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Rapport d'Activités



SHELLFISH COMMITTEE

COMITÉ DES CRUSTACÉS ET MOLLUSQUES

by par

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1990

FOREWORD

15 member countries of a total of 16 with members in the Shellfish Committee provided inputs for 1990 to the Shellfish Committee Report of Activities. Survey activities of both crustaceans and molluscs continue to play the dominant role in the activities of member countries. Interest in implementing relatively little used techniques has otherwise grown greatly, and this has manifested itself in the two successful Workshops held under the auspices of the ICES Shellfish Committee: a) Multivariate Analysis of Shellfish Stocks, b) Spatial Statistical Techniques. Reports of these were presented at the 1989 Statutory Meeting and modified versions will be published in due course in the Cooperative Research Report series. Further attention has been devoted to developing production, productivity and energetics approaches, including modelling. These supplement analyses of life-history trends. All these developments have naturally been focussed upon in the 1990 ICES "Symposium on Shellfish Life Histories and Shellfishery Models".

## CRUSTACEA

### Belgium - Belgique

(F. Redant)

#### *Nephrops norvegicus*

The market sampling programme on the Norway lobster (Belgian landings from the Botney Gut - Silver Pit stock) was continued, to evaluate the impact of fishing on population structure and composition and to complete the existing data-base for analytical assessment studies.

In November 1990 a preliminary and exploratory survey was performed in the Botney Gut - Silver Pit area (Central North Sea) to investigate possible relationships between sediment composition, fishing intensity and population structure of the *Nephrops* stock in the area. During this survey bottom profiles were recorded on several transects in the Botney Gut and sediment samples were collected for further analysis (e.g. granulometric composition, organic carbon content). These investigations are planned to be continued on a more regular and larger scale in 1991 and 1992.

#### Invertebrate by-catch species

A new project was started to collect information on seasonal fluctuations in the landings of invertebrate by-catch species (e.g. edible crab, whelk, scallop, squid and cuttlefish) by Belgian beam- and otter-trawlers. The landings data are to be related to data on the seasonal and geographical distribution of fishing effort, in order to find out whether these fluctuations are due to seasonal fluctuations in the availability of the species or to seasonal changes in distribution of fishing effort.

#### Epibenthic biota

At the request of the Study Group on Ecosystem Effects of Fishing Activities an updated bibliography was compiled on the effects of bottom-fishing gear and harvesting techniques on seabed and benthic biota. The update includes about 100 references, and covers a wide range of harvesting techniques, from hand-raking to trawling and hydraulic bivalve-dredging.

### Canada

#### Newfoundland and Scotia Fundy Region

(G. P. Ennis)

#### *Homarus americanus*

The 1990 Canadian lobster fishery landings from the open Atlantic coast and the western Gulf of Maine remained high in 1990, with overall landings the highest this century. Lobster landings continued to increase on the major inshore fishing areas of the western Gulf of Maine and the extreme northeast of Nova Scotia while landings from other areas of the coast have leveled off or shown a small decline.

Offshore lobster landings increased in 1990 after 3 years of decline. Factors controlling catchability and abundance are still poorly understood in this deep-water offshore stock.

Research continues on population ecology of all life history stages, with emphasis on reproductive ecology and larval distribution. Published trapping-study results suggest that smaller lobsters are less trapable than mature sizes and that this selection occurs over the size range in which the majority of the commercial catch occurs. Gear selection is thus a source of potential error in the length based assessment methods.

Long-term monitoring of catch and effort data continues, with sea and port sampling, compulsory logbooks in the offshore, and voluntary logbooks in the inshore.

Les travaux portant sur la détermination de la fréquence de mue ainsi que l'accroissement à la mue en fonction de la taille et du sexe des individus se sont poursuivis aux Iles-de-la-Madeleine et en Gaspésie (Québec) en 1990. Le suivi régulier des concentrations de homards et de leur pêcherie a également été effectué.

Long-term monitoring of fishery characteristics including catch rates, catch, effort and exploitation rates and aspects of the population biology of lobster including annual growth, recruitment and standing stock was continued in three localized fishing areas around Newfoundland. Annual plankton sampling to study larval ecology continued in one of these areas.

Sea sampling of commercial lobster catches was conducted throughout the Gulf of St. Lawrence from Baie des Chaleurs to western Newfoundland in order to provide management advice for specific local adjustments of fishery regulations and resource-monitoring projects.

On the western coast of Cape Breton Island, the incremental size increases for the pilot program have been completed. The minimum legal carapace length was increased from 63.5 to 70 mm over a four year period. Data on life cycle and population characteristics of lobster in the area were collected before, during and will be collected after the carapace size increases. Analysis of the effect of minimum carapace size increases on lobster population structure and fisheries yield is in progress.

The lobster population inside and adjacent to a shallow, semi-enclosed coastal bay, Malpeque Bay (Prince Edward Island), was investigated through tagging and molt monitoring. Extensive interchange of lobsters was observed between the bay and coastal areas. Four molting peak periods were observed in the bay over the ice free season. Analysis is in progress to determine what interaction there is between molting and movement trends.

#### *Pandalus borealis*

Fishermen's logbooks, observer data and a research trawl survey provided data on the northern shrimp fishery and status of the stocks off coastal Labrador and in Davis Strait in 1990. TAC's, totalling over 26,000 t, were taken in most of the traditionally fished areas and more effort was directed to some recently fished areas, especially Div. OB and 2G. A research survey was conducted from July 8 to July 25 in Div. 2H and 2J and biomass estimates were obtained for the Hawke Channel (Div. 2J) and Hopedale Channel (Div. 2H).

Les travaux portant sur l'évaluation des crevettes nordiques et de leur pêcherie dans l'estuaire et le golfe du Saint-Laurent, se sont poursuivis en 1990 et des conseils scientifiques multi-annuels à la gestion de cette ressource ont été formulés pour les saisons de pêche de 1991, 1992 et 1993. Un relevé par chalutage de fond a été effectué dans la zone de pêche de Sept-Iles et a permis d'une part,

de spécifier la distribution spatiale des crevettes et d'autre part, d'obtenir une estimation directe de biomasse. Un relevé conjoint sébaste/crevette a été effectué pour la première fois dans l'Estuaire et le Golfe dans le but d'obtenir des estimations directes de biomasse des espèces visées.

Des travaux visant à déterminer la structure génétique des concentrations de crevettes du fjord du Saguenay, de l'estuaire et du golfe du Saint-Laurent ainsi que de la cte du Labrador ont débuté en 1990. Ces travaux visent également à vérifier la pertinence des unités de gestion actuellement utilisées dans la pêcherie du Golfe. Les analyses sur l'organisation spatiale des crevettes de la partie ouest du golfe du Saint-Laurent se sont poursuivies. L'utilisation des géostatistiques a permis d'obtenir de l'information sur les relations entre les stations à faible et grande échelles ainsi que des estimations de biomasse. Les travaux portant sur la possibilité d'utiliser l'hydroacoustique comme méthode d'échantillonnage des crevettes ont été poursuivis en 1990. Des expériences de laboratoire ont été menées sur les larves de *P. borealis* afin de mettre au point une mesure de leur condition qui pourrait expliquer la survie larvaire de cette espèce. Des expériences sur le terrain en vue de vérifier les hypothèses développées en laboratoire ont également eu lieu.

### *Chionoectes opilio*

In the Newfoundland fishery, at-sea research sampling and sampling of commercial catches continued. Catch and CPUE data for the various management areas were analyzed. Landings are increasing in the southern zone offshore areas apparently because of increased recruitment since 1986. In 1982, there was a sharp reduction in the level of moulting activity in the population that had persisted and appears to be related to lower bottom temperatures throughout the area over this period. CPUE remained stable in the deep-water bays along the coast, probably as a result of strict quotas that were first imposed in 1986. Landings and CPUE in the northern zone are increasing due to increased recruitment and the discovery of new commercial fishing grounds. Additional new areas of commercial abundance were identified in 1990 in the Labrador Sea and northwest of the Funk Islands on the northeast coast of Newfoundland.

Research aimed at fully documenting behavioural, ecological and biological aspects of a deep-to-shallow breeding migration of snow crab in Bonne Bay on the west coast of Newfoundland continued. Studies of various aspects of moulting, mating and egg development continued. A spring bottom-trawl survey for snow crab in Conception Bay, on the east coast of Newfoundland, was successfully carried out for the third consecutive year.

The overall status of snow crab stocks in 1990 shows an improvement over 1989, continuing the reversal of the collapsed state noted in previous years. A wave of males first detected as pre-recruits in 1985 continued recruiting into the commercial stocks prior to the 1990 fishing season and increased fishable biomass over 1989 levels in all areas. A stronger market demand for snow crab resulted in an increase in total fishing effort (trap hauls) and expansion into the offshore areas. With a higher average catch rate and increased effort the total landings at 1,152t were 10% higher than in 1989. Catch rates throughout the offshore were high and it is probable that the fishery has yet to significantly impact on the resource. At-sea sampling showed that most of the males captured were relatively old-shelled and had attained morphometric maturity.

The minimal legal size was thought to confine exploitation to males that had been mature for 1-2 years. Hence, the full reproductive potential of the resource was believed to be protected. However, between 45.5% to 2.5% of the landed males sampled from the Cape Breton inshore areas during 1989 and 1990 were morphometrically immature. Although the long-term biological implications of this situation remain unclear, virtually all of the mature females sampled through the recent fishing seasons carried eggs. Analyses of morphometric data also showed that large numbers of males had

attained a terminal moult below the legal minimum size. A new claw measurement will be substituted for the carapace width measurement on an experimental basis in order to obtain a more complete separation of males which have and have not attained terminal moult. Research into reproductive physiology, morphology, and expressions of maturity in snow crab is continuing. In addition, tests are being conducted with radiochemical methodologies for aging snow crab carapaces.

La structure d'âge des carapaces de crabe des neiges a été déterminée pour une population vierge du fjord du Saguenay (Québec): des différences importantes sont observées pour les mâles selon qu'ils soient morphométriquement matures ou immatures. Des travaux de laboratoire sont en cours afin de vérifier l'héritabilité de la taille à maturité morphométrique, ainsi que la contribution des femelles primipares et multipares à reproduction de l'espèce.

Le mouvement ascensionnel d'une partie importante de la population de crabe des neiges de la baie Saint-Marguerite (Québec), composée principalement de femelles et de mâles morphométriquement immatures, a eu lieu à nouveau au printemps de 1990. Un suivi régulier de cet événement exceptionnel est effectué et permet d'observer directement le comportement de mue et de reproduction des crabes.

Les travaux de caractérisation phénotypique et génotypique des populations de crabe du Saguenay, de l'estuaire et du golfe du Saint-Laurent progressent; ceux-ci visent à fournir de l'information sur la structure des stocks et leurs interactions possibles de manière à obtenir une définition objective des unités de gestion. Les travaux portant sur l'évaluation des crabes et de leur pêcherie dans l'estuaire et sur la côte nord du golfe du Saint-Laurent se sont poursuivis en 1990 et des conseils scientifiques à la gestion de cette ressource ont été formulés pour la saison de pêches 1991.

L'état de la ressource dans le sud-ouest du Golfe a été étudiée à partir des statistiques de débarquement et des journaux de bord fournis par les pêcheurs. L'incidence des crabes récemment mués dans les débarquements n'a pas causé de problème aux pêches commerciales contrairement à la saison précédente ayant suscité une fermeture prématurée de la saison. Les estimations de la biomasse disponible effectuée par la technique géostatistique du krigeage, et basée sur la campagne des années 1989 et 1990 ont démontré que le stock est sur la bonne voie de se reconstituer. Afin de protéger et de reconstituer le stock, une nouvelle approche de la gestion de stock du crabe a été mise en place pour les saisons de 1990 et de 1991 en se basant sur les résultats de cette campagne.

Un relevé mensuel au chalut à langoustine a été effectué en 1990 à six stations différentes dans la Baie des Chaleurs afin d'y étudier le cycle de vie de crabes des neiges dans le milieu naturel. Une étude d'efficacité des différents types de casiers a également été effectuée dans la Baie des Chaleurs afin de concevoir un type de casier qui éviterait la capture de crabes à carapace molle.

L'histoire naturelle de l'espèce en relation avec la présence d'une mue terminale est étudiée en bassin thermocontrôlé à l'aquarium de Shippagan et *in situ* en plongée sous marine dans le Fjord de Bonne Bay. Les résultats de ces études ont permis de suivre le cycle et le mécanisme du recrutement du crabe en mue terminale dans le milieu naturel.

Une méthode simple et peu coûteuse pour déterminer l'âge des carapaces de crabes des neiges a été mise au point et sera validée sur le terrain par des expériences de marquage en 1990 et 1991.

### Cancer irroratus

Des travaux de recherche ont été réalisés en 1990 afin de déterminer la croissance, la maturité, le cycle reproducteur et la fécondité du crabe commun de la baie des Chaleurs (Québec). Des observations sur la distribution spatiale des crabes au moment de la mue et de la reproduction ont

aussi été effectuées. Ces travaux visent à connaître la biologie du crabe et à comprendre son écologie en vue d'établir une stratégie de la gestion de la ressource dans l'éventualité du développement d'une pêcherie.

## MARINE PLANT

### *Ascophyllum nodosum*

Landings of *Ascophyllum nodosum* in Nova Scotia reached a historical peak of 29,000 t in 1989 after a sharp rise since 1985. Landings dropped by 13% in 1990 despite an increase in the harvesting areas. Mechanical and hand harvest technologies accounted for equivalent amounts of the landings. In some areas overharvesting has occurred due to the high demand and competitive harvesting. However significant unexploited resources remain on the southern and eastern coasts of Nova Scotia and southern New Brunswick.

Les récoltes expérimentales de l'algue *A. nodosum* dans le but de déterminer la stratégie de coupe (hauteur et fréquence) permettant de maximiser la récolte se sont poursuivies en 1990. La poursuite de ces récoltes permettra de confirmer à moyen et long terme la validité de la stratégie retenue (coupe à une hauteur de 15 cm à tous les trois ans).

### *Chondrus crispus*

*Chondrus crispus* landings continue to be depressed in southwestern Nova Scotia, 50% below 1975-80 levels. Although lack of effort is one explanation of the low landings, local problems with pollution and competitive species are also contributing factors. Landings in the Gulf of St. Lawrence continue steady from the 1980's. However the effort has been concentrated in Western Prince Edward Island. In this area an influx of *Furcellaria* has been reported that threatens the industry.

## Denmark - Danemark

(S. Munch-Petersen & D. Carlsson)

### *Pandalus borealis*

Data for assessment of *Pandalus* stocks in ICES div. IIIa and IV have been collected from commercial landings.

Logbooks from the Greenland offshore shrimp-fisheries in the Davis Strait and the Denmark Strait were compiled and analysed with respect to the distribution of the fisheries and trends in CPUE. A multivariate model was developed to standardize CPUE in NAFO Division 1B.

Stratified-random trawl-surveys were performed in the July-September period in Davis Strait (NAFO Divisions OA, 1A, 1B, 1C and 1D) and in Denmark Strait (ICES Divisions XIVb) to estimate minimum fishable biomass and to obtain biological samples for analysis of stock size-frequency distributions.

A program was initiated to estimate discard rates in commercial fisheries by observers sampling on board commercial vessels in Greenland waters.

Exploratory-fisheries, searching for unexploited shrimp resources, were performed by commercial vessels in offshore and inshore Northwest Greenland waters and in offshore Southeast Greenland waters, but with poor results.

Mesh selection experiments and trials with a new shrimp sorting device in the cod-end of shrimp trawls were performed in order to reduce catches of small shrimp in Greenland waters (c.f. ICES Gear and Behaviour Committee).

A programme was initiated to distinguish shrimp populations in Greenland waters by electrophoresis.

*Nephrops norvegicus* (A. Nicolajsen, Faroe Islands)

Sampling from landings at the main fishing area continued in 1990 in order to monitor the creel fishery.

In June-July a six-week trawl survey was conducted in 12 commercial fishing areas. 111 samples with a total of 24,072 specimens were taken from the 122 catches to determine carapace length, sex, maturity stage, egg stage and soft-condition. At the same time, trawl selectivity was investigated by three different methods: covered bag, alternating hauls and vertically-split trawl.

*Gerion affinis*

On a trip with a hired commercial longliner some *Gerion* were caught by Canadian type pots.

France

(A. Charuau)

*Cancer pagurus*

La collecte des données d'apports et d'efforts des caseyeurs français attachés aux ports de Manche Ouest a été réalisée à partir des livres de bord européens (logbooks).

Comme les années précédentes, des mortalités imputables au dinoflagellé parasite *Hematodinium* sp. ont été notées en périodes hivernales, en particulier sur les tourteaux provenant de zone côtières.

*Homarus gammarus*

Aucun des homards marqués à l'état juvénile entre 1984 et 1987 avec une marque magnétique n'a été recapturé en 1990. L'expérience française de "tentative de forçage du recrutement du homard" est désormais terminée. Entreprise dans les années 1960 par l'immersion de femelles ovigères sur des cantonnements, elle s'était poursuivie à partir de 1970 par l'immersion de post-lavres puis de juvéniles d'un an produits en éclosion. Aucun impact appréciable n'aura pu être détecté sur les stocks.

*Maja squinado*

Une campagne annuelle d'estimation directe du recrutement a été effectuée dans le courant du mois d'août sur les principales nourriceries françaises de Manche Ouest (baie de Saint-Brieuc et Ouest Cotentin). Le recrutement est apparu particulièrement abondant (biomasse supérieure dans une

proportion 1.5 à 2 à celle de l'année précédente) et la taille moyenne des nouveaux adultes supérieure aux valeurs habituelles.

Ces observations confirment la capacité de renouvellement du stock à partir d'une biomasse féconde faible (influence de conditions climatiques favorables) et l'influence prépondérante des conditions de milieu sur la croissance. L'hypothèse d'une diminution de la taille moyenne sur les pêcheries fortement exploitées où la reproduction n'est assurée que par les plus petits individus (hors tailles) perd de sa consistance.

### *Nephrops norvegicus*

L'échantillonnage de débarquements de langoustine a été effectué comme chaque année sur les pêcheries du Golf de Gascogne et de la Mer Celtique.

### BILAN DE L'ECHANTILLONNAGE DE LA LANGOUSTINE SUR LES NAVIRES COMMERCIAUX FRANÇAIS

Zone	Période	Mesuré	Nombre de langoustines mesurée
Mer Celtique	1er trim.	10	1646
	2e trim.	10	1744
	3e trim.	9	1468
	4e trim.	8	1343
Golfe de Gascogne	1er trim.	64	3128
	2e trim.	50	2781
	3e trim.	45	2200
	4e trim.	49	2710

Les C.P.U.E. mensuelles sont calculées pour les deux pêcheries à partir de deux ports pris comme référence: St Guénolé pour la Mer Celtique et Lesconil pour le Golfe de Gascogne. Pour 1990 les moyennes annuelles respectivement de 253 Kg/jour et de 86 Kg/jour complètent les séries établies depuis 1983 et 1970.

La méthode de détermination de l'âge de la carapace par mesure de l'activité des radio-isotopes <sup>228</sup>Th et <sup>228</sup>Ra a été validée en 1990 par des mesures sur des carapaces d'individus ayant mué en vivier, donc d'âge connu.

A la suite de cette validation, la méthode a été appliquée à des individus proches de la mue, prélevés sur la vase nord du Golfe de Gascogne. Dans un premier temps, on a cherché à obtenir des résultats "points de repères" en effectuant des mesures sur des échantillons constitués de plusieurs carapaces d'une même classe de taille. Ces premiers résultats qui sont à considérer comme des indicateurs d'ordres en raison de ces regroupements, suggèrent le passage de deux à une mue par an pour les femelles lorsqu'elles atteignent la maturité sexuelle, et un rythme de deux mues par an pour les mâles. Une série de mesures individuelles sera effectuée en 1991 en vue d'étudier la variabilité inter-individuelle de l'activité des éléments mesurés.

## Germany - Allemagne

(R. Meixner)

### *Crangon crangon*

By-catch research in the German brown shrimp fishery was continued, and a total of 301 samples were analysed. An increase in the appearance of drifting green-seaweed and of young whiting, plaice and *Carcinus maenas* resulted in declining catches of brown shrimp in the autumn.

A cooperative programme initiated with the Netherlands and Belgium to study the abundance of young fish and brown shrimp continued. Information obtained from 299 samples along the coasts of Niedersachsen and Schleswig-Holstein indicate a reduction in the shrimp stocks. This is probably a response to an increase in the number of some shrimp predators, e.g. young whiting. Young cod were seldom found.

## Iceland - Islande

(U. Skúladóttir & H. Eiriksson)

### *Nephrops norvegicus*

An annual research-vessel survey was carried out in May covering all major *Nephrops* grounds. The survey included regular sampling of various biological parameters used in an annual stock abundance analysis. The nominal landings of Norway lobster amounted to some 1,700 tonnes compared to 1,866 tonnes in 1989. However, CPUE rose from 36 kg per trawling hour in 1989 to around 40 kg in 1990. The rise in CPUE is attributed to increased recruitment in fishing areas off SE Iceland, whereas recruitment remained low at SW Iceland.

### *Pandalus borealis*

Landings in the offshore areas increased to about 24,000 tonnes in 1990, following the effective TAC of 23,800 tonnes (the Marine Research Institute advised 22,000 tonnes) as compared to a nominal catch of about 22,200 tonnes in 1989. CPUE was about 84 kg for the north-west areas in 1990 (67 in 1989). This CPUE is an index taken from a regression of CPUE on gear size where the CPUE of a 1200 mesh trawl is calculated every year for the months May through August. The CPUE for the northeast area stayed much the same, being 100 kg in 1989 and 97 kg in 1990. The offshore areas were surveyed once (fixed stations) and the stock appeared to have increased since 1989.

Biannual surveys (fixed stations) were carried out as usual for assessment of stock size (area swept) in the fjords. The by-catch problem of young gadoids appears to have been solved by the uptake of square mesh in the bag of the trawl. This is now compulsory in all fjords.

Most of the inshore stocks are at a high level at present. This is due to a number of factors: Drastic reduction in TACS in the years 1986-1988 in the largest areas; the strong year-class of 1987 has been protected by implementation of square mesh (started in 1989); the predators have not been numerous.

The age determination of offshore shrimp has now been carried out for 3 years (1988-1990). The length at egg-bearing (mean of many years) in four areas in the Icelandic waters has been assessed, showing a difference in length of egg-bearing that can be related to annual average near-bottom temperature of these areas.

The collection of young shrimp in a small-meshed bag (6 mm) attached to the cod-end has been found to be very useful, showing the presence or absence of the youngest shrimp that would otherwise escape through the meshes.

Ireland - Irlande

(J.P. Hillis)

Nephrops

The programme of sampling of catch, landings and discards in Division VIIA continued as did the limited programme of interviewing of skippers to assess distribution of effort. Sampling of the Porcupine Bank (VII, c, k) also took place and, for the first time, sampling of the Aran Grounds (VIIb) fisheries.

A summer sampling cruise was again carried out, but on a more extended basis than in 1989. The findings of this cruise were subjected to cluster analysis in collaboration with the Zoology Department of Trinity College, Dublin, with a view to reducing the numbers of stations sampled in future with minimum reduction in information acquisition.

Irish sampling data for *Nephrops* in 1990.

Div.	Quar	No. of Sample	Sex	Catch	Landings	Disc.	Total
VIIa	1	5	Male	1047	458	141	1646
			Female	625	11	108	744
			Unsexed	-	1573	-	1573
			Total	1672	2942	249	3963
	2	9	Male	2331	971	497	3799
			Female	3283	379	702	4364
			Unsexed	-	4405	-	4405
			Total	5614	5755	1199	12568
	3	20	Male	2638	1840	1264	5742
			Female	2821	627	1556	5004
			Unsexed	-	4778	-	4778
			Total	5459	7245	2820	15524
	4	4	Male	896	290	132	1318
			Female	548	44	113	705
			Unsexed	-	1636	-	1636
			Total	1444	1970	245	3659

Total		38	Male Female Unsexed Total	6912 7277 - 14189	3559 1061 12392 17012	2034 2479 - 4513	12505 10817 12392 35714
VIIb-k	2	5	Male Female Unsexed Total	- - - -	987 573 - 1560	- - - -	987 573 - 1560
	3	4	Male Female Unsexed Total	- - - -	748 224 - 972	- - - -	748 224 - 972
Total	4	15	Male Female Unsexed Total	- - - -	4099 219 - 4318	- - - -	4099 219 - 4318
Total		24	Male Female Unsexed Total	- - - -	5834 1016 - 6850	- - - -	5834 1016 - 6850
VIIc,k	2	2	Male Female Unsexed Total	- - - -	489 361 - 850	- - - -	489 361 - 850
	3	14	Male Female Unsexed Total	1765 2338 - 4103	2728(117)* 2314(330)* - 5042(447)*	- - - -	4493(117)* 4652(330)* - 9145(447)*
Total		16	Male Female Unsexed Total	1765 2338 - 4103	3217(117)* 2675(330)* - 5892(447)*	- - - -	4982(117)* 5013(330)* - 9995(447)*
Overall		78	Male Female Unsexed Total	8677 9615 - 18292	12610(117)* 4752(330)* 12392 29748(447)*	2034 2479 - -	23321(117)*6 846(330)* 12392 52559(447)*

## The Netherlands - Les Pays-Bas

(R. Boddeke)

### *Crangon crangon*

#### Surveys

The annual, international young flatfish and brown shrimp survey conducted in cooperation with Belgium, Germany and the United Kingdom, was carried out in the standardized form in October. In the period 1985-1990, the shrimp stock in the coastal zone of the Netherlands in October has shown a declining trend, in particular in the northern areas. These results seem to be due to incidental (mild winters in the last three years, increasing presence of 0-group whiting in the Dutch coastal area in this period) and structural (fast decrease of the phosphate discharge by the river Rhine since 1981) factors. The latter factor is in particular relevant in the coastal zone north of the Hook of Holland.

As in preceding years, in March, May and August 1990, surveys were carried out on the Eaterschedt to follow possible environmental changes in this sea arm.

#### Sampling

The sampling of commercial landings in the six most important shrimp harbours continued as usual. Landed consumption-shrimps were of a small size in 1990 in the northern areas, with an average of approximately 800 shrimps per kg, but of a remarkably large size in the southern harbours with an annual average of approximately 650 kg.

## Norway - Norvège

(C.C.E. Hopkins and S. Tveite)

### *Pandalus borealis*

The Norwegian College of Fisheries Science (University of Tromsø) continued their monitoring of biomass and demographic parameters of *Pandalus* in selected north Norwegian fjords and in the fjords of West Spitsbergen. The Spitsbergen cruises also included surveys of macrobenthic communities at the prawn-trawling stations. Ashore, emphasis has been placed on developing cohort and population production models for prawn, that can be flexible enough to simulate geographic variability in dynamic population parameters. The role of total lipid-content in the life-cycle, relative to age and season, has also been described and quantified for a fjordic population. The cycle of total lipid accumulation and storage, together with information on fatty-acid food-chain markers, highlight the close dependence of this species on pelagic production, especially zooplankton. Work has also continued on examining the structure and variability of *Pandalus* - fish communities, sampled by demersal trawl surveys, in the Barents Sea from 1980 to 1989, and relating this to environmental determinants (e.g., latitude, longitude, depth, temperature).

The Institute of Marine Research (Bergen) continued their annual surveys in April-May 1990 in the Barents Sea (Division I) and in July/August in the Bear Island - Spitsbergen area (Division IIb). Abundance estimates (biomass) in the Barents Sea showed an increase of about 40% compared with the observations in spring 1989. In the Bear Island - Spitsbergen area the abundance estimate was

similar to that of the summer of 1989. By-catches of fish (species and cod stomach-contents) were also recorded.

The Institute of Marine Research (Bergen) had an inspector on a prawn trawler in March in the East Greenland area. Biological samples were taken and by-catch and discard were determined.

The Flodevigen Research Station (Arendal) recorded decreased CPUE in both the Skagerrak area and in the Norwegian Deeps, due to a combination of poor recruitment in 1986 and 1987 combined with heavy exploitation. On the basis of research cruises, however, the 1988 year-class seems to be slightly above average, while the 1989 year-class is a strong one.

Norwegian sampling data for *Pandalus borealis* in ICES areas I, IIa and b, and IV in 1990.

Species	Area	Season	No. of Species		No. of Animals
			Research	Market	
<i>Pandalus</i>	I	2	83		20751
		4	2		502
	IIa	2	21		5254
		3	11		2709
		4	1		247
	IIb	2	31		7708
		3	100		24594
		4	1		251
	XIV	1		16	3614

#### *Homarus gammarus*

The monitoring programme for CPUE and length measurements of commercial catches at five different localities in the Skagerrak area was continued in 1990.

Yearlings of lobster raised in warm water have been released at different localities along the Norwegian coast. This type contributed by about 50% of lobsters < 27 cm total length at the release sites. The first ones were released in 1985.

Samples of *Pandalus* and *Homarus* analysed by Norway in ICES areas IIIa and IVa during 1990.

Species	Area	Season	No. of Samples		No. of Individuals	
			Research	Market	Measured	Aged
<i>Pandalus</i>	IIIa	1. quart.	16	1	5026	5026
	IIIa	2. quart.	11	0	4516	4516
	IIIa	3. quart.	-	2	584	584
	IIIa	4. quart.	44	2	15201	15201

<i>Pandalus</i>	IVa	1. quart.	3	-	513	513
	IVa	3. quart.	3	-	567	567
	IVa	4. quart.	21	-	4532	4532

\* aged by normality separation method.

Lobster (*Homarus gammarus*) enhancement

A project supported by the Norwegian Fisheries Research Council (NFFR), studying release of tagged, one year-old reared lobsters in the sea, was terminated at Austevoll Aquaculture Station in 1990. The goal was to see if and how they survived in nature, and evaluate whether this is a viable way to replenish depleted lobster stocks. Tagged lobsters were in 1990 observed in three of the four release fields. They comprised 50% to over 75% of the catches of lobsters with carapace length between 55 and 75 mm. Increases in weight ranged from 3 to 6 g at release in 1988 to 110 to 170 g in 1990. However, the tagged returns accounted for about 1.5% of all the released lobsters, with 2.5% being the best achieved in the field.

As an extension to this pilot-project, a large scale release programme has now been started. In 1990, the initial year, 20,000 lobsters, marked with magnetic microtags, were released to enhance a commercially exploited population. The lobster hatchery at Kyrksterøra produced another 70,000 lobsters for release in 1991.

Lobster sampled from the Norwegian release programme, 1990.

Species	Area	Quarters	No of Samples		No. of Animals	
			Research	Market	Measured	Aged*
<i>Homarus</i>	Austevoll	3-4	11	7	20	20

\* Marked with code for age when released in 1988.

*Palaemon* spp.

The biology and ecology of *Palaemon elegans* and *P. adspersus* are being studied (Zoological Museum, Univ. of Oslo) at three different localities in the Oslo fjord.

Poland - Pologne

(NO REPORT ON CRUSTACEA)

## Portugal

(M.J. Figueiredo)

### *Nephrops norvegicus*

The sampling programme at landing ports was continued as in previous years. Three research surveys were carried out, one with the R/V "MESTRE COSTEIRO" in order to study the larval distribution off the south coast in early February, and two others with the R/V "NORUEGA" in order to determine the biological characteristics of the stocks on the traditional *Nephrops* fishing grounds as well as on new and deeper grounds lately detected by UNIP. These new grounds were found to be fairly rich in other deep-water crustaceans such as *Aristeus antennatus*, *Plesiopenaeus edwardsianus*, *Aristeomorpha foliacea* and *Geryon longipes*.

### *Parapenaeus longirostris* and *Aristeus antennatus*

The biological sampling programme was continued in Vila Real de Santo António. Four research-surveys provided data about the biology and the behaviour of these species and their by-catch.

University of Azores (Department of Oceanography and Fisheries)

### Lobsters

Some tagging was carried out during summer on the Mediterranean locust lobster (*Scyllarides latus*).

### Shrimps (*Pandalidae* and *Hippolytidae*)

A trial fishery with traps has been carried out 1988-1990. Weight-length relationships have been established for the three most common species, *Plesionika narval*, *Plesionika edwardsii* and *Ligur ensifer*. Additionally, data have been collected about their distribution and occurrence.

## Spain - Espagne

(A. Celso Fariña)

### *Nephrops norvegicus*

Sampling of commercial landings and collection of CPUE data for the Porcupine Bank, and the Galician and Cantabrian fisheries was continued. The numbers of specimens sampled in these areas are given below.

Spanish sampling data for *Nephrops norvegicus* in 1990.

Area	Season	Research Vessel	Market Samples	No. Measured
VII	1	-	15	3001
	2	-	15	3573
	3	-	15	3631
	4	-	15	2994
VIIIc	1	-	25	2996
	2	-	28	3281
	3	26	27	3492
	4	20	26	2588
IXa	1	-	10	2122
	2	-	10	2647
	3	14	9	3009
	4	-	9	2760

The abundance, spatial distribution and length composition of *Nephrops* have been studied during the research trips "Carioca 90" and "Cantábrico 90" of RV "Cornide de Saavedra" to the north and northwest shelf of Spain in late summer and early autumn.

Observations were also made on the distribution and abundance indices of the cephalopods *Octopus vulgaris*, *Eledone cirrosa*, *Illex coindetii* and *Todaropsis eblanae*.

#### Sweden - Suède

(H. Hallbäck)

#### *Homarus vulgaris*

The monitoring program for CPUE and length measurements at different localities was continued. Along the northern part of the west coast the catches were quite good and similar to those in 1989, while the results from the southern area were very poor.

The investigations in a totally restricted area have continued, dealing with test fishing, tagging, diving etc. This programme will continue for at least 5 years. A small-scale hatchery started during 1990 using ordinary sea water and warm water, and hopefully about 1,000 small lobsters will be studied and released.

#### *Cancer pagurus*

Catches are still good, and collection of catch data continues.

### *Nephrops norvegicus*

The fishery for *Nephrops* is still very intensive, using trawls of different types and creels in the northern part of the Kattegat and in the Skagerrak. In the southern part of the Kattegat the stocks are very poor, and during last year no commercial trawling took place. This has been due to low oxygen contents during the autumns. Monitoring of commercial catches from trawls and creels is conducted in some fishing harbours every month.

Aquaria experiments involving different oxygen contents have been carried out to study behaviour and associated biology.

An underwater vehicle, "Sea Owl MK II", has been used to study behaviour, bottom conditions, and the effects of trawling, combined with sediment sampling from bottoms where trawling takes place. Studies have also been conducted within and outside the trawling border to study differences in faunal composition.

### *Pandalus borealis*

Collection of catch data and analysis of commercial catches have continued.

## United Kingdom -Royaume-Uni

### 1. England and Wales

(R.C.A. Bannister)

#### Port Sampling

Collecting of landings, effort and size composition data by the Sea Fisheries Inspectorate for *Cancer*, *Homarus* and *Nephrops* continued, but as last year achievement of targets was poor. The collection of logbook and size composition data was continued on an opportunistic basis by scientific staff.

### *Cancer pagurus*

1. The assessment of the English Channel crab fishery has continued. Collaboration with French colleagues continued via an informal Channel working group looking at fishery interactions. Sampling for fecundity estimation and maturity studies took place at sites in both the eastern and western Channel. Following the extensive larvae sampling cruise in 1989, there was additional sampling in 1990 in the western Channel to examine seasonal production and vertical distribution.

2. On the east coast inshore crab fishing continued to be very poor, but fishing effort continued to expand in offshore waters off the Humber and off the north Norfolk coast. The biological sampling programme is being extended to provide some information on these new fisheries, and tagging off the Humber will commence in the coming year.

### Crangon crangon

The collection of catch and CPUE data continued for part of the current year for the main vessels landing at Kings Lynn, but was interrupted in the autumn by manpower problems, which also curtailed the biological sampling. Brown shrimp catches this autumn were poor, and subsequent catches in the winter have been very poor.

### Homarus gammarus

1. Long term studies continued in the east coast study area of Bridlington in Yorkshire (IVb) using chartered commercial vessels to study the seasonal abundance and size composition of trap-caught lobsters.
2. Also at Bridlington work continued to sample undersized and legal sized lobsters for the presence of microtagged hatchery reared stock released between 1983 and 1988 as part of the lobster stock enhancement experiment. Over 15,000 lobsters were tested, yielding 234 microtag recaptures from releases in 1983 (6 recaptures), 1984 (97 recaptures), 1985 (112 recaptures), 1986 (1 recapture) and 1987 (2 recaptures). Eight recaptures could not be dated. Size at recapture ranged from 67 to 114 mm carapace length. Recaptures continued to be clustered round known release sites and gave important information on recapture ratios. A parallel mark recapture experiment to estimate local abundance near a release reef was unfortunately affected by poor catch rates, but has not yet been analysed. Comparable stock enhancement monitoring at the Sea Fish Industry Authority site in West Scotland (14 recaptures) and Scapa Flow (41 recaptures) and at the North Western and North Wales Sea Fisheries Committee site at Aberystwyth (107 recaptures) continued. Studies on the behaviour of juvenile lobster in burrows also continued at the Fisheries Laboratory Conwy.
3. Studies on the by-catch of lobsters by local otter trawlers fishing inside 3 miles south of Bridlington were completed and results are being analysed.

## 2. Scotland

(C.J. Chapman)

### Nephrops norvegicus

Commercial landings of trawl and creel-caught *Nephrops* were sampled regularly at all the major ports. A regular programme of discard sampling was undertaken aboard commercial vessels in most areas. A limited sampling programme was carried out during one research vessel cruise in the Firth of Clyde and South Minch. Studies were initiated in the Clyde on predation of *Nephrops* by fish, production and distribution of *Nephrops* larvae. Experiments were also conducted on the metabolic aspects of swimming behaviour.

### Pandalus borealis

Sampling of commercial landings from the Fladen area was undertaken during the summer months.

Homarus gammarus

Sampling has been maintained in all areas. The log book introduced in 1989 has now been taken up by 70 volunteer fishermen and provides information on effort and CPUE in all the crustacean creel-fisheries. Yield/recruit assessments were carried out on the lobster stocks at Hebrides, Orkney and off the east and south east coast.

The artificial reef off Dunbar was surveyed by fishing gear and underwater TV cameras as part of a joint monitoring project with the Gatty Marine Laboratory, St. Andrews. The field-work on this project has now been completed and a full report is being prepared.

At the end of the year an outbreak of *Gaffkemia* occurred at a lobster holding facility in south east Scotland.

Cancer pagurus and Liocarcinus puber

Sampling of both crab species was undertaken in all main areas. Yield/recruit assessments were carried out on *Cancer* stocks around the Hebrides, Shetland and off the south east coast.

PSP toxins

Following the PSP outbreak in bivalve molluscs the toxin was also found in several Crustacean species. PSP levels were relatively low in *Cancer*, *Nephrops* and *Homarus* where the toxin was largely confined to the digestive gland. High PSP concentrations (up to 2700 MU per 100 g) were found in *Liocarcinus puber* from the west coast area where high PSP levels were found in mussels and queen scallops. In this area PSP toxicity was still present in *Liocarcinus* several months after the toxin had fallen below detectable levels in the bivalves.

Crustacea: Quarterly (1, 2, 3, 4) sampling.

Species		IVa (C)	IVb (C)	VIa (C)	VIa (R)
<i>Nephrops</i>	1	8148	4885	8281	411
	2	9756	9418	39247	2529
	3	9018	9595	42502	-
	4	5639	3875	12208	-
<i>Nephrops</i> discards	1	347	1157	-	
	2	2639	-	8865	
	3	-	1886	13160	
	4	3781	781	6543	
<i>Homarus</i>	1	-	-	-	
	2	1072	725	-	
	3	2741	2639	1333	
	4	5	1231	1485	
<i>Cancer</i>	1	-	1443	-	
	2	1881	918	121	
	3	2568	1626	1784	
	4	455	-	2187	
<i>Liocarcinus</i>	1	-	-	165	
	2	585	107	62	
	3	1130	-	1916	
	4	-	-	1847	

C = Commercial samples, R = Research samples.

USSR - URSS

(A.A. Elizarov, B.J. Ivanov)

*Pandalus borealis*

Investigations on stock size, and the biology and distribution of the shrimp *Pandalus borealis* in the Barents Sea and Spitsbergen area were continued in 1990 in February - July and November-December.

A total of 204 shrimp samples have been collected and analysed.

Shrimp stock assessment indicated a further growth of its biomass in most areas of the Barents Sea, which is due to a reduction in abundance of cod, one of its most abundant predators.

## MOLLUSCA

Belgium - Belgique

(NO REPORT ON MOLLUSCA)

Canada

(G. P. Ennis)

### *Illex illecebrosus*

Abundance of squid at Newfoundland was low during 1990, for the ninth consecutive year. No pre-season abundance survey was conducted in 1990 and no biological studies were pursued in inshore areas. Some samples were collected from the commercial fishery at two inshore localities.

### *Placopecten magellanicus*

A survey was conducted on St. Pierre Bank to determine spatial distribution and abundance of sea scallops. Nominal catch from NAFO Div. 3Ps was 153 tonnes (meats), down from 300 tonnes in 1989. The fishery continues to be based on the residual 1982 year-class. There is no evidence of significant and widespread settlement.

Offshore landings in NAFO SA 4, Scotian Shelf, were 5,500 tonnes round weight for 1990. The Eastern Shelf has sustained continuous exploitation with catches of a few thousand tonnes per year but at a low (0.200 kg per crhm) catch-rate because of the low but regular recruitment in the southwestern section of Western Bank. The Western area of the Scotian Shelf has been returned to exploitation with an experimental fishery concentrated on the northern approaches of Browns Bank. It is a short-term fishery lasting only a few months each year. The experimental fishery conducted with a size limit different from the Georges Bank one and a quota to be split into enterprise allocations allowed a rationalized exploitation of scallop beds that would not have been realized otherwise. For two consecutive years this management strategy has worked well. Although recent CPUE's have dropped, they are still relatively high. With the high abundance-at-age estimated from survey results, more experimental fishing activity might be considered.

The Georges Bank catches (NAFO SA 5) represent about 85% of the total annual offshore catches. A management plan using enterprise allocations has been approved for the long-term. Under this plan, a heavy targeting of effort was seen on age 5 animals. Research surveys show poor survivorship above this age. The TAC for 1990 was set at 43,160 tonnes round weight. Landings exceeded the TAC level. In addition, a roe fishery landed less than 50 tonnes. Catch-rates increased slightly (10%) from last year. Research data indicated decreasing trends in the abundance of pre-recruits.

Inshore landings for the Bay of Fundy portion of NAFO SA 4 were approximately 25,000 tonnes round weight for 1990, a decrease from the previous few years. The Digby beds had experienced a strong recruitment pulse which led to record landings in 1988-89. Overall Bay of Fundy landings remained at high levels due to the exploitation of a sizable scallop bed off Cape Spencer, N.B. The most recent stock survey indicates that the abundance of pre-recruits is at low levels. 1991 landings are expected to decline further from current levels.

Stock surveys were carried out on the eastern Scotian Shelf scallop beds and on Georges Bank. Research activities are focusing on the reproductive ecology of the deep-sea scallop on Georges Bank.

A study on the distribution of juvenile scallops has shown a strong aggregation of young animals on gravelly bottoms and that juvenile growth varies directly with depth.

A stock survey was carried out on the Digby scallop beds in the Bay of Fundy. Research activities are continuing on growth rates and meat yield variability of inshore stocks. Genetic studies have been initiated.

Les travaux portant sur l'évaluation des pétoncles géants des Iles-de-la-Madeleine, de la Gaspésie et de la Basse Côte Nord ainsi que de leur pêcherie se sont poursuivis en 1990 et des conseils scientifiques à la gestion de cette ressource ont été formulés pour la saison de pêche 1991. Les recherches visant à étudier la possibilité de repeupler les fonds de pêche et à élaborer une stratégie de gestion des gisements repeuplés ont également été poursuivies. Des collecteurs ont de nouveau été immergés au printemps et relevés à l'automne 1990 afin d'évaluer la fixation du naissain.

Un modèle de la relation entre la densité et la biomasse des mollusques qui tient compte des relations dépendantes de la densité a été testé en conditions d'élevage contrôlé. Le modèle décrit bien l'évolution temporelle des populations expérimentales de pétoncles (*Placopecten magellanicus*) pour une période limitée, lorsque ses postulats sont bien respectés. Toutefois, une expérience sur la moule (*Mytilus edulis*) montre que le modèle est très sensible au viol du postulat d'indépendance de la nourriture et de l'espace comme facteurs limitants.

#### *Chlamys islandica*

A small fishery has begun for Iceland scallops on St. Pierre Bank (NAFO) Div. 3Ps). Nominal catch for 1990 is estimated at 35 tonnes (meats). A research survey using a stratified random design was conducted in the area and an estimate of fishable biomass has been obtained.

Les travaux portant sur l'évaluation des pétoncles d'Islande de la côte nord du golfe du Saint-Laurent ainsi que de leur pêcherie se sont poursuivis en 1990 et des conseils scientifiques à la gestion de cette ressource ont été formulés pour la saison de pêche 1991. Un relevé exploratoire a permis de définir spatialement les gisements et d'obtenir des estimations de biomasse.

#### *Mactromeris polynyma*

Three offshore (two Canadian and one foreign-flagged) vessels prosecuted the clam fishery along the eastern Grand Banks (NAFO Div. 3LNO). Nominal catch for 1990 was 11,768 tonnes (pre-emptive TAC 20,000 tonnes round weight). Neither standing stock nor production are known. Commercial fisheries data will be used to assess the fishery.

Landings for 1990 were 6,021 tonnes from Banquereau Bank on the Scotian Shelf (TAC 30,000 tonnes) and 84 tonnes from the inshore fishery in Nova Scotia. There was also some exploratory fishing in Gulf of St. Lawrence. The Banquereau Bank landings are down from 1989 as the vessels involved switched to fishing Grand Bank for most of the summer. The limiting factor is still market demand rather than the supply of clams, and thus landings are still far below the TAC's. The landings are expected to slowly increase over the short term as efforts are made to expand the market.

#### *Buccinum undatum*

Les travaux portant sur la détermination de l'âge et de la taille à la maturité sexuelle se sont terminés en 1990. Ces travaux ont servi à émettre certaines recommandations sur l'établissement d'une taille minimale de capture qui permettrait de protéger le potentiel reproducteur de la population.

## Denmark - Danemark

(S. Munch-Petersen)

### Mytilus

The investigations on mussel beds in the Wadden Sea in 1990 by the Danish Institute for Fisheries and Marine Research (DIFMAR) were concentrated on the Ho Bay. The aim was mainly to monitor a specially regulated mussel fishery in this area.

DIFMAR has continued its collaborative project with the Mussel Industries Association of the Limfjord (started in 1989) with the aim of 1) investigating the feasibility of mussel cultures in the Limfjord, and 2) investigating the benefits of transplanting undersized mussels from localities with poor growth to areas with fast growth.

### Cockles

DIFMAR has also been monitoring an experimental fishery for cockles in the North Sea at the rim of the Wadden Sea.

### Chlamys opercularis ((A. Nicolajsen, Faroe Islands))

The sampling of landings and of catches on board a factory trawler continued in 1990. In May one of the two main areas was investigated by research vessel in order to make a swept-area assessment.

## France

(D. Latrouite)

### Venus verrucosa

La production est toujours en baisse (1000 tonnes en 1990) malgré un effort de pêche en augmentation. Une réduction sensible de l'effort s'avère nécessaire.

### Tapes rhomboïdes, Spisula ovalis, Glycymeris glycymeris

#### Manche-Ouest et Golfe de Gascogne

Des évaluations directes à la benne Hamon ont été conduites dans le golfe normand breton et en Vendée. Elles ont permis de mettre en évidence un important prérecrutement de palourdes roses nées en 1989. L'exploitation globale de ces bivalves stagne autour de 10.000 tonnes essentiellement pour des raisons commerciales. Une étude de l'impact des dragues à palourdes a montré l'inadéquation des outils actuellement mis en oeuvre dans le golfe normand breton.

#### Manche-est

En 1990, une prospection complémentaire à celle effectuée en 1989 a été menée dans certaines zones de la baie de Seine afin de mieux évaluer les potentialités d'exploitation. *Spisula ovalis* est présente, en faibles densités, dans les zones sableuses. Les possibilités d'exploitation, si elles existent seront très limitées. *Tapes rhomboïdes* présente des densités un peu plus élevées. Quelques zones pourraient

faire l'objet d'une exploitation, qui resterait cependant limitée, comparée à celle existant dans le golfe normand breton. *Glycymeris glycymeris* est une espèce peu abondante en baie de Seine.

### Pecten maximus

Les principaux stocks de coquilles St. Jacques du littoral Atlantique et de la Manche restent à des niveaux très bas. Plusieurs gisements n'ont pas été ouverts en raison de l'absence de coquilles (coureux de Belle-Ile, pertuis charentais).

Sur les deux principaux gisements, des campagnes sont réalisées par IFREMER au cours des trois mois précédant l'ouverture de la pêche. Les données permettent de proposer des scénarios d'exploitation (quota global, effort de pêche total, tailles minimales, rythmes de pêche).

### Baie de Saint-Brieuc

A la suite de trois recrutements de faible abondance (cohorte de 1986, 1987 et 1988), la pêcherie de coquilles St-Jacques en baie de St-Brieuc est arrivée, au cours des deux dernières saisons de pêches (1989-1990 et 1990-1991) à l'état le plus critique connu depuis plus de 25 ans.

La saison de pêche 1989-1990 a été caractérisée par le tonnage débarqué et l'effort de pêche les plus faibles jamais enregistrés (1200 tonnes pour 7200 heures de pêche). Le nombre de licences de pêche n'a pas diminué pour autant (314 navires). A l'issue de la saison de pêche et selon les recommandations de l'IFREMER, la bande côtière de 2 à 4 milles a été interdite au chalutage pour protéger le naissain, très abondant, de la cohorte de 1989.

Les campagnes d'évaluation directe effectuées par l'IFREMER en juin et en septembre-octobre 1990, ont mis en évidence une très abondante cohorte, née en 1989, qui représente la perspective d'un redressement significatif du stock dans un proche avenir. Par contre, les groupes d'âge exploitables ne dépassent guère le niveau estimé une année auparavant, ce qui a justifié pour la saison de pêche 1990-1991 un quota analogue à celui de l'année précédente, soit 1.500 tonnes pour une flottille de 283 navires.

Un dernier constat montre que la reconstitution d'une ressource en coquilles Saint-Jacques abondante nécessite la prise de mesures de restriction du chalutage de fond dans les secteurs les plus sensibles. L'évaluation de l'impact des engins de pêche sur les fonds côtiers est une opération nouvelle, conduite en baie de St-Brieuc sur le gisement coquillier. Elle devrait se poursuivre dans les prochaines années.

### Manche-Est

Au cours de la saison 1989-1990, 204 bateaux ont exploité la coquille St. Jacques en Manche-Est. Les captures se sont élevées à 3200 tonnes dont 1100 tonnes pour la baie de Seine. On a pu remarquer une stabilité des captures effectuées par les grosses unités pêchant dans les zones du large.

L'évènement marquant de cette saison a été la croissance exceptionnelle de la coquille résultant de conditions météorologiques favorables et ayant eu pour conséquence la capture d'individus du groupe I dès le mois de janvier.

Le deuxième fait marquant est la diminution du nombre de coquilles âgées dans les captures effectuées hors baie de Seine, la pêche ne s'effectuant plus que sur deux, voire un seul groupe d'âge. Ceci rend la pêcherie entièrement dépendante du recrutement.

La campagne de prospection réalisée en 1990 a montré une stabilité de la biomasse disponible en baie de Seine, ainsi qu'un bon indice de recrutement de coquilles du groupe II (classe 1989) dans toute la Manche-Est. En baie de Seine et en bordure de la baie de Seine s'y ajoute un indice de prérecrutement que l'on peut qualifier d'exceptionnel.

#### Aquaculture extensive

Les travaux sur la production de juvéniles en aquaculture se sont poursuivis et se sont soldés par plus de 3.000.000 d'amimaux semés en rade de Brest et en baie de St-Brieuc. D'autres sites de semis sont en cours d'expérimentation.

L'exploitation des semis expérimentaux de 3-4 ans donne des résultats variables, bons en baie de Morlaix et mauvais en rade de Brest.

### Germany - Allemagne

(R. Meixner)

#### *Mytilus edulis*

Some of the intertidal beds of mussels exhibited an excessive summer growth of green seaweeds, e.g. *Ulva*, *Enteromorpha* and *Chaetomorpha*. The mussels, suffocated by mud due to a reduced current speed, and covered by heaps of torn-off algae, suffered from losses of approx. 50 % (Institut für Küsten- und Binnenfischerei, Hamburg).

Monitoring of marine planktonic algae at a number of key stations provided an early warnings to mussel fishermen with regard to increasing cell counts of *Dinophysis* spp. The result of this in 1990, as in the previous three years, was that no DSP-contaminated mussels were delivered to the market (Umweltministerien Hannover and Kiel).

#### *Littorina littorea*

The periwinkle, though of no commercial importance, has been the subject of a study on host-parasite relationships. The trematode *Renicola roscovita*, which utilizes and eiderducks as a final host, infests the periwinkle *Littorina littorea*, for example, as an intermediate host. Recent results in the laboratory demonstrated a reduced heat resistance of parasitized periwinkles, which can explain the relative decrease in number of infested specimens in warm summers (Biologische Anstalt Helgoland, Sylt Island).

### Iceland - Islande

(U. Skuladottir & H. Eiriksson)

#### *Chlamys islandica*

An annual dredge survey to determine stock abundance was carried out in the major scallop fishing area of Breidafjordur, W. Iceland. A stock index, based on over 100 tows showed a slight drop in 1990 compared with the previous year. However, the CPUE of scallop boats remained similar. The overall annual landings rose to approx. 12,000 tonnes, up by some 1,000 tonnes compared with 1989.

#### Ireland - Irlande

(J.P. Hillis)

##### Loligo spp

University College, Cork, in collaboration with Bord Iascaigh Mhara and the British Antarctic Survey have started a survey on the distribution and biology of coastal squid populations.

##### Tapes semidecussatus and T. decussatus

A comparative study on the ecophysiology of these two species continues at University College, Cork.

#### Netherlands - Pes Pays-Bas

(R. Dijkema)

##### Oyster culture and fishery

In lake Grevelingen, research was carried out into methods to increase survival of the European flat oyster (*Ostrea edulis*), while infected by the oyster disease *Bonamiasis*. The trials were interrupted by an unexpected, widespread mortality in June, which wiped out 70 - 90% of the oysters in the lake. The cause of this has probably been a combination of adverse bottom conditions, which had stressed the oysters, and *Bonamiasis*. Concentrations of oyster larvae and spatfall were good in 1990, indicating that environmental conditions in July were favourable and that the reproduction and the larval stages of the oysters had not been affected. On the Yerseke Bank, the culture area of the flat oyster in the Oosterschelde, cultivation of the flat oyster had been suspended due to *Bonamiasis*. In 1990, small amounts of larvae of the flat oyster were found again in plankton samples, indicating that natural spatfall is recovering through seeded oysters and a gradually recovering wild population. Larval production and spatfall of the Pacific oyster were profuse, thanks to a prolonged period of high water temperatures in August. *C. gigas* production was about 700 tonnes, with a satisfying flesh quality.

Current velocity measurements were carried out in the oyster culture area on the Yerseke Bank. They revealed a 28-35% drop in the current velocity, caused by the construction of a flood barrier in the mouth of the Oosterschelde estuary in 1987. Abiotic conditions for oyster culture appeared to have improved on a considerable part of the plots, as transport of sand by the tidal currents along the bottom is not longer effecting the oysters.

##### Mussel culture and fishery

For the second year in succession, spatfalls were extremely poor in 1990. Combined with the disappearance of large amounts of mussels from the cultivation plots during storms in February, this has resulted in a relatively low production in the 1990 - 1991 season, with unprecedentedly high

prices. The reasons for the bad spatfalls, which also seem to extend to cockles, are unknown. The fact that the phenomenon extends over all European coastal waters possibly implicates climatic influence (mild winters). The reduced stocks of mussels in the Waddenzee were heavily predated on by eider ducks during the winter of 1990 - 1991, which saw their food supply (cockles and mussels) depleted by fisheries on mussel seed and cockles, storms and poor spatfall. Prospects for mussel culture in 1991 are bleak, as almost no results are expected from the spring fishery for mussel seed. The industry will have to depend largely upon the old stocks and imports.

The research program into the functioning of mussel cultivation plots in the Oosterschelde, carried out in cooperation with the Ministry for Public Works and Waterways, is entering its final phase. In the mouth of the Oosterschelde a decline in growth and meat yield of cultivated mussels has occurred since 1986, when the storm barrier in the Oosterschelde was constructed. On a number of plots mortalities have also been recorded due to siltation. These developments coincide with a drastic local decline in the current velocity, both affecting food supply to the mussels in this area and increasing sedimentation of organic matter. On the other hand, lower current velocities have improved conditions for mussel cultivation in a number of other areas, where the mussels previously had a too high risk of being swept away from the plots. In order to avoid siltation and to improve the food supply on the plots where the production has declined, it has been suggested relocating a number of plots to areas where conditions have improved.

An assessment was made of the possibilities for the establishment of mussel culture plots in the eastern part of the Waddenzee. To investigate the risk of mussels being swept away by storms and currents, grain size composition of the bottom sediment in the investigated area was compared with that from culture areas with a known storm risk. Most of the investigated area appeared to have a relatively low "storm risk".

High market prices of mussels and shortage of mussel seed for bottom cultivation have stimulated a number of pilot projects with suspended cultivation of mussels.

#### Cockle fishery

Due to poor spatfall during the last two years, the stocks of wild cockles in the Dutch coastal waters have shrunk considerably. The biomass of the cockle stock was insufficient to satisfy the demands of the fishery as well as to safeguard food supply for overwintering birds like oyster-catchers and eiders. On behalf of the management of the cockle fishery a widespread assessment of the wild stocks of intertidal cockles (*Cerastoderma edule*), baltic tellins (*Macoma balthica*) and mussels (*Mytilus edulis*) was carried out for the first time in the Waddenzee and Oosterschelde. Within two weeks, at total of 1,414 stations were sampled in the Waddenzee and 379 in the Oosterschelde. The estimated stocks amounted to 102,000 tonnes of cockles (fresh weight) in the Waddenzee and 44,000 tonnes in the Oosterschelde. The results were extrapolated to the fishing season, which started in September. For the first time the assessment provided information on the biomasses of the species in both areas. The survey will be repeated annually and will be extended to the sublittoral cockle stocks in the coastal waters.

#### Sanitary control of shellfish and water

Sanitary control of shellfish waters is routinely carried out in all Dutch coastal waters on a quarterly basis, in accordance with EC standards, while in areas requiring a closer watch it is carried out weekly. Sanitary water-quality in all areas appeared to have improved in comparison with the previous year; levels of thermotolerant faecal coli bacteria in flesh and shell liquid of sampled mussels remaining far below the current EC norm of 3 per mg. A research program was started to assess the

possibilities for disinfection of domestic sewage treatment effluent with UV irradiation, as a substitute for chlorination. An irradiation unit was placed in the effluent flow of a treatment plant, and samples are being taken to measure the rate of elimination of *E. coli*.

#### Quarantine installations for molluscs

Sponsored by the Commodity Board for Fish and Fish-Products, a study was carried out to design a collective installation for quarantine storage of imported mussels. The reason for this study was the current prohibition to immerse into the coastal waters any imported bivalve shellfish originating from waters other than the Wadden sea. This regulation is aimed at preventing the introduction of toxic dinoflagellate species from foreign waters. The set-up comprises alternatives in which amounts of 40 to 250 tonnes of mussels can be stored simultaneously. Important features of such an installation are the elimination of dinoflagellate cells and cysts in the effluent and the removal of the sand, silt and shells, mixed with imported mussels, which are also expected to contain cysts. Besides being applied to mussels, quarantine systems for imported oysters are also being developed. Effluent filtration is considered a satisfactory method for the elimination of cysts from the effluent.

#### Norway - Norvège

(C.C.E. Hopkins and S. Tveite)

#### *Mytilus edulis*

Monitoring of algae which may contain toxins was carried out throughout the year by the Flødevigen Research Station (Arendal), southern Norway. DSP and other toxins were monitored by mouse bioassay. The presence and levels of DSP prohibited sale of mussels from southern Norway during most of the year.

#### *Chlamys islandica*

Research conducted by the Norwegian College of Fishery Science (University of Tromsø) on Islandic scallop continued in 1990, with a comparatively reduced sea-going activity. The large data-base, mainly accumulated in previous years covering almost the whole of the Barents Sea and the Svalbard - Jan Mayen area, is being treated by multivariate analysis to examine the influence of environmental factors (e.g. depth, latitude and longitude, temperature) on demography and biomass/production. Variability in recruitment patterns and demographic parameters (e.g. growth and mortality) are being determined by standard methods.

#### Poland - Pologne

(J. Porebski)

#### Squid

The biology as well as fisheries of *Illex argentinus*, *Loligo gahi* and *Martialla hyades* were studied off Patagonia and in waters off the Falkland Islands.

## Portugal

(M.J. de Figueredo, C. Sousa Reis)

### Squid

Fisheries Potential of the North Eastern Atlantic Squid Stocks (FAR 1 1.146 UK E P): According to a pre-established programme within this EEC project, biological sampling (specimens from commercial and research trawls) of the species *Loligo forbesi*, *L. vulgaris*, *Illex coindetii* and *Todaropsis eblanae* was carried out by INIP in 1990. Within the programme of work laid out for the project, INIP undertook 3 research cruises during the year, aimed solely at collecting data about the distribution and biological characteristics of the *Cephalopod* species found in Portuguese waters.

An acoustic telemetry experiment was carried out with the common squid *Loligo forbesi* (Department of Oceanography and Fisheries, University of the Azores). Transmitters inserted in the mantle gave depth records and mantle pressure (e.g. swimming performance) of 7 individuals tracked in the Central group of Islands. A project titled "Eurosquid: Fishery potential of North East Atlantic squid stocks" was initiated. This is a EEC-funded project with Scotland, Spain and Portugal as the participating countries.

### Octopus vulgaris

A number of 458 individuals were studied throughout the year by the University of the Azores, in order to obtain information about the spawning season, growth rates and feeding habits. Fishing effort data was also recorded.

### Limpets

Stock assessments of the two exploited limpet-species (*Patella ulyssiponensis aspera* and *P. candell candell*) were carried out (29 localities were sampled) at 6 of the islands. Reproduction studies were continued, and studies on age, growth and fecundity were initiated. Manipulation experiments were undertaken in the littoral zone.

## Spain - Espagne

(A. Pérez Camacho)

### Mytilus edulis

Studies on chromosomic morphometry of this species, reproductive cycle of cultured mussels, and growth and energetic physiology of mussels in relation to different seed source and culture area continued during this year.

Research is also being carried out on the determination of factors regulating larvae settlement over coastal rocks and collector ropes hung on the rafts. Pathology research is being focused on *Marteilia* sp. infestation.

Ostrea edulis and Venerupis sp.

Studies continue on energetics, physiology, and nutrition of larvae and seed of *O. edulis*, *V. decussata* and *V. pullastra*, as well as on dynamics of different populations of *V. decussata*, *V. pullastra* and *V. rhomboides*. Research on chromosomic morphometry of these species has just started.

Pecten maximus

Studies on the reproductive cycle and seed collection continued.

Pipisidia longicornis

Population dynamics of this species has been studied in Rfa de Arousa (NW Spain) in relation to mussel culture.

Necora puber, Carcinus maenas, Liocarcinus depurator and L. arcuatus

The influence of mussel culture on the feeding of these species has been studied.

Panaeus kerathurus

The variation in total lipid, polar lipid and neutral lipid fatty acid contents was studied in muscle, mid-gut gland and ovary of *P. kerathurus* females during spawning period.

Sweden - Suède

(H. Hallbäck)

Mytilus edulis

There are still problems with toxin from *Dinophysis*. Only about 350 tonnes of *Mytilus* were landed during the 1990 season.

United Kingdom - Royaume Uni

1. England and Wales

(R.C.A. Bannister)

Cerastoderma edule L.

The annual transect survey of stocks in the Bury Inlet, Wales (VIIf) was carried out and analysis of the 30 year data set on abundance and recruitment was continued. In the Wash (IVc), survival and growth on a small study area continued to be monitored, and further surveys of fishable stocks were conducted. Elsewhere Sea Fisheries Committees are assessing stock levels in the Thames Estuary and the effects of suction dredging at Lavan Sands, North Wales. Cockle stock levels are very low in the Wash, low on Irish Sea coasts, and moderate in South Wales and the Thames Estuary - reflecting vagaries of settlement and high over-winter losses of young cockles to storms.

### Mytilus edulis

Stocks are low in all areas following poor recruitment and heavy exploitation in recent years. The potential of aerial surveys for stock assessment in The Wash was reported to ICES in 1990.

### Ostrea edulis

In the Solent (VIIe) stocks were again surveyed by dredge and monitoring for the disease *Bonamia* was maintained. Experiments to assess spatfall using scallop shells relaid on trial plots proved promising. Oyster samples were also collected for age determination.

### Pecten maximus

Studies continued in all the research areas outlined in the previous year's report. A research vessel survey in the western Channel (VIIe) found that good recruitment to the stock off Cornwall occurred in several recent years. Comparative fishing trials between the research vessel and commercial vessel were also made in this area.

### PSP

High levels of PSP toxin were found in samples of *Mytilus edulis* collected on the north east coast near the Tyne in the early summer. A ban on consumption followed and was extended to lobster, crab and scallop. Extensive sampling from the Scottish border to the Humber was instituted to define the limits of the distribution of toxin, and to enable officials to monitor the progress of the toxic bloom. Consumption restrictions were eventually lifted, but the sales of shellfish were obviously reduced during this period.

## 2. Scotland

(C.J. Chapman)

### Pecten maximus and Chlamys opercularis

Sampling of scallops (*P. maximus*) and queens (*C. opercularis*) continued in the main fishing areas. Assessments were carried out on the *P. maximus* stocks west of Kintyre, off the northwest and northeast coasts and around Shetland. There has been evidence of recent poor recruitment and a decline in spawning stock biomass in the west coast stocks.

The study of settlement of both species on artificial collectors continued on the west coast of Scotland and successful trials were conducted of a small mesh cover attachment on scallop dredges in order to sample pre-recruits.

### Cephalopods

Increased sampling of commercial landings of squid (mainly *Loligo forbesi*) was undertaken during the year as part of an EC funded multinational project coordinated by Aberdeen University. This project involves scientists from Spain, Portugal and Scotland. Coordinated studies of morphometrics, size composition and reproductive biology of loliginid squid species will be made throughout their geographical range to assess fishery potential in the north east Atlantic.

Cerastoderma edule

Landings of cockles in the Solway Firth declined to around 2,000 tonnes in spite of the location and exploitation of some new grounds. The main grounds were surveyed by a chartered suction-dredging vessel in December and a detailed survey of one area was carried out by quadrag sampling in August. Sampling consisted mainly of one and 4 year-old cockles (1986 and 1989 year-classes). The fishing operation was investigated to assess dredge efficiency, damage to cockles and discard survival.

Pests and diseases of molluscs

The number of registered shellfish farms in Scotland increased to 290, although farm production is still disappointingly low. Consignments of *Crassostrea gigas*, *Tapes semidecussata* and *T. decussata* from England and the Channel Islands were monitored prior to deposition in Scottish waters.

During the summer of 1990 high levels of Paralytic Shellfish Poison (PSP) toxin were found in bivalve molluscs which led to the issuing of public health warnings along sections of the east and west coasts of Scotland. Peak toxicity (above 16,000 MU per 100 g) was found in mussels and queen scallops on the west coast but the outbreak was very localised. PSP toxins were also found in crustaceans (see Crustacea section of this report).

Scottish molluscs quarterly (1-4) sampling data, 1990.

ICES Area Species		IVa (C)	IVa (R)	VIa (C)	VIa (R)	VIb (R)	VIIa (C)
<i>Pecten</i>	1	712		1063	-		
	2	3067		5442	6922		
	3	3704		4496	-		
	4	1711		9939	6238		
<i>Chlamys</i>	1	-		822			1929
	2	-		-			2078
	3	1984		641			3731
	4	3079		1392			2161
<i>Cerastoderma(1)</i>	1						324
	2						574
	3						937
	4						1014
<i>Squid(2)</i>	1		7338		493	-	
	2		-		-	-	
	3		353		-	305	
	4		-		2019	-	

C = Commercial samples, R = Research samples, 1 = research samples not yet worked up, 2 = data on commercial samples not yet available.

United States - Les Etats Unis

(C.H. Peterson and S.A. Murawski)

NO REPORT ON MOLLUSCA.

USSR - URSS

(A.A. Elizarov, B.J. Ivanov)

*Chlamys islandica*

Studies on the Iceland scallop *Chlamys islandica* were continued in the southeastern Barents Sea in April, May, July and August in 1990. A total of 95 scallop samples have been collected and analysed. The scallop investigations indicated that July-October would be an optimal period for conducting the fishery.