. Specialised surveys were conducted for sea scallops (*Placopecten magellanicus*), surf clams (*Spisula solidissima*), ocean quahogs (*Arctica islandica*), and northern shrimp (*Pandalus borealis*), totalling 70 days at sea. The NEFC also continued work on design and testing of a new shrimp research trawl and participated in a cooperative shellfish survey with Canada. The Massachusetts Division of Marine Fisheries (DMF) and the Rhode Island Department of Environmental Management (DEM) conducted inshore bottom trawl surveys which provided data for shellfish species. Several state agencies conducted resource inventory work and collected statistical data and biological samples. NEFC personnel also collected commercial samples at dockside and performed age determinations on sea scallops, surf clams, and ocean quahogs.

NEFC and Southeast Fisheries Center (SEFC) personnel continued stock assessment research for major shellfish resources and completed other reports and manuscripts dealing with biology and distribution. The Manned Undersea Research Team (MURT) of the National Oceanic and Atmospheric Administration (NOAA) continued monitoring of key shellfish species in oil and gas drilling lease areas on Georges Bank and in adjacent submarine canyons. Studies on a variety of parasites and pathogens continued at the NEFC Oxford Laboratory.

Several state agencies continued stock assessment work and related research. The Maine Department of Marine Resources (DMR) continued surveys to determine types and sources of pollutants affecting shellfish resources and impacts on production potential. The New York Department of Environmental Conservation (DEC) continued inventories of shellfish resources, studies of pollution incidence and shellfish transplanting programs. The Massachusetts DMF continued its Shellfish Technical Assistance Program in support of industry and local municipalities. The Maryland Department of Natural Resources (DNR) and the Delaware DNR studied the distribution and intensity of shellfish diseases in Chesapeake Bay.

Northern shrimp (*Pandalus borealis*)

The Maine 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, and Massachusetts and the NEFC continued cooperative stock assessment research and gear development studies.

Shrimps (*Penaeus* spp.)

Several state agencies, including the North Carolina DMF, the South Carolina WMRD and the Georgia DNR, sampled nursery areas to evaluate size and species composition and trends in abundance. The Georgia DNR also continued mark-recapture studies and development of predictive harvesting models.

Pink shrimp (*Penaeus duorarum*)

SEFC personnel conducted a survey of the Tortugas grounds off Florida to evaluate trends in abundance and size composition by season and depth. Mark-recapture studies were also conducted to determine migration patterns.

Brown shrimp (*Penaeus aztecus*)

White shrimp (*Penaeus setiferus*)

SEFC personnel monitored the shrimp fishing grounds in the north and north western Gulf of Mexico to determine abundance and size composition during the 1983 Texas Shrimp Closure. Post-larval and juvenile brown shrimp were monitored in Texas waters to obtain indices of abundance useful for prediction of the commercial harvest. Other studies included shrimp biomass surveys in the north central Gulf of Mexico, predation by fish on juvenile and adult shrimp, the effects of bottom water hypoxia on post-larval shrimp immigration and juvenile shrimp emigration, shrimp/sediment relationships, and the function of salt marshes in the ecology of juvenile brown and white shrimps.

American lobster (*Homarus americanus*)

Several state agencies, including those of Maine, Massachusetts, Connecticut, New York, and New Jersey initiated or continued commercial sampling programs, studies of abundance and distribution, and evaluations of growth, mortality, and molting frequency. The Massachusetts DMF also studied sexual dimorphism and trends in sex composition by gear and monitored the incidence of disease organisms and contaminants. NEFC scientists continued larval sampling and assessment work for offshore populations and conducted tagging studies to evaluate movement and mortality rates. Population density, behavior and ecology in offshore areas were also investigated by use of manned submersibles.

Blue crab (*Callinectes sapidus*)

Several state and academic institutions continued recruitment monitoring programs. The New Jersey DEP continued stock identification work and studied migrations and seasonal movements. The New York DEC monitored trends in abundance and sex and size composition. The North Carolina DMF, the South Carolina WMRD, and the Georgia DNR continued to monitor population distribution, size and sex composition, and trends in abundance.

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

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

USSR

(S A Studenetsky)

Pandalus

In April-May 1983 the distribution and abundance of northern shrimp (*Pandalus borealis*) were studied by R V "Menzelinsk". Investigations were conducted in the Barents Sea and Spitsbergen area. Two hundred and twenty trawl hauls were made; about 8 000 shrimp specimens were analysed. In December 1983 scientists also studied shrimps on board the scouting research vessel "Khadyzhensk". Fifty-nine trawl hauls were performed; 2 900 specimens were analysed. In 1983 cooperative calibration of trawls used for northern shrimp trawling surveys was performed by the USSR and Norway for the first time.

