International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la mer

CM 1986/K:1
Report of Activities

Rapport d'Activités

SHELLFISH COMMITTEE

COMITÉ DES MOLLUSQUES ET CRUSTACÉS

by par

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1985

MOLLUSCA

Belgium - Belgique

(Reporting only on Crustacea)
(Rapport sur les crustacés seulement)

Canada

(G.P. Ennis)

Illex illecebrosus

A survey of larval/juvenile squid was carried out along the frontal zone of the Gulf Stream between Cape Hatteras and the Straits of Florida during January. This, and a smaller survey immediately south of Cape Hatteras in December, provided good catches of Illex larvae and juveniles and enhanced our understanding of the distribution of early life stages. The data helped clarify the role played by the Gulf Stream and indicated that the spawning area for Illex may lie off the east coast of Florida.

Another survey was conducted during February-March to determine the distribution and abundance of larval and juvenile squid in the Gulf Stream/slope water frontal zone south of Newfoundland and attempt to develop an index of squid recruitment based on abundance of young stages. Results indicated a relatively low level of larval and juvenile abundance.

A survey was conducted along the Gulf Stream frontal zone between 37°51'N, 69°00'W and 39°08'N, 57°51'W in September to determine if spawning also occurred in summer. No Illex larvae or juveniles were collected either along the Gulf Stream or in slope waters adjacent to the Continental Shelf.

Abundance of adult Illex illecebrosus on the Scotian Shelf continued to be low in 1985.

Another annual survey was conducted on the southwest slope of the Grand Bank during June. Catches indicated a low level of abundance despite favorable temperatures throughout much of the survey area. A poor inshore squid fishery at Newfoundland was forecast and later realized. The low level of abundance limited biological studies in the Newfoundland inshore area. However, some squid samples were acquired for detailed biological analysis and the relative abundance of potential prey species was monitored at one locality using traps. A study aimed at validating an ageing method for squid in the wild was initiated.

Placopecten magellanicus

Scallop research activities were directed toward larval, juvenile, and adult biology on Georges Bank, the Scotian Shelf, and the Bay of Fundy. A study outlining the distribution of scallop larvae was carried out on the Bay of Fundy, southwestern Scotian Shelf, and Georges Bank. Preliminary results indicate large numbers of scallops on Georges Bank, up to 5,800/m^2, with less than one-tenth of this number found at stations in the Northwest Channel or on Browns Bank. Areas of the Bay of Fundy in the vicinity of Grand Manan also had very high concentrations, up to 8,400/m^2.

A large-scale juvenile tagging study was started in the Bay of Fundy, with 10,000 tags applied to date. This study was stimulated from the analysis of tagged animals on Georges Bank which showed smaller animals moving considerable distances, in some cases greater than 10 km. A study of spat biology indicates that in the early fall Placopecten has a short period of settlement compared to other bivalves. Growth is rapid during the late fall, and animals 6 to 10 mm in size by December.

Research abundance surveys used in the assessment process were carried out on Georges Bank, the Bay of Fundy, and the Scotian Shelf. New methodology was developed to convert the meat weight distributions supplied by port sampling into age distributions for the sequential population analysis of the Georges Bank stock. The results of an enzyme characteristic analysis showed that there was considerable gene leakage among the study sites on Georges Bank and the Scotian Shelf.

A research survey was conducted to assess status of sea scallop stocks on St. Pierre Bank. Significant patches of prerecruits have been identified in the area. Only sporadic commercial effort was

directed into St. Pierre Bank with only 53 t of meats taken. Catch-per-unit-effort showed further declines of approximately 13% from 1984 levels.

The average loss in meat yield from hand-shucked sea scallops (> 100 mm) was estimated at 11%.

Status of stocks in the Northumberland Strait and northeastern New-Brunswick areas of the southern Gulf of St. Lawrence was assessed on the basis of surveys conducted in five fishing areas and statistics from commercial fishing. Good levels of pre-recruitment were detected in the Northumberland Strait.

Studies were carried out dealing with space/time variations of reproductive cycles, allometric relationships, growth and recruitment. Selectivity and efficiency of the commercial gear were studied using divers and double netting.

Chlamys islandica

A research survey was conducted to determine the distribution and abundance of this species on St. Pierre Bank. Iceland scallops were not targeted for by the offshore scallop fleet in 1985.

Meat weight-shell height regressions computed to date are based on complete removal of adductor muscle tissue. As such they have little relevance to meat yields in the hand-shucked commercial fishery. Various factors reduce yield in the latter. In the Iceland scallop the loss in yield, compared to total available, is negatively correlated to shell size and decreased from an estimated 30% at 60 mm to 11% at 90 mm with an average overall loss of 23%.

The fishery for Iceland scallops in the Strait of Belle Isle (northeastern Gulf of St. Lawrence) has been considerably expanding geographically in recent years. A survey was conducted to map the overall distribution of the resource in the area and to give a first estimation of average densities. Catch and effort data from experimental permits were analyzed.

Mya arenaria

An ongoing resource assessment program continued covering two major clam fishing areas, viz. Three Fathom Harbour and Clam Harbour, in Halifax county, Nova Scotia.

Three Fathom Harbour (11.0 ha) which has supported catch rates of as much as 40-50 kg per tide showed standing stocks of approximately 1,250 kg/ha of recruits (shell height 51 mm). Prerecruit densities were also very high (215 clams/m^2). Clam Harbour (13.7 ha) appears to be more productive in the standing stock of recruits, averaging approximately 1,370 kg/ha. The average density of prerecruits was, however, less at 145 clams/m^2.

A long-term comparative study of settlement, growth, and survival of clams in open and closed areas on the flats was extended with additional experimental plots. More than 2,000 tagged animals have been planted. New information on overwintering shell growth was recorded early in the year.

Arctica islandica and Spisula polynyma

Resource surveys conducted between 1980 and 1983 inshore along the south shore of Nova Scotia and Offshore on the Scotian Shelf and Georges Bank showed harvestable densities in several areas. This year commercial interest of the offshore resources of Arctica islandica and Spisula polynyma has resulted in a "test fishery" scheduled to begin in spring 1986, with potentially as many as six offshore hydraulic dredge boats.

Spisula solidissima

Biological studies on bar clams were initiated at sites on the Northumberland Strait and Gulf of St. Lawrence sides of Prince Edward Island. Field sampling for a consecutive year study of the reproductive cycle was completed. Examination of the histological preparations of gonad tissue is in process. A preliminary ageing study based on the analysis of chondrophore sections and subsequent determinations of growth rates indicated considerable geographic variability. A more extensive laboratory examination of chondrophores and shells ensued and is being corroborated by a mark-recapture field study started in 1985.

Denmark - Danemark

Not reporting on Mollusca

France

(D. Latrouite)

Pecten maximus

Le suivi des principaux stocks de coquille Saint-Jacques du littoral Atlantique et de la Manche a fait l'objet en 1985 de campagnes côtières soit avec des navires océanographiques de l'IFREMER (Baie de Saint-Brieuc, Manche Est), soit à bord de bateaux de pêche.

D'une manière générale, les ressources de coquille Saint-Jacques sont exploitées en hiver de façon très intensive et les captures dépendent essentiellement du recrutement estimé moyen à faible depuis les dix dernières années. La production nationale devrait se maintenir à environ 12 000 tonnes.

En Baie de Saint-Brieuc toutefois, il semble que la reproduction naturelle ait été meilleure en 1982, provoquant un recrutement plus élevé pour la saison 1984-1985. Cette classe d'âge, partiellement recrutée en 1984, l'est pleinement en 1985, permettant une saison 1984-1985 moyenne et une saison 1985-1986 avec des rendements supérieurs d'environ 20%. Le quota global en augmentation a été fixé à 5 000 tonnes au lieu de 4 200. La réglementation sur les engins de pêche a pu être modifiée en accord avec les pêcheurs: le diamètre des anneaux réglementaires sur le dos du sac de la drague a été porté de 72 à 85 mm.

En Manche-Est, après la forte dimunition constatée entre 1976 (12 000 tonnes) et 1983 (6 500 tonnes), les captures se sont stabilisées au cours des deux dernières années autour de 5 300 tonnes. Toutefois, les observations faites à bord du N.O. "LA PELAGIA" (dragages expérimentaux) ne laissent pas augurer une forte production pour la saison de pêche 1985-1986 en raison d'une part de l'appauvrissement de la partie centrale de la Manche orientale, et d'autre part d'une certaine stabilité de la baie de Seine proprement dite. Cette production pourrait être de l'ordre de 4 à 5 000 tonnes. Par ailleurs, les indices de prérecrutement recueillis sont moyens sur l'ensemble des gisements et ne permettent pas d'espérer, pour les deux années à venir, une reconstitution conséquente des stocks.

Sur le plan des recherches, la coquille Saint-Jacques est suivie dans le cadre d'un programme quinquennal (1983-1987). 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. 1985 a pu permettre de confirmer la production de juvéniles en écloserie-nurserie avec préélevage et 1,2 millions d'animaux devraient être semés.

Une contribution plus fondamentale à la maîtrise de l'exploitation de cette espèce est apportée par le programme national sur le Déterminisme du Recrutement mené en commun par l'IFREMER et les laboratoires universitaires. En baie de Saint-Brieuc, il a mis en évidence l'importance de la maturation pour la production de larves et celle des courants de marée pour leur concentration ou leur dispersion.

Chlamys varia

Le pétoncle noir (Chlamys varia) fait l'objet d'une exploitation spécifique en rade de Brest et le gisement assure une production à hauteur de 350 tonnes. L'aménagement basé sur la rotation de zones de pêche se poursuit avec un apport de supports pour favoriser la fixation des larves et un apport de juvéniles de captage: 45 millions de juvéniles captés en 1984 ont été semés sur 100 hectares. Cette dernière méthode reste cependant incertaine et la survie observée est faible en raison d'une taille trop faible au semis. Le captage de 1985 a été pratiquement nul en raison, vraisemblablement, de l'abondance de Gyrodinium dans le plancton.

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 1985 par la prospection des gisements de Barfleur et Ravenoville, au cours de deux campagnes océanographiques (ROSELYS II et PELAGIA).

Ces campagnes, réalisées au printemps (17-29 mai) et à l'automne (20 octobre - 4 novembre), au cours desquelles ont été effectués respectivement 236 et 339 dragages, ont permis d'estimer d'une part l'état du stock en place avant l'ouverture de la saison de pêche, et d'autre part l'intensité du recrutement annuel.

De plus, à l'automne, une prospection a été menée au large des côtes du Calvados et des essais de visualisation sous-marine ont été effectués sur les gisements de Ravenoville et Barfleur.

Les rendements (kg/mn) en moules commerciales (cf. tableau) observés en 1985 montrent une diminution importante des stocks de moules essentiellement due à la faiblesse du recrutement en 1983 et 1984.

*Rendements en moules commerciales

	1982		1983		1984		1985	
	MAI	OCT	MAI	OCT	MAI	OCT	MAI	OCT
Barfleur	63,0	71,8	103,8	38,2	49,0	30	47	8
Ravenoville	161,6	54,7	120,2	390,1	44,3		20	15
Reville	186,4	104,4	85	46,1				

Le nombre total de juvéniles observés lors des campagnes automnales est resté depuis 1983 relativement faible par rapport à 1982.

*Nombre total de juvéniles (en millions)

	1982	1983	1984	1985
Barfleur	739,2	51,4	16,8	78,15
Ravenoville	949,8	9,4		11,5
Reville	463,6	106,8		

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

* Production en tonnes - Gisements de l'Est Cotentin

1982	1983	1984	1985
15 000	5 000	3 600	1 375

Buccinum undatum

La production de buccin, estimée à 4 000 tonnes, reste stable depuis plusieurs années malgré une augmentation constante de l'effort de pêche.

Le suivi de cette pêcherie, assurée depuis 1982 par l'IFREMER, a permis de fournir des éléments de décision à la profession qui a élaboré une réglementation adaptée (mise en place de licenses de pêche, limitation de l'effort, quotas par zone et taille de première capture) dont l'application doit intervenir en 1986.

Venus verrucosa (L.)

Le déclin de la pêcherie de praires du golfe normano breton se poursuit. La production devrait être inférieure à 2 000 tonnes en 1985 contre 4 400 tonnes en 1981. Le recrutement observé en 1985 est aussi faible que ceux enregistrésd depuis 1979.

Un transfert de l'effort de pêche est attendu vers d'autres espèces (Tapes rhomboïdes, Spisula ovalis, Glycymeris glycymeris) dont la biomasse potentiellement exploitable est de plusieurs milliers de tonnes. Des travaux sont en cours au sein de l'IREMER tant au plan de la technologie de captures que de la valorisation des produits.

Federal Republic of Germany
République Fédérale d'Allemagne

(K. Tiews)

Mytilus edulis

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

Cerastoderma edule

Cockle beds in the Wadden Sea along the coasts off Niedersachsen and Schleswig-Holstein were monitored with the purpose to formulate management advice at the Institut für Küsten- und Binnenfischerei.

Iceland
Islande

(H. Eiriksson and I. Hallgrimsson)

Chlamys islandica

One dredge survey was conducted during June - July. A considerable drop was observed in the scallop abundance index for SW Breidafjördur. Moreover exploratory tows in deeper waters off the west coast revealed no scallops.

Scallop landings in 1985 amounted to approx. 16.000 m. tons compared to the previous record catch of 15.600 tons in 1984. In most areas cpue remained at similar levels as in 1984 which is slightly lower than the average cpue for the period 1980-1983.

Scallop surveys in 1986 will include stock abundance estimates for some of the most heavily fished stocks in the northwestern part of the country. Moreover a deep-water dredge survey is planned off the north and east coasts.

Ireland
Irlande

(J.P. Hillis)

Pecten maximus

Investigations into growth and age distribution of landed escallops in Bantry and Kenmare Bays were commenced in 1985. Investigations were also carried out on the Cork Harbour population.

Mytilus edulis

A number of aspects of biology, notably meat yields, were monitored at Mornington (Boyne Estuary, East Coast), Wexford (South-east) and Cromane (South-west).

The Netherlands
Les Pays Bas

(A. C. Drinkwaard)

Ostrea edulis L.

Attention has been paid especially to the Lake Grevelingen as spatting pond for the flat oyster. During the last years there was an intensive spatfall in the month of July. The concentrations of oyster larvae showed high peaks. This year up to more than 500 larvae per samples of 100 litres.

The mortality of settled spat was high, as in 1984, up to 90% from July till at the end of October. Growth was normal, as in 1983. The survival of 10% was still good for over 200 million spats on the scattered 7000 m^3 of musselshells, setting aside the spatt fall in the wild area. The checking methods were the same as previously.

In spring several plots with the nearly not grown spat of yearclass 1984 were cleaned up by the growers. Scarcely some survived spat could be observed, which restarted growth in the month of May. The cause of this failed 1984 yearclass must be searched in a negative influence on the aquatic environment, not traced by the monitored parameters. The organisation of oystergrowers asked for a check on trifenyl- and tributyltin at the time that yachting starts.

Experiments started with off bottom spat collection on musselshells in network to several test locations.

The shipment of close to twelve million consumption oysters out of the Lake Grevelingen means an effected yearly increase, which could be accepted without a further stock enhancement.

In the Oosterschelde the eradication policy against the Bonamia ostreae disease will be continued in 1986. This year only two ongrowing experiments were allowed. One with 300,000 oysters on six Yerseke Bank plots in combination with the disease control and one with a small amount of oysters, housed in suspended lantern nettings, sheltered behind the storm-surge-barrier across the mouth of the Oosterschelde. This experiment has been carried out in combination with rainbow trout culture in cages. 60% of the oysters on the Yerseke Bank could be harvested at the end of the year. This means a direct estimate of 40% natural mortality.

Mytilus edulis L.

The research was completely dominated by the anticipation to the coming hydrographical changes in the Oosterschelde, which be caused by the functionning of the storm-surge-barrier in 1986. Several physical and ecological surveys were continued to follow the biotic and a-biotic processes. Insights have developed gradually concerning the possibilities of re-arrangement of the musselplots.

In autumn the work on the barrier necessitated the part-closure of the gates in the northern channel. This reduced the vertical tide at Yerseke by 10%. The mussel merchants observed abnormal silting on some places of the mussel-rewatering plots. This has been checked in the beginning of December. At that time the bottom between the scattered heaps of mussels was once more clean. This was a good check on the operational mobility of the stand by research team. A continuous supervision, amongst others with divers and a current velocity watch, will have to be maintained during the changing tides in relation to the estuary bed protection. Several research institutes co-operate under the guidance of the Ministry of Transport and Public Works. The closure of the compartment dams will be completed when the barrier is ready, so that the tide in the Oosterschelde can be influenced during critical phases. However, it should not be permitted that use of the barrier would cause any significant or lasting damage to environmental interests or to mariculture and fishery. Complete closures of the barrier can be expected in October 1986 and in April 1987.

The Dutch mussellandings during the season 1985 - 1986 recovered completely and exceeded 100,000 tonnes (MT). The importation amounted to 30,000 tonnes, all scattered on the rewatering plots. The European market appears to be elastic enough to take up enlarged fluctuating quantities of mussels.

Cerastoderma edule L.

The total landings of the Dutch shallows again surpassed the level of 8,000 tonnes shucked meat, which means more than 50,000 tonnes fresh weight.

Dependent on the market demand most of the cockle dredgers terminated the fishery at the time that the meats of 700 per kg became scarce. Since several dredgers continued the fishery on cockles with far over 1000 meats as kg, they must have seen a chance to sell these small meats to willing customers.

The question is posed whether the yearly landings can remain above this high level without limitation of the size. Otherwise drifting ice in the Waddenzee as in the following 85/86 winter could have had also a depleting effect on the fishable stock.

Environmental conditions

The area under control in the Oosterschelde was enlarged, especially in the direction of the fishculture location behind the storm-surge-barrier and the mussel rewatering-desanding- and processing activities.

In the large set of monitoring programmes of environmental parameters, routine sampling has been carried out on plant micro-nutrients and chlorophyll to provide useful indices for the assessment of the water quality. This favoured the possibility to make a

statement about the degree of enrichment of the area and the changes which might occur in the new Delta-situation.

The reduction of the tidal exchange will influence the specific estuarine processes. Amongst others the distribution of nitrogen compounds is largely dependent on the input of organic material from the sea. The anthropogenic inputs will be reduced too. It is desirable to provide an optimal management after some years, when the impact on the ecosystem becomes clear, especially because as the variables advecting dispersal processes are also changing.

The expected - increase by a few degrees - of the sea-water temperature during the summer in the eastern part of the Oosterschelde led to new assumptions on the recruitment level of the natural population of Crassostrea gigas Thunberg in that region.

Molluscan shellfish toxicity and sanitary control

The sanitary quality of mussels from the culture- and rewatering plots in the Oosterschelde came up to the high observed standard. Nearly 70% of the samples during the whole year were free of faecal coli bacteria. The other 30% were contaminated by less than 3 coli bacteria per gram biomass.

The monitoring programme on D.S.P. (Diarrhetic Shellfish Poison) in the Waddenzee and Oosterschelde during May till in October has been performed.

The causing dinoflagellate Dinophysis acuminata has been observed in concentrations of up to 10 cells per litre in the Waddenzee. This was quite in agreement with the negative response of mussels in the rat bioassay during the period of investigation.

Diseases and pests

The challenge test on the presence of the oyster pathogen Bonamia ostreae in the eastern part of the Oosterschelde - Yerseke Bank - has been repeated in a way similar to 1984. Only the site of the oysterplots, used for planting of the new oysters, somewhat changed.

The experimental 300,000 oysters from the Lake Grevelingen, which is still free of the Bonamia disease, were planted in April. Sampling has been done monthly till December. Other than this sampling the remaining oysters of the unused oyster beds, which participated in the experiments of 1984 and before, were sampled and examined. These plots were cleaned as far as possible.

The 1985 results showed the presence of Bonamia infected oysters not before the September samples were taken. In totality it concerned 3 specimens on the formerly used plots. Although this was a very low level infection, it proved the persistant existence of the disease. This continued presence of some Bonamia infected oysters was disappointing because of the expectation of a disease

free result for this year, based on the decreasing characteristics of the disease in the preceding years. However, it showed that experimental work in this field is equally important to gain the required understanding of this disease.

Norway
Norvège

(B. Bøhle)

Ostrea edulis (European Oysters)

Experiments on growth of oysters along different parts of the coast continued. In the Eastern part of Skagerrack a natural bed with old and large oysters was localized and exploited by local divers.

Along the Skagerrack coast a survey for oyster beds and hydrographic studies were performed during the summer.

Chlamys islandica (Icelandic Scallops)

A fishery for the Iceland Scallop in the Bear Island and Hopen area were started in 1985. Approximately 120 tons of chucked meat were produced and frozen onboard during fishing.

Investigations for studying growth rate, stock size and yield estimates of scallops will be initiated in 1986.

Mytilus edulis (Blue mussels)

Mussels in the Oslofjord, along the Skagerrack coast and north to the Sognefjord contained DSP (diarrhetic shellfish poison) during the winter. After short poison-free periods in the spring and summer, the mussels became poisonous again in the autumn and are still poisonous (February 1986).

Commercial harvesting and distribution of mussels were closed most of the year and nobody has been reported poisoned. Samples of mussels and water for analysis of poison and algae (mainly Dinophysis acuta) were collected during most of the year.

Poland
Pologne

Portugal

(A. Cascalho)

Spisula solida

Biological studies and reproduction experiments on Spisula solida were conducted along Algarve coast.

Ruditapes decussata

Studies on growth and mortality were undertaken.

Crassostrea angulata

Experiment on larvae settlement and their evolution were made. Six hundred and thirty four trawl hauls were made on a survey cruise covering the littoral area between Espinho and Figueira da Foz, in order to gain the knowledge of the most important beds of the species and to determine their relative abundance.

Spain
Espagne

(A. Perez-Camacho and M. Torre)

Commercially exploited natural beds of Cytherea chione, Venerupis rhomboides, and Pecten maximus of the South of Spain were assessed for management purposes.

Spat collection of Pectinids on onion bag type collectors was undertaken in the Alboran Sea.
(Instituto Español de Oceanografía Fuengirola Malaga)

Natural populations of oysters (O. edulis) were studied in a coastal lagoon -Mar Menor- in the Mediterranean. Experiences were made on spat collection.
(Instituto Español de Oceanografía, San Pedro del Pinatar - Murcia)

The Faculty of Genetics of the University of Santiago de Compostela (NW Spain) initiated studies on oyster genetics in natural populations.

The biology, mortality and reproduction of the Manila clam (A. philippinarum) was studied on tidal flats in the Rias of Northwest Galicia. A group of pathologists undertook studies mainly on mussel (M. edulis) and oyster (O. edulis) parasites (Mytilicola), and on pathogens (Marteilia and Bonamia).
(Instituto Español de Oceanografía, La Coruña, Vigo-Pontevedra; Xunta de Galicia)

The biology and feeding of the cephalopods Sepia officinalis and S. elegans were studied at the aquarium of Vigo.
(Instituto Investigaciónes Pesqueras, Vigo-Pontevedra)

The 5th Pectinid workshop took place in May at La Coruna and it was attended by scientists from Europe and North America.

Sweden
Suède

(H. Hallbäck)

The interest of cultivation Mytilus edulis is now decreasing. During 1985 all production of mussels has been stopped, almost the whole year. The reason is probably the same as during 1984, toxin from some species of Dinophysis. No toxin was found in Ostrea edulis. A new research program has started along the Swedish west coast.

United Kingdom
Royaume Uni

1. England and Wales

(R.C.A. Bannister)

Surveys of mollusc stocks were carried out as listed in Table 2.

Pecten maximus

The distribution and density of scallops by size and age was again examined by fine meshed dredge in two study areas off south west Cornwall. The seasonal distribution of maturity was examined by the collection of gonad samples at two depths off Cornwall. Examination of grounds for spat commenced using sledge mounted underwater TV and 35 mm photography. Samples of hydroids were also obtained for examination.

Commercial dredge efficiency for capturing 1 to 3 year old scallops was tested by relaying 800 seed scallops of different ages on an experimental plot. Subsequent dredging showed only 2% dredge efficiency for the largest size group (52-85 mm). Efficiency improved to 4% by fitting fine mesh backs to the dredges. No 1 year old scallops (18-30 mm) were recaptured.

Ostrea edulis

In addition to the stock surveys in the Solent, Poole Harbour (VIIa) and Milford Haven (VIIf) studies continued on the distribution and abundance of oyster larvae in the Solent and Beaulieu River. Larvae were also sampled in Langstone and Chichester Harbours (VIId). Late stage larvae were scarce. Sampling of the spawning stock showed that the fecundity of Solent oysters was similar to published information for Ostrea and that on the basis of their lipid levels larvae were physiologically fit to survive the planktonic stage.

The areas where Bonamia ostreae has been identified since 1982 have been monitored for incidence and spread of the disease. In all instances infected areas have shown a slow spread of infection into further relaying beds or natural stocks. In 1985 no new regions of infection were found and the main production areas in the Solent and other South Coast regions remained free from the disease.

Mytilus edulis

In 1985 quadrat survey showed a continued decline in the abundance of both adult and seed mussel on the main beds in the Wash. Total stock has now declined from 20,000 tonnes in 1982 to 5,000 tonnes in 1985.

Mercenaria mercenaria

The 1985 grab survey in Southampton Water showed that this stock has declined from 16,000 tonnes in 1979 to 1,750 tonnes.

Table 2. Surveys of mollusc stocks in 1985.

Species	ICES Division	Date	Duration (days)	Locality	Survey type
Pecten maximus	VIIe	May	6	Cornwall	Dredge (adult stocks) Dredge efficiency Photo/TV sledge
		June	6	Cornwall	Photo/TV sledge
		July	6	Cornwall	Photo/TV sledge
		October	6	Cornwall	Photo/TV sledge
Ostrea edulis	VIId	July	10	Solent	Dredge - (adult stocks)
		July/ August	10	Solent	Larval sampling and breeding condition
		November	3	Poole	Dredge - (adult stocks)
Mytilus edulis	IVc	July	4	Wash	Quadrat (adult stocks)
		April- October	-	Wash	Spat collection
Mercenaria mercenaria	VIId	January	12	Southampton	Grab (adult stocks)

United Kingdom
Royaume Uni

2. Scotland

(J. Mason)

Pecten maximus and Chlamys opercularis

Monitoring of the major fisheries and assessment of the state of, and effect of fishing on, the stocks were maintained. Scallop (P. maximus) landings have been well maintained in all areas in the early 1980s. Catch per unit effort has fallen slightly and fewer yound scallops (up to 4 rings) have been caught compared with the late 1970s, when recruitment was high. However, dredging by FRV "Goldseeker" on the west coast late in 1985 showed evidence of recent improved recruitment.

Queen (C. opercularis) landings and catch per unit effort are showing no definite trends.

The study of settlement of both species on the west coast was continued. As before queen settlement was generally heavier than that of scallops. Settlement in 1984 varied appreciably from place to place, being heavy in Loch Ness (up to 4000 scallop spat per standard collector) but less heavy elsewhere and as low as 20 per collector in the Islay - Sound of Jura area. Preliminary results suggest that the 1985 scallop settlement was good in the Clyde and Islay areas. The studies will continue, and in the Islay area will form a part of a study of the local fishery to try to establish a correlation between settlement and subsequent recruitment to the fishery.

The best way to transport pectinid spat was found to be in seaweed in cool conditions. The optimum density for overwintering in nets was found to be 2500 per m^2, which gave a survival of 80%.

Studies of predation of spat were commenced, using a time-lapse camera to observe the effects of shore crabs and starfish.

Squids

Studies were carried out in collaboration with the Zoology Department of Aberdeen University. The population structure, growth and diet of Loligo forbesi are being studied, and a study of the structure of the statolith is being undertaken with a view to its possible use for age determination.

Pests and diseases of molluscs

Examination and certification of oysters for import into Scotland and of scallops and oysters for export from Scotland continued. Samples of mussels for examination for paralytic

shellfish poisoning at MAFF, Burnham-on-Crouch, were collected on the east and west coasts of Scotland. No toxin was found in west coast samples; levels of toxin below the danger level were found off the south east.

An investigation was conducted into the advisability of allowing mussel shell cultch from Yerseke, Holland, to be laid on Scottish oyster beds to encourage settlement. As a result a consignment of cooked mussel shells was licensed for deposit in Loch Ryan.

Anti-fouling and molluscs

The deleterious effect on oysters of anti-foulants containing tributyltin compounds on boat hulls are well known. Such preparations are commonly used on nets in salmon cultivation units in Scottish sea lochs, and an experiment was carried out to assess its effect on Crassostrea gigas at various distances. Inhibition of oyster growth and accumulation of tin were demonstrated at distances up to 500-1000 m from salmon farms.

USA

(S. H. Clark and M. Castagna)

The Northeast Fisheries Center (NEFC) of the USA National Marine Fisheries Service (NMFS) conducted spring and autumn bottom trawl surveys off the northeast coast which provided data for bivalves and squids. A summer survey was also completed in the same region for sea scallops (Placopecten magellanicus) and Iceland scallops (Chlamys islandica). State agencies, i.e. those of Massachusetts and Rhode Island, conducted inshore bottom trawl surveys which provided data for mollusc species. NEFC personnel continued development of aging techniques for bivalve species. Approximately 1600 sea scallops and 800 surf clams were aged under contract agreements with academic institutions.

The New Jersey Department of Environmental Protection (DEP) completed a five-year inventory of shellfish resources with particular reference to hard clam (Mercenaria mercenaria) and American oyster (Crassostrea virginica) populations to determine resource size as a basis for management. Several stage agencies continued resource inventory and monitoring work, transplanting and stocking programs, and monitoring for disease.

Crassostrea virginica (American oyster)

Several state agencies continued resource surveys, disease monitoring, and biological studies. Researchers at Rutgers

University continued studies of the haplosporidian pathogen MSX and summarized previous work on this and other diseases. Studies on pathology, depuration, and acquired immunity continued at the Virginia Institute of Marine Science (VIMS).

Placopecten magellanicus (Sea Scallops)

The NEFC continued stock assessment studies and completed an evaluation of the relative precision and efficiency of survey designs employed by the USA and Canada on Georges Bank. Additional studies were performed to evaluate relative fishing power of different survey gear configurations. The Maine Department of Marine Resources (DMR) continued biological investigations and ecological studies on Gulf of Maine populations.

Argopecten irradians (Bay Scallop)

Several state agencies continued monitoring work to evaluate trends in abundance and size composition and to study reproduction, growth rates, and juvenile survival. The Rhode Island Department of Environmental Management (DEM) continued resource inventory work, ecological investigations, and pathology studies.

Mercenaria mercenaria (Hard Clam)

Life history studies (including larval settlement and recruitment and growth and survival of juvenile and adult clams) continued at the University of Connecticut. Several state agencies continued monitoring programs to evaluate resource trends. The Rhode Island DEM continued monitoring of contaminant levels and various assessment-related projects. The South Carolina Wildlife and Marine Resources Department (WMRD) has maintained an active research program including genetics, growth and reproductive biology in cooperation with Clemson University and other academic institutions.

Arctica islandica (Ocean Quahog)

The NEFC continued stock assessment work and age and growth studies. Maine DMR and University of Maine researchers studied growth and reproductive biology in relation to location and depth. Other state agencies conducted growth studies and other biological research.

Spisula solidissima (Surf Clam)

The NEFC continued stock assessments and related research and initiated development of a bioeconomic model of the fishery. Similar modeling work was conducted at VIMS and the University of Delaware. Several state agencies continued resource surveys and related studies. Stock assessment work and biological research continued at Rutgers University under contract to the New Jersery DEP.

Mya arenaria (Softshell Clam)

Studies on survival, growth, and reproductive biology continued at the University of Connecticut. Normandeau Associates continued work on growth and survival, population levels, and spatfall density in New Hampshire waters. Several state agencies in the Middle Atlantic have continued investigations of the seasonality, distribution, and severity of a viral disease associated with a neoplastic condition and widespread mortalities. Other state agencies in the northeast have continued resource monitoring work and biological studies.

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

NEFC personnel continued biological research and stock assessment work. Studies continued on the distribution of Illex along the continental shelf-slope water front off the northeast coast of the USA.

USSR
URSS

(S. A. Studenetsky)

Squids. In March-May, 1985, the distribution of arrow-squid (Todarodes sagittatus) and migration routes of the young were investigated in the area within 51°N and 64°N on the shelf of Ireland and Iceland b y R/V "Kokshaisk". About 3000 samples of several squid species were collected and examined.

In July, 1985, the distribution of squids was investigated in the Norwegian Sea by R/V "Menzelinsk". 460 samples of young Gonatus fabricii were collected.

In October-November 1985, R/V "Spiridonov" investigated feeding concentrations of arrow-squid (T. sagittatus) in the coastal Barents Sea and north-eastern Norwegian Sea up to Vesteralen Bank. 92 samples were taken.

CRUSTACEA

Belgium
Belgique

(F. Redant)

Crangon crangon

Biannual sampling (in spring and autumn) of the brown shrimp stock and its predators and competitors off the Belgian coast was continued in 1985. The samplings consisted of 15 minutes' hauls with a small meshed beam trawl on about 35 fixed stations. The investigations included qualitative and quantitative analyses of the epibenthic and demersal fauna, and measurements of the length composition of the shrimp stock.

A critical study on the evidence of protandric hermaphroditism in brown shrimp was completed. It consisted of histological examinations on about 600 male shrimps in the size class 40-50 mm, on an evaluation of the consequences of a sex-change on the reproductive potential of the shrimp population and on recrutement to the exploitable stock.

Nephrops norvegicus

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

A preliminary study on seasonal variations in the size composition of the landings was completed. It showed a clear seasonal pattern, which was believed to be related to the reproductive cycle of female Nephrops. To test this hypothesis a year-round sampling programme, including observations on the egg-bearing state of the females, was started in April 1985. This programme is intended to continue until mid-1987.

Other species

A comprehensive study on the relationships between physical environmental parameters (such as depth, granulometry of the sea bed and hydrodynamic features), and the distribution and abundance of major epibenthic species (such as Crustaceans and Echinoderms) in the Belgian coastal waters was started. These investigations are based on the results of biannual sampling surveys in the period 1973-1985.

Canada

(G. P. Ennis)

Homarus americanus

Lobster larvae hatched by three ovigerous females from southwestern Nova Scotia and two from the Northumberland Strait were individually cultured at 10.2, 12.2, 14,8, 18.0, and 22.0°C. Stage durations for individual larvae were linked; those that tended to develop quickly did so at each stage, and vice versa. Survival to Stage V was more than 45% at all temperatures except 10°C where survival was less than 10%. Stage V dry weight was largest at either 15°C or 18°C and smallest at 10°C. No geographic trend was seen for differences in stage duration, survival, or body size, although intra-site variation was great.

The impact of the nemertean (Pseudocarcinonemertes homari) on the egg loss from ovigerous lobsters caught in the Grand Manan area was examined. The proportion of eggs lost each month was variable but generally increased to a maximum of 0.38-0.43 at the end of each incubation period. The few lobsters that acquired high densities (greater than four per 1,000 eggs) of P. homari during the early stages of egg incubation appeared to suffer extensive or complete egg mass destruction. Most lobsters (74%) infested with P. homari maintained low densities of nemerteans (less than two) and hatched most of their eggs (greater than 60%). Although there was a significant, but low, correlation between P. homari densities and the proportion of eggs lost, egg losses could not be attributed solely to P. homari. Indeed, egg loss did not differ significantly between uninfested and nemertean-infested lobsters. Other factors such as inadequate egg adhesion, handling by fishermen, and female grooming may have been responsible. The discovery of total egg loss in 20% of tagged ovigerous lobsters during an egg incubation period has important implications to the estimation of the reproductive potential in the lobster population of the area.

A study was carried out which indicates that lobster injury and losses due to scallop gear dragging on lobster grounds off Prince Edward Island (P.E.I) during 1981 was minimal. This detailed study uses scallop drags, SCUBA diving, hauling lobster traps, and tag release-recapture methodology to resolve an important question in the scallop-lobster fishery gear conflict off P.E.I.

Intensive sampling since 1971 of the offshore lobster catches has revealed no significant change in size frequencies. Tagging studies in the offshore areas of the Scotian Shelf used multiple recaptures of ovigerous females to follow seasonal movements. Some lobsters underwent short migrations from the slope and hatched eggs at the Shelf edge; others undertook long-distance (more than 100 km) annual migrations.

As part of studies of lobster habitat in coastal Nova Scotia it was observed that a sea urchin pathogen continued to expand in 1984 to 1985, adding mortalities or approximately 100,000 t to the 250,000 t that died from 1980 to 1983. As a result of reviews, discussions, and new data the popular hypothesis that predators, especially lobster, controlled sea urchin abundance prior to 1970 is less favored.

Calibration studies of an aerial survey technique of estimating and locating lobster fishing effort have been conducted. These complement other methods such as kriging and allow interpretation of aerial surveys to include other fisheries.

Tagging to investigate lobster movement and a ghost fishing study were conducted in the southern Gulf of St. Lawrence.

Long-term monitoring of the lobster fishery and studies of various aspects of lobster population and dynamics were continued in three localities around Newfoundland. On-going plankton sampling to study larval ecology continued at one Newfoundland locality and laboratory experiments on rheotactic responses of larvae were conducted.

Pandalus borealis

Logbook records from fishermen provided most of the data on the shrimp fishery off coastal Labrador in 1985. Most fishing occurred in the Hopedale Channel as in previous years. The observer coverage again was very low in 1985, providing data only from the beginning and end of the fishing season. A research cruise was conducted in Divisions 2HJ3K from July 31 to August 21.

The survey in Division 3K showed that shrimp abundance was generally low outside the area fished in the previous year (St. Anthony Channel). Several stations also were fished in Hawke Channel (Division 2J) and indicated that the shrimp stock remains depressed in that area.

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

Biological studies on Gulf shrimp included an analysis of stomach contents of potential predators, initiation of a sampling program to determine distribution, abundance and drift of larvae and a project on genetic discrimination of the various populations.

Research surveys were carried out on Scotian Shelf in April and October. Biomass estimates for the commercial areas were the lowest since these surveys were initiated in 1982.

Most females had released larvae before the April cruise. Three plankton tows done on Canso Hole had more than a 2:1

preponderance of P. montagui to P. borealis. This is surprising in that P. montagui comprises less than 1% of the adult catch. Inshore (Chedabucto Bay) plankton samples were comprised of more than 90% P. montagui.

Chionoecetes opilio

Snow crab stocks in the five management areas along the Atlantic coast of Cape Breton Island were assessed. Catch, effort, and CPUE levels have continued the declines noted since 1980 and further emphasize the low productivity of these stocks. Research into the biological basis of snow crab production, in terms of growth and reproduction, has been furthered. Additional evidence for a terminal molt to maturity in male snow crab was obtained; the management implications of this scenario are being considered. A study completed off the northwestern coast of Cape Breton Island suggests that cod and skate are not major predators on snow crab. Results of laboratory evaluation showed that both the t-bar tag and the internal magnetic tag commonly used to mark snow crabs are prone to loss and can cause mortality and limb deformities. Improved marking techniques are being studied.

In the East Newfoundland fishery, sampling of commercial catches continued. Catch and CPUE data for the various management areas were analyzed and biomass estimates based on 1985 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 molting 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 molting and egg development were continued. A breeding migration of snow crab into shallow water during April-May was discovered in Bonne Bay on the west coast of Newfoundland in 1982. Research aimed at fully documenting behavioral, ecological and biological aspects of the phenomenon continued during the 1985 migration.

Studies were conducted on molt stage determination based on setal morphogenesis and on functional maturity using a bivariate discriminant technique. T-bar and carapace tagging were conducted north of Prince Edward Island to determine movement of crabs in the area. Short-term movements of crabs were studied in Bonne Bay, Newfoundland using biotelemetry. Attempts to estimate densities based on Nephrops trawl catches along with data from an underwater television system and using a geostatistical technique for data analysis were continued. Also continued were laboratory studies of crab reproductive behavior.

Geryon quinquedens

Monitoring of the newly developed fishery for deep-sea red crab along the edge of the Scotian Shelf was continued. Apart from some seasonal variation, catch rates have been similar to those observed

during 1984, the initial year of the fishery. To obtain long-term data on movement and growth, 1,435 red crabs were marked with t-bar tags.

Cancer sp.

The natural diets of rock crabs and jonah crabs from southwestern Nova Scotia have been investigated based on stomach analysis. Larval settlement patterns and growth of early-juvenile rock crabs have been documented by analyses of data from larval collectors moored in the Northumberland Strait. Both rock crabs and jonah crabs continue to be landed as by-catch to the lobster fishery; the directed fishery for jonah crab on the Scotian Shelf was abandonned after only one year.

Denmark
Danemark

Not reporting on Crustacea

France

(A. Charuau)

Cancer pagurus

Le suivi des captures et des efforts développés par les caseyeurs français travaillant dans le VIId, VIIe, VIIf et VIIIa a été facilité par la mise en place de carnets de pêche à partir de mars 1985, l'informatisation et l'exploitation des données est en cours.

Sur les 1958 tourteaux marqués en 1984 dans le VII e_1, 8% de retours ont été signalés par les pêcheurs avec mention de la date, du lieu, et dans un nombre plus restreint de cas avec fourniture de la carapace. L'étude des données est en cours pour statuer sur la fiabilité des deux techniques de marquage utilisées, sur les déplacements et sur la croissance.

Maïa squinado

Une étude de la biologie et de la dynamique de ce majidé a été entreprise dans le VIIe (Manche-Ouest). Des enquêtes en mer et à terre sont réalisées pour établir l'effort, la production et les caractéristiques des captures par secteur et par période de

l'année. L'étude de carnets de pêche personnel de quelques pêcheurs a permis de suivre l'évolution des rendements sur plusieurs années.

Des essais d'élevage à partir de post larves produites en écloserie sont réalisées et le cycle annuel de ponte et d'éclosion, différent d'un secteur à l'autre, a été établi pour l'année 1985. Des marquages en différents points de la pêcherie (de Brest à Cherbourg) sont en cours pour établir les schémas migratoires (1943 individus marqués en octobre 1985).

La sélectivité et l'efficacité de filets à mailles de 110 mm, 120 mm et 160 mm ont été étudiées et des essais d'évaluation directe de la densité d'araignées dans le Golfe normano breton sont effectués à l'aide d'une caméra sous-marine remorquée.

Homarus gammarus

Le programme d'aquaculture extensive et de repeuplement visant à déterminer le taux de survie de homards juvéniles nés en écloserie puis remis dans le milieu naturel s'est poursuivi par l'immersion de 8 400 animaux d'un an porteurs d'une marque magnétique. Cette opération fait suite à l'immersion dans les mêmes conditions et sur le même site de 8 500 individus en 1984. Les premières recaptures sont escomptées à partir de 1987.

Le suivi en laboratoire d'animaux témoins indique que le taux de perte de la marque magnétique est de l'ordre de 8% après 3 mues. Des études éco-éthologiques conduites en laboratoire et en zone intertidale du milieu naturel ont apporté des données sur l'habitat des homards juvéniles, sur les critères de choix de l'abri en fonction de ses caractéristiques externes et sur les relations inter-individuelles intra spécifique. Les résultats portant sur ce dernier point ont permis d'entreprendre des essais d'élevage communautaire.

Nephrops norvegicus

Des échantillonnages en routine pour les deux pêcheries au nord et au sud du 48è parallèle ont été effectuées pour la langoustine, ils ont couvert les débarquements et les rejets.

a) Golfe de Gascogne (VIIIa, b).

Les mensurations, à raison de 2000 individus par mois, ont été réparties sur les points de débarquements du littoral. Dans le même temps, l'échantillonnage des rejets a eu lieu au cours d'embarquements à raison de deux par mois. Ces embarquements ont permis d'établir également les compositions en taille des captures d'espèces accessoires : merlu et baudroie.

b) Mer Celtique (VIIg, h, k).

Un échantillonnage a également fonctionné sur les principaux points de débarquements et a porté en moyenne sur 900 individus/mois.

Une évaluation en poids et en taille des rejets a également été effectuée. En raison de l'éloignement des pêcheries, on a préféré faire effectuer les prélèvements par les pêcheurs eux-mêmes. Un descriptif de la méthode est actuellement sous presse. Deux bateaux ont été échantillonnés par mois. Les compositions en taille des captures de toutes espèces ont été établies.

Federal Republic of Germany
République Fédérale d'Allemagne

(K. Tiews)

Crangon crangon

Long-term studies to assess the by-catch in the German brown shrimp fishery were continued at the Institut für Küsten- und Binnenfischerei, in order to determine abundance indices for fish and crustaceans of commercial and non commercial importance occurring on the shrimp fishing grounds. These studies are of importance for the prediction of year class strength of fish and for the calculation of the loss of shrimp stock caused by predation.

Young fish and brown shrimp surveys in the Wadden Sea areas off the coasts of Niedersachsen and Schleswig-Holstein were continued at the Institut für Küsten- und Binnenfischerei. These surveys are part of a cooperative program agreed upon with the Netherlands and Belgium who simultaneously carry out similar surveys along their coasts.

Ireland
Irlande

(J.P. Hillis)

Nephrops norvegicus

Sampling of catch, landings and discards was continued throughout the year on an increased scale in Division VIIa and samples were also taken during the season on the Porcupine Bank Fishery in Divisions VIIc.k.

Numbers sampled were as follows:

Division VIIa

Quarter	Number of samples	Sex	Catch	Landings	Discards	Total
1	4	Male	868	729	491	2 084
		Female	399	239	429	1 067
		Unsexed	...	716	...	716
		Total	1 263	1 684	920	3 867
2	4	Male	650	133	477	1 260
		Female	929	12	766	1 707
		Unsexed	...	1 540	...	1 540
		Total	1 579	1 685	1 243	4 507
3	10	Male	1 524	1 007	947	3 478
		Female	1 742	579	1 105	3 426
		Unsexed	..	1 742	...	1 74
		Total	3 266	3 328	2 052	8 646
4	11	Male	1 637	724	1 338	3 699
		Female	1 334	257	1 554	3 145
		Unsexed	...	1 745	...	1 745
		Total	2 971	2 726	2 892	8 589
Total	29	Male	4 675	2 593	3 253	10 521
		Female	4 404	1 087	3 854	9 345
		Unsexed	...	5 743	...	5 743
		Total	9 079	9 423	7 107	25 609
DIVISION VIIc,k						
Total (all 3)	13	Male	127	839	9	975
		Female	223	461	26	710
		Unsexed	...	124	..	12
		Total	350	1 424	35	1 809
OVERALL TOTAL	44	Male	4 802	3 499	3 262	11 563
		Female	4 627	1 558	3 880	10 065
		Unsexed	...	5 867	...	5 867
		Total	9 429	10 924	7 142	27 495

Iceland
Islande

(H. Eiriksson and I. Hallgrimsson)

Nephrops norvegicus

Two research vessel surveys were carried out during the Nephrops season (May-August). The second survey included observations on gear and Nephrops behaviour by a submersible video camera unit.

Landings of Norway lobster were approximately 2.375 m tons, compared with 2.450 tons in 1984. Average cpue was the highest since 1966 or 56 kg per hour as compared to 46 kg/hour in 1984. The fishery in 1985 seems to have benefited both from increased recruitment and even more so to greater availability of Nephrops due to exceptionally favourable environmental conditions.

According to stock assessments a TAC of 2.500 m tons has been proposed for 1986. Two Nephrops surveys are planned for 1986.

The Netherlands
Les Pays Bas

(R. Boddeke)

Crangon crangon

Population dynamics

During March, a survey was carried out along the Netherlands west coast with shrimp beam trawls provided with a fine meshed cod end (1.5 x 1.5 mm mesh) to complete the set of surveys carried out in 1984. These surveys, in combination with stomach research of brown shrimps and sand gobies, beach surveys and landings statistics have clearly demonstrated the important nursery function of this coastal area.

Market sampling

The monthly sampling of consumption shrimps in all important shrimp harbours (Breskens, Colijnsplaat, Den Oever, Harlingen, Lauwersoog and Termunten) continued.

As usual, body length, sex, presence and development of the eggs and the number of shrimps per kilogram are defined.

Norway
Norvège

(B. Bøhle)

Shrimps (Pandalus borealis)

In the Northern areas as in the previous years, 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.

A survey of the stock(s) in the Norwegian Trench and Skagerrak was performed in October. In addition samples were collected from fishermen and from research cruises for other purposes.

Lobsters (Homarus vulgaris)

The monitoring programme for the CPUE of lobsters was continued. Approximately 100 000 one year old lobsters reared in warm water, were released at different localities in southern Norway.

Poland
Pologne

Portugal

(A. Cascalho)

Nephrops norvegicus

Four surveys on board the research vessels "NORUEGA" and "MESTRE COSTEIRO" were carried out along the Portuguese coast. The main purposes were the determination of the stock composition by areas and the identification of new fishing grounds mostly off the northern part of the west coast. In addition, studies on fecundity were undertaken from the berried females captured in January off the south coast. In November attempts were made to trace recruitment areas both off the south coast (Algarve) and the southern part of the west coast (Alentejo). In the four surveys a total of 36 410 individuals were measured.

The sampling programme at the fishing ports of west and south coast was continued as in previous years in order to determine length and sex composition of the stocks.

Parapenaeus longirostris and Aristeus antennatus

Three surveys on board of research vessel "MESTRE COSTEIRO" were carried out along southwest and south coast of Portugal. The main purposes of these cruises were the studies on distribution and abundance, selectivity and distribution of juveniles.

Other observations such as maturity stages were made. By-catch species were registered.

The sampling program at Olhao (south coast) was pursued. Sampling was made about twice a week for each species.

Numbers sampled:

	Cruises		Fishing ports	
	Samples	Indiv.	Samples	Indiv.
P. longirostris ...	54	14 784	78	8 535
A. antennatus ...	22	2 612	110	8 222

Spain
Espagne

(M. Torre)

Research was conducted on Aristeus antennatus in the Mediterranean sea in cooperation with Italy and France.
(Instituto Investigaciónes Pesqueras, Barcelona)

Experimental culture and growth of Liocarcinus puber was studied in the laboratory as a function of temperature and salinity.
Research on the biology of Polybius henslowi on the continental shelf of Galicia (NW Spain) was undertaken.
(Instituto Español de Oceanografía, La Coruña)

The biomass transformation and ingestion rate of crustacean and fish larvae were studied in Cadiz.
(Instituto de Ciencias Marinas, Puerto Real Cadíz)

The III Colloquium on Crustacea Decapoda Mediterranea took place in Barcelona.

Research on Artemia salina and culture of Copepods is reported in the Mariculture Committee.

Sweden
Suède

(H. Hallbäck)

Homarus vulgaris

Commercial catches are still decreasing. New regulations are set up along the southern part of the west coast. All spring fishery is stopped. Collection of catch data continued.

Nephrops norvegicus

Trawl fishery is still increasing. The new fishing areas, which were opened during 1985, showed in the beginning very good catches. Collection of catch data continued, in some areas more in detail. The new creel fishery has been successful and is now increasing very rapidly and will be followed by different investigations.

Cancer pagurus

Catches are still good, collection of catch data continued.

Pandalus borealis

The study of stocks in the biggest fjord was continued. Some trawling experiments in the Skagerrak were carried out. Collection of detailed catch data has started from some selected trawlers.

United Kingdom
Royaume Uni

1) England and Wales

(C. Bannister)

Stock monitoring. The numbers of crustaceans measured in 1985 are listed in Table 1. In addition 55 log books were issued for the collection of catch and effort information.

Homarus gammarus

The study of lobster dynamics continued with the development of a theoretical model to study the effect of size composition bias on the estimation of fishing mortality.

Yorkshire parlour pots and Norfolk creels were fished alternately on the same string on Norfolk lobster grounds and the size composition of the catches compared. Norfolk creels caught significantly smaller lobsters and crabs than the parlour pots, while the latter caught lobsters larger than those normally seen in Norfolk creels, thereby illustrating that the size selectivity of pots must be considered when interpreting size composition data.

20 small meshed parlour pots were deployed in Bridlington Bay in an effort to catch pre-recruit lobsters. The catches comprised 24 undersized lobsters with a minimum carapace length of 63 mm.

Studies of the survival and recruitment of juvenile lobsters continued with the release of 9000 microtagged juveniles at the study site near Bridlington. Transect counts of local lobster density, and exhaustive reef searching for small lobsters, continued.

Cancer pagurus

872 mature adults were tagged in November close to an overwintering site in the Eastern Channel. Local fishermen were consulted about the distribution of crab sizes in this area.

Nephrops norvegicus

For the North Sea fishery routine size composition collections were augmented by a continuing study of the discarding pattern, followed by an analysis of different methods of working up discard data.

In the Irish Sea investigation of the distribution and dynamics of Nephrops larvae continued with several larval surveys of the hatching areas. Results of previous larval surveys are being written up to estimate stock size in conjunction with fecundity data. The Irish Sea stock has been assessed using a quarterly length cohort analysis and yield per recruit model, and a review made of the results of recent experiments and commercial trials with separator trawls. Analysis of Nephrops CPUE data for 1972-84 showed a significant (P 0.001) one year lagged negative correlation with cod biomass. Work on the Nephrops-cod interaction continued with studies on cod gastric evacuation.

Table 1. Crustacean measurements, England and Wales 1985.

ICES Division	Cancer pagurus	Homarus gammarus	Nephrops norvegicus	Maia squinado
IVb	2041	5448	11977	-
IVc	505	131	-	-
VIId	965	187	-	142
VIIe	1637	21	-	-
VIIa/g	196	851	-	-
VIIa	-	429	5877	-

United Kingdom
Royaume Uni

2. Scotland

(J. Mason)

Nephrops

Regular monthly sampling of trawl and creel landings continued at all major fishing ports and research vessel surveys were conducted on the important grounds. Information was obtained on abundance, size and sex composition, growth and maturity. Studies of density were made by means of a towed underwater sledge carrying television and photographic cameras. The usefulness of this technique has been greatly improved by a laser device for measuring camera distance from the sea bed.

Sediment and trawl catch surveys in the Firth of Forth revealed large variations in abundance and size composition of Nephrops which appear to correspond to the pattern of sediment distribution. Sediment with the lowest silt/clay content supported the highest density and biomass of Nephrops, but they were smaller because of a lower growth rate.

The study of the survival of undersized Nephrops discarded in the fishery continued. The amount of damage to the retina caused by exposure to light was shown to be less in light-adapted than in dark-adapted animals. It is thus likely that many Nephrops, especially those caught in deep water in the middle of the day, suffer severe eye damage before they are released. A tagging experiment to compare long-term survival of normal and visually impaired animals is in progress.

In studies of swimming, a larger proportion of visually intact than visually impaired Nephrops swam in response to an approaching ground-rope before actual contact with the stimulus.

Swimming response is of one of two types according to the direction of the stimulus. A touch on the head causes Nephrops to swim away with a low trajectory. A similar stimulus directed posteriorly results in a high trajectory. On the approach of a ground-rope, about half the Nephrops observed began to swim before the ground-rope arrived and the other half only on contact. Most swam in a direction normal to the ground-rope. These findings are important in studies of Nephrops capture.

Pandalus borealis

Routine monitoring of the North Sea fishery continued.

Crangon crangon

Monitoring of the Solway Firth fishery was carried out and further studies were made on the fish by-catch.

Homarus gammarus

Sampling of commercial catches continued in the main fishing areas and catch and fishing effort data were obtained from selected fishermen. Landings continued to increase, landings per unit effort are generally high and increased numbers of undersized lobsters were caught, reflecting the recent good recruitment.

Tagging experiments involving the re-release of recaptured animals were carried out on the east and west coasts in order to study growth, movements and mortality. An experiment in the St. Andrews fishery gave an instantaneous fishing mortality coefficient of 0.77 and a coefficient of mortality from all other causes of 0.88. Some lobsters released inshore were recaptured 17 miles (27 Km) offshore, and a study has now begun of the relationships between offshore and inshore stocks.

A study was started of the distribution and abundance of lobster larvae and juveniles with a view to investigating a possible link with subsequent recruitment to commercial stocks. Substratum preference is also being studied.

The artificial reef established in the Firth of Forth in 1984 was observed. Fishermen reported catching lobsters on the reef, but no corroborative evidence of them was obtained. Further observations of the flora and fauna will be made in 1986.

Cancer pagurus

Sampling of commercial landings was continued. Catch and effort data were obtained from selected fishermen.

Liocarcinus puber

The fishery for the velvet crab is now well established on the west coast and landings in 1985 increased to 315 t. Landings are being monitored. It was established that L. puber first breeds at a size of 50 mm carapace width, some 10 mm less than the size at which it is usually marketed.

USA

(S. H. Clark and M. Castagna)

The Northeast Fisheries Center (NEFC) conducted spring and autumn bottom trawl surveys which provided data for crustacean species. NEFC and state personnel 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. NEFC and Southeast Fisheries Center (SEFC) personnel and researchers in several state agencies performed stock assessment work and related studies.

Pandalus borealis (Northern Shrimp)

The Maine DMR continued larval physiology and ecology studies and development of separator trawls for reducing incidental harvest and discard of juvenile groundfish. Cooperative stock assessment work involving the state agencies of Maine, New Hampshire, and Massachusetts continued. NEFC historical trends in abundance and environmental parameters.

Penaeus setiferus (White Shrimp)
P. duorarum (Pink Shrimp)
P. aztecus (Brown Shrimp)

The SEFC continued cooperative mark-recapture studies with Mexico to evaluate movements and mortality and studied ecological factors affecting juvenile shrimp populations. Other projects included resource surveys and stock assessment work (yield per recruit studies) to evaluate effects of areal closures in the Gulf of Mexico. Several state agencies in the southeast conducted mark-recapture studies and continued sampling programs as required for management by seasonal closures.

Homarus americanus (American lobster)

Several state agencies in the northeast continued monitoring of commercial landings, size, and sex composition of the commercial catch and trends in catch per unit effort. The New Hampshire Fish and Game Department studies impacts of an increase in minimum carapace length on landings and economic revenue, while the Connecticut DEP continued a variety of investigations including larval and juvenile lobster distribution and ecology, total mortality, and condition of ovigerous females. Work by Connecticut and New York State personnel in Long Island Sound have documented apparent fishery-related differences in mortality and size and sex composition.

NEFC researchers developed improved methods for modeling stock-recruitment relationships and yield and egg production per recruit. Studies of ecology, behavior, larval and adult

distribution and biochemical investigations including the biological roles of hormone-like secretions continued at the University of Rhode Island, the Woods Hole Oceanographic Institute, the Woods Hole Marine Biological Laboratory, the University of Connecticut and other academic institutions.

USSR
URSS

(S. A. Studenetsky)

Deep-water prawn In April-June a stratified trawl survey using underwater photography of deepwater prawn (Pandalus borealis) was conducted in the Barents Sea and Spitsbergen area. 229 trawlings and 72 hydrological stations were made. 18 800 deep-water prawns and 16 100 fishes taken as the by-catch were analyzed.