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Report of Activities

Rapport d'activités

SHELLFISH COMMITTEE

COMITE DES CRUSTACES ET MOLLUSQUES

by par

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1987

Foreword

All member countries participating to Shellfish Committee Activities reported on their research and assessment in 1987. Survey activities for harvested invertebrates has reached a great importance in all countries.

The trends in research activities are similar to 1986. There is a general interest in new methodologics for analysing population phenomena and incidence of fishing on the environment. New statistical tools are being developed for optimizing assessment strategies and data processing (kriging, spline approximation). New technologies are being developed for analyzing behavior such as tracking of sonic tags and time lapse photography. Submersibles and ROV's are used for assessing the effects of fishing on the environment. Acoustics are being used for assessing abundance of squids. Mapping of bivalve beds is attempted with promising success by aerial photography and side scan sonar. Magnetic microtags are used for monitoring growth of lobsters and snow crab. There is a wide interest in approaching experimentally the problems of fishery management. Collectors are being used for monitoring bivalve spat falls and Cancer pagurus recruitment and relating these abundances to environmental factors. For Pecten maximus, it appears that the environment, rather than the abundance of the stock, determines the fluctuations of recruitment. Artificial recruitment of bivalves, as well as lobsters, is being attemped with increasing success.

The incidence of diseases on the fluctuations of natural populations is being demonstrated on Cancer pagurus (Hematodinium perezi), on Ostrea edulis (Bonamia ostreae), on Crassostrea virginica and Mya arenaria. There is a general effort for monitoring the causes and incidences of toxins in bivalves (DSP, PSP).

Genetic studies of stocks are being developed by electrophoresis and multivariate analyzes. It seems that species such as Chlamys islandica with very large ranges of geographic distributions would be an excellent material for population genetic studies.

Experimental managements of lobster stocks is closely monitored in order to check the conformity of predictions provided by models observed. Licencing and boat quotas are being applied for the first time in certain local mollusc fisheries in Europe, with close biological monitoring. There is a renewed interest in bioeconomic studies.

Invertebrate fisheries research is developing original management approaches custom fitted to the geographic peculiarities of each species.

Préambule

Tous les pays membres participant aux activités du Comités des Crustacés et Mollusques ont fourni un rapport sur leurs activités de recherche et d'évalation de stocks en 1987. Les activités d'évaluation de stocks d'invertébrés exploités par pêche ont atteint un niveau important dans tous les pays.

L'orientation générale des activités de recherche est semblable à celle de 1986. Il y a un intérêt général pour de nouvelles méthodologies permettant d'analyser les phénomènes de population et l'incidence de la pêche sur le milieu naturel. De nouveaux outils statistiques sont mis au point pour optimiser les stratégies d'évaluation de stocks et le traitement des données (krigeage, approximation par spline). Des technologies nouvelles sont mises au point pour analyser le comportement: détection et localisation de marques soniques, ralenti photographique. Des submersibles et des véhicules téléguidés sont utilisés pour évaluer l'abondance des stocks et les effets de la pêche sur l'environnement. Des méthodes acoustiques sont utilisées pour évaluer l'abondance des calmars. La cartographie des bancs de bivalve est réalisée avec un succès prometteur en utilisant la photographie aérienne et le sonar latéral. Des micromarques magnétiques sont utlisées pour suivre la croissance des homards et du crabe des neiges.

Les approches expérimentales aux problèmes de gestion des stocks sont considérées avec grand intérêt. Des collecteurs sont utilisés pour évaluer l'importance des chutes de naissain de bivalves et le recrutement aux stades benthiques de Cancer pagurus, et pour étudier l'effet des facteurs de l'environnement sur ces phénomènes. Il semble que pour Pecten maximus, l'environnement, plutôt que l'abondance du stock, détermine les fluctuations du recrutement. Des méthodes de recrutement artificiel sont essayées avec un succès grandissant pour les bivalves et le homard.

L'effet des maladies sur les fluctuations naturelles des populations est démontré pour Cancer pagarus (Hematodinium perezi), pour Ostrea edulis (Bonamia ostreae), pour Crassostrea virginica et Mya arenaria. Il y a un effort général pour étudier les causes et détecter les cas d'apparition de toxines chez les bivalves (DSP, PSP).

L'étude génétique des stocks est réalisée par électrophorèse et par analyses multivariables. Il semble que des espèces telles que Chlamys islandica dont l'étendue de la distribution géographique est très vaste, soient un excellent matériel pour des études de génétique des populations.

La gestion expérimentale des stocks de homards est étudiée pour confronter les prédictions fournies par les modèles avec des résulats réels. L'approche d'imposer des licences et des quotas par bateau est mise en application pour la première fois dans certaines pêcheries de mollusques en Europe sous un strict contrôle biologique. Il y a un renouveau d'intérêt pour les études de bioéconomie.

Les recherches sur les pêches d'invertébrés mettent en pratique et testent des méthodes originales de gestion des stocks adaptées aux particularités géographiques de chaque espèce.

CRUSTACEA

Belgium - Belgique

(F. Redant)

Crangon crangon

The biannual Young Fish and Brown Shrimp Surveys (in spring and autumn) were continued in 1987. These investigations included faunistic and quantitative analyses of the epibenthic and demersal fauna in the Belgian coastal waters. The surveys consisted of 15 minute hauls with a small meshed beam trawl on about 35 fixed sampling stations in an area within 10 miles off the Belgian coast.

Nephrops norvegicus

The sampling of commercial Nephrops landings was continued, in order to detect possible long-term changes in the catch composition (length, frequency distributions and sex-ratio) and the exploitation pattern of Norway lobster in the Central North Sea (Botney Gut - Silver Pit Stock).

A two years study on the reproductive cycle of female Nephrops in the Central North Sea, the seasonal behavior of male and female Nephrops, and the effects of reproduction and seasonal behaviour on the sex-ratio of the Nephrops landings was completed. The results of these investigations suggest that, especially amongst the larger females, spawning might be biennial. In order to test this hypothesis, a complementary study on the development rate of the abdominal eggs in relation to, amongst others, the size of the berried females was started. These investigations are expected to be concluded by mid-1988.

Canada

Région du Golfe du Saint Laurent
et
Région du Québec

(Gérard Y. Conan)

Pandalus borealis

L'état de la ressource pour les cinq unités de gestion du golfe du Saint-Laurent a été évalué à l'aide de données obtenues de l'exploitation commerciale et d'un relevé expérimental. Les débarquements de 1987 (près de 12,000 t) sont les plus élevés depuis le début de l'exploitation en 1965. Les taux de capture

sont relativement stables depuis quelques années alors que l'effort de pêche augmente graduellement. Les estimés de biomasse obtenus par chalutage de fond indiquent une augmentation de l'abondance de la ressource depuis le dernier relevé en 1985.

Le projet visant à identifier les zones de production larvaire du golfe du Saint-Laurent s'est poursuivi. De nouveaux échantillonnages ont été effectués afin de cerner la distribution spatio-temporelle des larves.

Homarus americanus

L'abondance et les déplacements de homard de la Baie de Gaspé ont été étudiées au cours d'une saison de pêche. Deux expériences successives de marquage magnétique ont été effectuées et l'exploitation commerciale a été suivie à l'aide des données de capture et d'effort.

L'évaluation de la population de homards de l'Ile d'Anticosti s'est poursuivie. L'expérience de marquage entreprise un an plus tôt a été complétée en examinant 31,000 individus en vue de détecter les micro-étiquettes. Un total de 900 pléopodes a été examiné afin de définir la période de mue de cette population.

Une expérience de gestion expérimentale des pêches a débuté depuis un an et doit durer 5 ans sur la côte Ouest de l'ile du Cap Breton. Cette région comporte une population de homards relativement isolée aux stades benthiques. La longueur minimale légale de carapace des homards est augmentée légèrement chaque année et les prédictions fournies par un modèle de rendement par recrue sont comparées aux résultats réels de la pêcherie. L'expérience est réalisée en collaboration avec les pêcheurs du secteur concerné. Les mouvements, la croissance, la mortalité et la fécondité des homards sont étudiés d'année en année, afin de déterminer si ces caractéristiques biologiques vont être modifiées en fonction de la densité du stock.

Le bilan des résultats d'un nombre important de marquages par marques sphyrion et par marques soniques permet d'identifier des patrons de déplacement du homard dans le Sud Ouest du Golfe ainsi que sur la côte Ouest de Terre Neuve et de fournir des renseignements pratiques adaptés à la gestion de chaque secteur de pêche.

A la demande des pêcheurs, la sélectivité des trappes à trois compartiments successifs ("cuisine", "parloir" et "salon"), munies de dispositifs permettant aux homards de taille sublégale de s'échapper, a été étudiée. Il a été démontré qu'un seul dispositif d'échappement situé dans la troisième chambre suffit, un dispositif supplémentaire dans la chambre intermédiaire ne facilite pas l'évasion des homards de taille sublégale.

Chionoecetes opilio

Une évaluation de l'état des stocks de crabe des neiges de l'estuaire et du nord du Golfe du Saint-Laurent a été effectuée à partir de l'analyse des statistiques de pêche et des journaux de bord des pêcheurs. Une expérience de marquage magnétique a débuté dans le secteur de la Basse Côte-Nord en vue d'estimer la population et d'évaluer le taux actuel d'exploitation. Le projet visant à décrire l'habitat des juvéniles et à évaluer le recrutement à la pêche s'est poursuivi.

L'état de la ressource dans le Sud Ouest du Golfe a été étudié à partir des statistiques de débarquement et des journaux de bord remplis par les pêcheurs. L'échantillonnage des captures commerciales est effectué à la mer par du personnel embarqué. Une forte chute des captures, non prévisible en utilisant les méthodes traditionnelles d'analyse du stock après la saison de pêche (méthode de Leslie-Delury) a suscité une campagne de chalutage expérimentale. L'utilisation de chaluts à langoustines a permis d'évaluer, pour la première fois, l'abondance des très jeunes stades de crabe non encore recrutés et de vérifier que les captures des trappes commerciales ne nont pas représentatives de l'abondance des différentes catégories biologiques du stock en place. Une cartographie et une évaluation de l'abondance des différentes catégories biologiques ont été réalisées par la technique geostatistique du krigeage. Il apparaît que le fait de négliger les caractéristiques de distribution spatiale de la ressource et de l'effort de pêche dans certaines méthodes traditionnelles d'évaluation de stock puisse aboutir à une surestimation de l'abondance de la ressource du crabe des neiges.

Un programme de marquage en zone hauturière est en cours, le but est d'étudier les mouvements à long terme et la croissance. Des marques soniques sont utilisées pour étudier les mouvements à court terme dans le Fjord de Bonne Bay (côte Ouest de Terre Neuve).

L'histoire naturelle de l'espèce en relation avec la présence d'une mue terminale est étudiée en bassins thermocontrolés à l'aquarium de Shippagan et in situ en plongée ou par télévision sous marine dans le Fjord de Bonne Bay. Les résultats de ces études sont utilisés pour établir, sur des bases biologiques expérimentales, un modèle de rendement par recrue tenant compte des effets de la mue terminale.

Des travaux préliminaires de datation de carapaces par radioisotopes pour étude de la croissance ont été réalisés en collaboration avec l'IFREMER, le CNRS et le CEA (France) dans le cadre d'accords de coopération scientifique Canada-France.

Canada

Newfoundland Region & Scotia Fundy Region

Région de Terre-Neuve et Région de Nouvelle-Ecosse

(G P. Ennis)

Homarus americanus

Landings of the inshore lobster fishery on the Scotian Shelf and in the Bay of Fundy increased 2.8 times from 1980 to 1986. The 1986 landings of 14,000 t were the highest since 1905. A review was conducted of landings history, license number, trap hauls per year, catch per trap, exploitation rate, yield per recruit and eggs per recruit. The results indicate that a 30% increase in the number of fishermen would reduce the catch per fisherman by 30% and the eggs per recruit by 27-74%, but would have no significant effect on the yield per recruit. An increase in the minimum size equivalent to one year's growth would increase yield and eggs per recruit.

The offshore fishery of the Scotian Shelf, Gulf of Maine, and Georges Bank increased landings from 430 t in 1984 to 800 t in 1986. Effort and catch per trap haul also increased. The increased landings occurred under a new increased quota and following the ICJ Gulf of Maine boundary decision which opened new grounds to Canadian vessels. Samples show that the size-frequency distributions of the catch have remained constant since 1972 when the fishery began. Work continues on movement and growth rates.

An assessment of the impact of scallop fishing on the lobster population in St. Mary's Bay, Nova Scotia, showed that there was no detectable impact on lobster stocks by scallop drags. Traditional lobster and scallop fisheries have little overlap due to the tendency for commercial abundance of both species to occupy different substrate types.

Lobster larvae distribution on Browns and Georges Bank was investigated during July 1987. Larvae were sorted at sea to larval and molt stages. Stage 1 dominated catches on Browns Bank, with a daytime depth distribution between 20-30 m and a nighttime distribution of 0.5 m. All four larval stages were found on Georges Bank. Stages 1 and 2 migrated vertically, Stage 4 was neustonic, but Stage 3 behavior is not yet resolved.

In the laboratory in investigation of juvenile lobster habitat preference and its impact on mortality, lobsters were found to choose habitats with seaweeds (Irish moss, Chondrus crispus) more frequently than habitats without. Additionally, seaweeds and increased habitat complexity were found to reduce lobster mortality from a fish predator.

Long-term monitoring of fishery characteristics including catch rates, catch, effort and exploitation rates and aspects of the population biology of lobsters including annual growth, recruitment and standing stock was continued in three localized fishing areas around Newfoundland. Analyses of 1975 to 1986 data for one of these study areas demonstrated that annual egg production varied by a factor greater than 10. This resulted from variation in numbers of matures females in the population which is linked to recruitment variation and from variation in the percentage of mature females that spawn. At high levels of abundance, molting among mature females was reduced and spawning increased.

Annual plankton sampling to study larval ecology continued at one Newfoundland locality and laboratory experiments on rheotactic responses of larvae were conducted.

Pandalus borealis

Annual research surveys using bottom trawls were carried out in May and October on Scotian Shelf. Biomass estimates show a slow but steady increase from the minimum values determined in the spring of 1985. The abundance of finfish observed in the same surveys did not show a significant change over that of previous years, with redfish and cod continuing to be the major by-catch species. Larval samples were again collected during the spring survey.

Fishermen logbooks, observer reports and a research trawl survey provided data on the northern shrimp fishery and status of the stocks off coastal Labrador in 1987. The number of shrimp licenses was increased from 12 to 16 and, consequently, TAC's were taken in most the traditionally fished stock areas. More effort was directed to some less productive areas late in the year and stocks of P. montagui in Eastern Hudson Strait and Ungava Bay were also fished. A research survey was conducted in Hopedale (Division 2H) and Cartwright (Division 2J) Channels from July 8-22 and estimates from both research and commercial fishing are being analysed for resource assessment.

Chionoecetes opilio

Monitoring data were collected for the commercial snow crab fisheries off the Atlantic coast of Cape Breton Island in 1987. Catch and effort patterns from fishermen's logbooks were analyzed by the Leslie method to assess biomass levels and exploitation rates in each fishing area. The overall status of the stocks appears to be an improvement of the 1986 situation and a further reversal over the collapsed stated noted in previous years. A pulse of males first detected in 1985 continued recruiting into the commercial biomass prior to the 1987 fishing season and increased abundance over 1986 levels in all areas. Up to 40% of the landed males sampled during 1987 were morphometrically immature. Although the longer-term biological implications of this situation remain unclear, virtually all of the mature females sampled through the 1987 fishing season were carrying eggs. Morphometrical analysis also revealed that large numbers of males had attained a terminal molt below the legal minimum size; an innovative stragegy to harvest this "wasted" resource on an experimental basis is being considered.

A series of research projects are underway on the respiratory physiology, growth and reproductive anatomy of snow crab. A study on the distribution, population dynamics and natural mortality of snow crabs off northwestern Cape Breton Island has been completed. In the study, crab remains in cod and skate stomachs were analyzed to provide information on seasonal, substrate, depth, sex, and size-specific predation patterns. An experimental evaluation of snow crab tagging methodology revealed major problems in terms of tag-induced mortality and deformities, as well as tag loss. Revisions of tagging protocol are being advised.

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 and biomass estimates based on 1986 data derived. Landings have remained at low levels in the southern zone offshore areas apparently because of sustained recruitment failure since 1982. In 1982, there was a sharp

reduction in the level of molting activity in the populaiton that has persisted and appears to be related to lower bottom temperatures throughout the area over this period. CPUE remained constant in offshore areas but increased markedly 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 declined dramatically as a result of excessive fishing pressure.

Research aimed at fully documenting behavioral, 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 molting, mating and egg development continued. A study into the feasibility of using a Remotely Operated Towed Vehicle (ROTV) as a means of determining prerecruit snow crab size, distribution and density by means of bottom photography was initiated.

Denmark - Danemark

(Sten Munch-Petersen)

Pandalus borealis

In order to improve the data for assessment of Pandalus stocks in Sub-Divs. IIIA and IV, sampling for length measurements of Danish commercial landings has taken place.

France

(Anatole Charuau)

Radiométrie

Les recherches sur la technique de détermination de l'âge d'une carapace par mesure du rapport de l'activité du radium 228 et du thorium 228 ont été poursuivies par l'IFREMER en collaboration avec le Centre National de la Recherche Scientifique (CNRS). Le principe de la méthode, sa mise en oeuvre et les premiers résultats sont présentés dans une publication à paraître en 1988. L'expérimentation sur des carapaces-témoin d'âge connu a confirmé la validité de la technique sur les espèces et les gammes de temps testées, soit Maia squinado 0,25 à 1,33 an et Homarus gammarus à 0,21 à 1,20 ans. Par ailleurs, des mesures sur des Cancer pagurus et Nephrops norvegicus (d'âge inconnu) ont montré que les taux de radioactivité étaient suffisants pour que la technique leur soit applicable.

Cancer pagurus

Les apports et les efforts des caseyeurs français attachés aux ports de la Manche font l'objet d'une évaluation régulière et d'une ventilation par rectangle statistique.

Le dinoflagellé parasite hematodinium perezi, responsable de mortalités importantes pendant l'hiver, a été retrouvé (à des taux variables) sur des tourteaux provenant de secteurs aussi éloignés que l'Ecosse et la Bretagne Sud en passant par toute la Manche et l'Iroise.

Homarus gammarus

Trois mille juvéniles d'un an marqués magnétiquement ont ont été immergés sur le site témoin de Bretagne Sud. Ils portent à 25 000 le total des immersions. Un individu marqué en 1984 a été récupéré en mai 1987 dans un lot de homards hors taille. Compte tenu du rythme de croissance de l'espèce, des recaptures en nombre significatif ne peuvent être escomptées qu'à partir de 1988. Les études sur le comportement du homard et sur l'élevage communautaire sont poursuivies.

Maia squinado

L'étude sur la biologie de ce majidé et sur la dynamique du stock en Manche Méridionale, entreprise en 1985, a été poursuivie sur les points suivants:

- Estimation des apports et des efforts exercés par les fileyeurs et les caseyeurs.
- Suivi de la reproduction.
- Etude des schémas migratoires par marquages-recaptures.
- Estimation directe de la densité des juvéniles sur nurserie par draggage (sans caméra vidéo).
- Approche économique de la pêcherie.
- Etude de la durée des stades d'intermue et invalidation par radiométrie de critères externes d'estimation de l'âge.

Nephrops norvegicus

La distinction par pêcheries unitaires de langoustines a été maintenue et les échantillonnages ont porté sur les principales unités de gestion du Golfe de Gascogne, de la Mer Celtique et du Banc Porcupine.

Ces échantillonnages sont réalisés sur les marchés. L'évaluation des rejets n'est assurée que dans le Golfe de Gascogne. Du point de vue biologique, une approche des paramètres de croissance, en couplant l'étude de l'évolution du cycle d'intermue et le niveau radiométrique a été entreprise.

Sur toutes pêcheries, un suivi systématique de l'activité des flotilles est poursuivi. Un renouvellement profond de leur structure est en effet en cours et l'introduction, dans les stratégies d'exploitation, d'une grande flexibilité, fait rapidement évoluer les schémas traditionnels de gestion.

Federal Republic of Germany
République Fédérale d'Allemagne

(K. Tiews)

Crangon crangon

By-catch research in the German brown shrimp fishery to determine abundance indices for fish and crustaceans of commercial and non-commercial importance occurring on the shrimp fishing grounds was continued at the Institut für Küsten und Binnenfischerei der Bundesforschungsanstalt für Fisherei. A total of 359 samples of 2836 kg were analyzed.

Studies on the occurence and cause of the black spot disease of Crangon which were started in 1986, were continued.

As part of a cooperative program agreed upon with the Netherlands and Belgium German coastal waters along the coasts of Neidersachsen and Schleswig-Holstein were surveyed to study the abundance of young fish and brown shrimp populations by the Institut für Küsten und Binnenfischerei der Bundesforschungsanstalt für Fischerei.

Iceland - Islande

(Hrafnkell Eiriksson)

Nephrops norvegicus

Two research vessel surveys were carried out during Nephrops season (May-August). Most importantly, the surveys included regular sampling of various biological parameters for stock monitoring purposes. In that respect, some 50-60 sampling stations are taken annually before or at the start of the season in May on all the most important grounds. Moreover samples were obtained from Nephrops boats for the remainder of the season.

Landings of Norway lobsters amounted to approximately 2.650 m. tons compared to 2.560 tons in 1986. Average CPUE remained high or 53 kg per trawling hour, although somewhat down from the record 61 kg/hour in 1986.

Compiling of biological data for the last 15 years (1973-1987) was initiated in 1987 and will hopefully be completed and ready for publication in 1989.

Pandalus borealis

Research vessel surveys were carried out as usual for sampling P. borealis and obtaining information on by-catch in the inshore areas. In case of most inshore areas, this was done both in the beginning of the fishing season and towards the end of the season. At the same time, stock assessments were made, using area swept. A virtual population analysis was carried out for the last 10 years in one area, Isafjartardjup. The biomass of 1-3 years old was found to agree very closely with the fishable stock size estimated one year later by area swept. Approximation of age-classes mainly by the MacDonald and Pitcher methods, but also using the deviation method and the criteria of presence/absence of sternal spines, have been used more during the year than ever before. Weighing of shrimp in the categories with or without sternal spines was initialized during the year. This will be continued during the year 1988.

Landings in the offshore fishery increased from 30.397 m. tons in 1986 to about 36.000 tons in 1987. The CPUE declined somewhat or from 88 kg in 1986 to 78 kg in 1987 for the Northwest areas and from 125 kg in 1986 to 102 kg in 1987 for the Northeast areas. The latter was expected to fall as most of the banks there were new to the fishery in 1986. Stock assessment by the area swept method was initiated for offshore areas as well as the collecting of young shrimp in a small meshed bag attached to the codend.

In 1988 research will be carried out along similar lines as in 1987.

Hyas araneus

Exploratory creel surveys were continued in 1987. A preliminary study of the distribution and density of Hyas down to 50 m depth in fjord areas around Iceland will be completed in 1988.

Incidental catches of up to 25-30 kg of H. araneus per creel per day have been observed averaging in some areas up to 10 kg creel/day.

Due to export marketing difficulties, fishing is still limited to a very small home market.

Ireland - Irlande

(J.P. Hillis)

Nephrops

Sampling of catch, landings and discards continued in the Irish Sea, Division VIIa. Numbers sampled are shown in the accompanying table. The development of the computer programmes to process the data also advanced.

A cruise to examine mean size of Nephrops in relation to sea bed sediment particle size was undertaken during the summer. Results indicated mean weight as being correlated positively and population density negatively with percentage of particles of diameter exceeding 80um. Further, length frequency of males was found to show a clear modal structure covering age-groups presumed to be from 2 to 6 from previous studies (Hillis, J.P. (1979), Rapp. P.V. Cons. perm. int. Explor. Mer. 175:170-175).

While the length-frequency distribution of mature females does not exhibit such modality, that of immature females exhibited age-group 2 modes at most stations, but age group 3 modes were also present at some, and predominated at one, modal length appeared to decrease with increasing depth.

Results of recaptures of micro-tagged Nephrops remained poor. Despite wide publicity being given to a reward amongst boats and in processors factories, trawling the area of release with a research vessel was the most effective means of obtaining returns.

To improve results, 5,600 tagged were further marked externally by tail punching and were released at a single point where fishing is moderately light of which boats will be informed during the period of the recapture campaign.

Further development of a separator trawl to separate from whiting Nephrops was successfully undertaken. The gear involved is simpler and of more economic construction that existing separator gears.

1987

Numbers of Nephrops sampled, Division VIIa

Quarter	Number of samples	Sex	Catch	Landings	Discards	Total
1	5	male	1 147	587	446	2 180
		female	725	148	393	1 165
		unsexed	.....	360	...	360
		Total	1 872	1 095	738	3 705
2	7	male	975	524	518	2 017
		female	741	132	611	1 484
		unsexed	.....	2 130	...	2 130
		Total	1 716	2 786	1 129	5 631
3	18	male	3 444	113	677	4 234
		female	3 587	46	788	4 421
		unsexed	.....	1 344	...	1 344
		Total	7 031	1 503	1 445	6 376
4	7	male	1 560	682	682	2 890
		female	1 136	154	797	2 087
		unsexed	.....	1 399	...	1 399
		Total	2 696	2 235	1 445	6 376
TOTAL	37	male	7 126	1 906	2 289	11 321
		female	6 189	480	2 488	9 157
		unsexed	.....	5 233	...	5 233
		Total	13 315	7 619	4 777	25 711

The Netherlands - Les Pays Bas

(R. Boddeke)

Crangon crangon

Surveys

During June, July and August, surveys were carried out along the Netherlands west coast with the R.V. Isis. This survey was aimed at registration of settlement of postlarvae in this area.

The International young flatfish and brown shrimp survey was carried out in cooperation with Belgium, FRG and UK in September and October.

Market sampling

The market sampling of the Netherlands shrimp harbours, Breskens, Colijnsplaat, Den Oever, Harlingen, Lauwersoog and Termunten continued. Body length, sex, presence of eggs and the stage of development of the eggs are defined. For studies on stock-recruitment relations in the different shrimp populations along the Netherlands coast, densities are expressed in numbers of consumption shrimps and ripe eggs caught per fishing day on basis of this market sampling.

Norway - Norvège

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

Pandalus borealis

Abundance estimates (number and biomass) of deep-water prawn by age-class were continued by the Institute of Marine Research (Bergen, Directorate of Fisheries), in the North Sea, Skagerrak, Norwegian Sea, Barents Sea and the West Spitsbergen Shelf in 1987. By-catches of fish (species and year-class) were also recorded.

In the Norwegian deeps, the catches of prawns in 1987 were greater than in 1986. Especially towards the end of the year the CPUE decreased in the Skagerrak area, whereas it was continuously high further west.

In the East Greenland area, Norway had one inspector on a trawler in the spring. Biological samples were taken, and by-catch and discard were measured. In September, a scientific trawl survey was carried out in the Denmark Strait in order to measure prawn abundance and distribution.

Population density, demography, maturity stages, fecundity, and growth and mortality studies in selected north Norwegian and Spitsbergen fjords were continued by the University of Tromsö in 1987. Classification of populations on the basis of the above mentioned parameters using multivariate statistical techniques (e.g. Factor Analysis) were continued further.

Latitudinal life-cycle responses and reproductive output from the southern to the northern limits of geographical sampling have been examined by the University of Tromsö. A further refined version of the previously developed biomass, production and productivity model, using individual growth and mortality inputs, was developed and documented in 1987. Data describing proximate composition and energy content of P. borealis as a function of body size, age and season were analysed in 1987. Studies of the importance of this species in the food webs of north Norwegian fjords, the Svalbard area and the Barents Sea have been continued.

Studies of multispecies interactions, involving prawns as prey for cod and seals, have been continued at the Institute of Marine Research (Bergen, Directorate of Fisheries) and University of Tromsö, and University of Oslo respectively. Population dynamics, behaviour, and alimentary physiology studies are involved.

Homarus gammarus

The monitoring program for CPUE and length measurements of the commercial catches of lobsters at five different localities was continued in 1987. Only at one of the localities, where yearlings of lobsters raised in warm water were released, was an increase in the catch of undersized lobsters observed.

Species	Area	Season	No. samples research	No. samples market	No. individuals measured	No. individuals aged
Pandalus borealis	I	1987	99	50	52 150	
	IIB	1987	69	47	24 150	
	IIIA	1.quart.		5	1 459	1 459
	IIIA	2.quart.		5	1 598	1 598
	IIIA	3.quart.		4	994	994
	IIIA	4.quart.	44	3	9 933	9 933
	IVA	4.quart.	40		8 414	8 414
Homarus gammarus	IIIA	4.quart.		7	1 382	

Poland - Pologne

(Anna Garbacik-Wesolowska)

Not reporting on Crustacea.

Portugal

(M.J. Figueiredo and A. Cascalho)

Nephrops norvegicus

(1) A sampling programme on size composition of the landings on the west and south coast of Portugal was continued as in previous years.

Four research cruises were carried out on board the R/Vs "Noruega" and "Mestre Costeiro", two directed to the achievement of a tagging programme in a selected area of the Portuguese south coast, in May and November (5691 individuals were tagged and 43 recovered during a period of about six months) and two directed to the biological study of different populations and to the definition of the characteristics of the fishing grounds (4281 individuals were measured and analysed).

Parapenaeus longirostris and Aristeus antennatus

(1) The same sampling programme on size composition of the landings in the Portuguese south coast was maintained.

Three research surveys on board R/V "Mestre Costeiro" with the purpose of recognizing the distribution areas of these shrimps were carried out off the central and southwest coasts of Portugal. Information on biological characteristics were obtained.

Carcinus maenas

(1) Studies on the life cycle of this species in a coastal lagoon of the Purtuguese central west coast (Ria de Aveiro) were continued.

Maja goltziana

(2) Experiments have been carried out on the laboratory rearing of the brachyuran Maja goltziana.

Other species

(2) Studies have been carried out on the decapod larval ecology in the river Mira estuary (portuguese south western coast): larvae release patterns and short term variations in the plankton.

Studies were conducted on the decapod ecology in the river Mira estuary, mainly on palaemonid shrimps: distribution, population structure and temporal variations.

(3) Studies on Amphipods in benthic communities of the estuary of the river Mondego (Portuguese west coast), including biology and population dynamics of Echinogammarus marinus were conducted.

Source of information:

(1) Instituto Nacional de Investigaçao Das Pescas (INIP)
(2) Faculty of Sciences (Lisboa) - Guia Laboratory
(3) University of Coimbra - zoological Museum and Laboratory

Spain - Espagne

(A. Perez-Camacho & M. Torre)

The velvet swimming crab (Liocarcinus puber) was studied in Northern Spain. The conditioning and spawning induction in Homarus gammarus were also studied. The studies on the biology of shrimp in SW Spain (Penaeus kerathurus) and the crab Polybius henslowi in NW Spain were continued.

Sweden - Suède

(H. Hallback)

Homarus vulgaris

Commercial catches are still decreasing. New regulations have been discussed.

Cancer pagurus

Catches are still good, collection of catch data continued.

Nephrops norvegicus

The fishery for Nephrops is very intensive along the Swedish westcoast, both with trawls and creels. A new research program has started dealing with tagging, catch data, in situ studies, the oxygen situation in the south of Kattegat etc.

Pandalus borealis

Collection of catch data continued.

United Kingdom - Royaume Uni

1) England and Wales

(R.C.A. Bannister)

The voluntary log-book scheme to sample catch rates has been extended to all of England and Wales and a database developed. Details of market sampling data collected are given in Table 1. Size composition information was also collected during research projects.

Cancer pagurus

A major 12 month study of the important English Channel crab fishery started in July. Its aims are to collect fishery and population structure data stratified by season and area to allow a re-assessment of the state of the stock. Analysis of past larval data (ICES CM 1987/K:48) has provided the basis for a plan to survey larvae for distribution, stock identity, recruitment and spawning stock. Laboratory experiments on temperature and larval development were completed. The question of an increase in minimum landing size for NE England was assessed using length cohort analysis. Attempts have been made using various underwater observation techniques (divers, TV, ROV) to observe ovigerous crabs in areas subjected to gravel extraction.

Nephrops norvegicus

North Sea: fecundity samples collected and analysed. Discard sampling continued at North Shields. A series of RV cruises to survey larval abundance was completed, but larval productions was low.

Irish Sea: monitoring of the Cumbrian fishery has continued. Discussions have been held on the possible reduction in minimun landing size. The current 25 mm CL results in considerable discarding in the Western Irish Sea, with low discard survival.

Homarus gammarus

Work on stock-recruitment modelling and the landing of berried lobsters has continued. Liaison with Sea Fisheries Committees on various permit schemes have included discussions on means on holding fishing effort at the current level. A study on lobster and crab escape gaps has been started to take account of recent changes in minimum landing sizes.

The stock enhancement study releasing micro-tagged hatchery reared juveniles has continued at Bridlington. A total of 14 170 lobsters were released by divers in the current year. Water temperatures were low in the spring release and digging-in behaviour limited, but the autumn release was onto suitable reefs in good conditions. Quayside monitoring of undersized lobsters was commenced at Bridlington. Of the 713 scrutinized, none were micro-tagged. (Some recaptures have been made at the site in Orkney where another group have been making release). In a mark-recapture experiment, 1163 undersized lobsters were released, 180 recaptured, including 5 emigrants from Bridlington Bay.

Low larval abundance was encountered during 2 cruises off the North-east coast. A new fecundity study has begun. Past data were analyzed and written up for ICES (ICES CM 1987/K:47).

CRUSTACEAN MARKET SAMPLING IN ENGLAND AND WALES 1987

Species	Area	Nos measured
Nephrops norvegicus	IVb	5661
	VIIa	3790
Homarus gammarus	IVb	3865
	IVc	253
	VIId	219
	VIIe	206
	VIIa	407
Cancer pagurus	IVb	3455
	IVc	1607
	VIIe	2453*
Maja squinado	VIIe	307
Palinurus elephas	VIIe	63

* excludes 106 shorebased and 18 at sea samples of approximately 150 crabs/samples, ie about 18,600 crabs, collected during special 12 months project.

United Kingdom - Royaume Uni

2. Scotland

(J. Mason)

Nephrops norvegicus

Sampling of trawl and creel landings at major fishing ports continued on a regular basis, supplemented by research vessel surveys in some areas, notably the Firth of Clyde.

Studies of the biology of larval and juvenile Nephrops in the Clyde were completed. The fecundity of females was also studied. There was a 20% loss of eggs during development. In addition, about 25% of ovigerous females appeared to have lost most of their eggs soon after spawning. Information on fecundity was incorporated with larval surveys to estimate spawning stock size in the Clyde.

Further tagging studies were carried out in Loch Torridon to examine the growth and survival of adult Nephrops blinded by light. Returns so far indicate that eye damage has little effect on these parameters.

Laboratory and field studies were initiated in the role of mechanical stimuli in the behaviour of Nephrops, particularly towards fishing gear.

Pandalus borealis

Routine monitoring and sampling of the Fladen fishery continued, the data being made available for assessments by the ICES Pandalus Working Group. The Farn Deep fishery was surveyed on a research vessel cruise.

Crangon crangon

Monitoring of the Solway fishery continued and further observations were made on the by-catch of miniature flatfish.

Homarus gammarus

Monitoring and sampling of lobster landings was undertaken in the main fishing areas. The collection of CPUE data was expanded to include more vessels.

A preliminary underwater television and side-scan sonar survey of an artificial reef off Dunbar was carried out but no lobsters were seen.

An investigation of a localised lobster population continued off the west coast of Scotland. Further lobsters were tagged and the number of recoveries in this experiment has reached 1700 up to the end of 1986. Many lobsters have been recaptured more than once, giving valuable information on growth and mortality rates.

Cancer pagurus

Sampling of commercial catches and the collection of CPUE data continued. Some preliminary experiments were carried out on the use of "collectors" to sample juvenile creel.

Liocarcinus puber

Landings of this species have continued to rise with the development of a new fishery at Orkney. Tagging experiments commenced at a west coast site and recovery rates have generally been high (up to 50%). Several crabs had moulted providing information on moult increments. The high recapture rate suggests that velvet crabs remain in the area of the capture.

ICES Shellfish Sampling Data

Area	IVA C	IVA R	IVB C	IVB R	VIA C	VIA R	VIIA C	VIIA R
Nephrops								
Jan-Mar	2891	-	7043	-	21463	3143	-	-
Apr-Jun	13444	-	4330	1090	13857	3100	-	-
Jul-Sep	3347	-	---	-	15914	8553	-	-
Oct-Dec	6519	-	9535	-	11525	3359	-	-
Lobster								
Jan-Mar	-	-	-	-	237	-	-	-
Apr-Jun	459	-	1699	-	35	-	-	-
Jul-Sep	-	-	220	-	2767	-	-	-
Oct-Dec	513	-	2670	-	-	-	-	-
Pandalus								
Jan-Mar	912	-	-	-	-	-	-	-
Apr-Jun	1292	-	-	7700	-	-	-	-
Jul-Sep	447	-	-	-	-	-	-	-
Oct-Dec	-	-	1520	-	-	-	-	-
Crab								
Jan-Mar	269	-	-	-	215	-	-	-
Apr-Jun	1770	-	1606	-	1449	-	-	-
Jul-Sep	242	-	-	-	2711	-	-	-
Oct-Dec	264	-	543	-	589	-	-	-
Scallop								
Jan-Mar	1886	-	-	-	5034	-	872	-
Apr-Jun	1057	-	-	-	5711	1583	658	-
Jul-Sep	722	-	-	-	3400	1693	756	-
Oct-Dec	1814	-	-	-	1325	834	412	-
Queen								
Jan-Mar	281	-	-	-	-	-	1845	-
Apr-Jun	281	-	-	-	673	265	1030	-
Jul-Sep	-	-	-	-	-	-	1692	-
Oct-Dec	234	-	-	-	1152	661	680	-
Squid								
Jan-Mar	-	-	-	-	426	-	-	-
Apr-Jun	-	-	-	-	1848	-	-	-
Jul-Sep	-	-	-	-	304	-	-	-
Oct-Dec	-	-	-	-	453	-	-	-

C = commercial (market) sample
R = research vessel sample

United States of America - Les Etats Unis d'Amérique

(S. A. Murawski)

The Northeast Fisheries Center 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). State bottom trawl survey programs were conducted by Massachusetts, Rhode Island and Connecticut. Stock assessment research was conducted by NEFC and SEFC (Southeast Fisheries Center) scientists, as well as several state agencies.

Northern Shrimp (Pandalus borealis)

The Maine DMR initiated research on the effects of temperature on survival or larval shrimp, as well as continuing trials of various designs for shrimp separator trawls to minimize the catch of groundfish. Cooperative stock assessment work involving the state agencies of Maine, New Hampshire and Massachusetts continued. NEFC researchers studied biology, distribution and relationships between abundance and environmental parameters. NEFC researchers began a study to evaluate the multispecies consequences of by-catch of small groundfish in the small-mesh trawl fisheries for northern shrimp.

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

SEFC researchers continued monitoring of the population dynamics of shrimp populations, and the seasonal movements of shrimp relative to areal closures in the Gulf of Mexico. Several state agencies continued sampling programs to determine abundance and distribution, and to evaluate management programs based on areal and seasonal closures. Georgia researchers developed a project aimed at evaluating movement and growth of commercially important penaeid shrimps in estuarine and coastal waters.

American lobsters (Homarus americanus)

Several state agencies continued monitoring programs for lobster landings, CPUE and biological characteristics of the catch (e.g. Maine, Massachusetts, Connecticut, New York). The Maine DMR is engaged in long-term tagging studies to evaluate growth and movement patterns, in addition to lobster disease work.

Massachusetts investigators continued a project to evaluate areal differences in fecundity, based on automatic procedures for egg counting and measurements. Other work carried on by State of Massachusetts workers evaluated growth, movements, maturity and morphometrics. The State of Connecticut evaluated larval, juvenile and adult biology and population dynamics utilizing SCUBA and research trapping surveys, and monitoring of the commercial landings. Larval dynamics and feeding in Long Island Sound were investigated with a plankton sampling program. NEFC research focused on improved models for evaluating long-term patterns in lobster landings. A number of state agencies were involved in analyzing the impacts of increases in lobster minimum size consistent with the federal government's management plan for waters 3-200 n. miles from the coast. NEFC researchers instituted a tagging program to evaluate lobster movements associated with the closing of an historical sewage sludge disposal site near New York City.

USSR - URSS

(S. Studenetsky)

In 1987, the Soviet investigations on commercial crustaceans carried out in the Barents and Norvegian Seas and off Spitsbergen (Subarea I, Divs. IIa, IIb) were predominantly directed at studying stocks regularities of distribution and biological peculiarities of the Shrimp Pandalus.

Shrimp surveys were made in the Barents Sea in May and off Spitsbergen in June-July.

Five special research cruises were made with the aim of studying commercial invertebrates, a total of 33 915 specimens of shrimp were examined.

A new approach for trawl surveys was used as a complete method during shrimp investigations off Spitsbergen by R/V "Fridtjof Nansen".

The approach includes:

1) survey design before surveying;
2) adaptive design during surveying;
3) stock assessment using spline approximation of stock density. The results obtained indicated a decrease in the shrimp stock of Pandalus borealis in the Barents Sea and adjacent waters.

MOLLUSCA

Belgium - Belgique

(F. Redant)

NOT REPORTING ON MOLLUSCA

Canada

Région du Golfe du Saint Laurent

et

Région du Québec

(Gérard Y. Conan)

Placopecten magellanicus

Un relevé expérimental et l'analyse des données de l'exploitation commerciale ont permis d'évaluer l'état des stocks de pétoncle des Iles-de-la-Madeleine, de la Gaspésie et de la Basse Côte Nord (golfe du Saint-Laurent). Les débarquements des Iles-de-la Madeleine ont subi une importante diminution par rapport à 1986. Cependant, un grand nombre de pré-recrues (environ 30 mm) a été observé dans cette région.

Les expériences de photographie sous-marine visant à mesurer l'efficacité de la drague Dibgy ont été poursuivies. Les résultats préliminaires confirment que le rendement de l'engin de pêche utilisé lors des relevés expérimentaux est inférieur à 15%. Ils indiquent également une relation positive entre la direction du courant et l'orientation des pétoncles.

Le projet de recherche sur le recrutement du pétoncle aux Iles-de-la-Madeleine a été poursuivi pour une troisième année consécutive. Des collecteurs ont été immergés au printemps et relevés à l'automne afin d'évaluer la fixation du naissain.

Une analyse de la structure génétique des populations de pétoncles du golfe du Saint-Laurent est en cours. L'analyse préliminaire d'une partie des données donne à penser que les populations de la Gaspésie et des Iles-de-la-Madeleine seraient distinctes.

Le stock de pétoncles géants du sud du Golfe a été étudié à partir des données d'échantillonnages à la mer, des livres de bord et des statistiques de débarquement. L'abondance relative des prérecrues de taille inférieure ou égale à 70 mm s'est accrue ou est restée stable dans la plupart des secteurs. Des résultats préliminaires suggèrent que les caractéristiques des débarquements en 1987 étaient identiques à celles de 1986. Les fluctuations d'abondance du stock s'inscrivent dans les limites dont l'étendue reste semblable depuis 1977.

Chlamys islandica

Les données obtenues de l'exploitation commerciale ont permis d'évaluer l'état des stocks de la côte nord du golfe du Saint-Laurent. Une hausse notable des captures a été notée en 1987 dans le secteur de la Moyenne Côte-Nord du Golfe.

Le stock de pétoncles d'Islande du détroit de Belle Isle a été étudié à partir de données d'échantillonnage au port, des livres de bord, des statistiques de débarquement et des résultats d'une croisière de pêches expérimentales. Les fonds de pêche sont maintenant bien connus. Toutefois, il est difficile de standardiser les captures par unité d'effort car les engins de pêche utilisés continuent à évoluer.

Mytilus edulis

Les travaux sur la répartition spatiale des structures d'élevage des moules se sont poursuivis. De plus, ils visent à évaluer l'effet de la resuspension de la nourriture, de l'adaptabilité et de la sélectivité alimentaire sur la croissance des moules.

Spisula solidissima

L'étude de l'âge et de la croissance des palourdes de dune dans le détroit de Northumberland et le long des côtes de l'Ile du Prince Edouard a été effectuée avec succès à partir d'expériences de marquage et de recapture effectuées dans le milieu naturel. Des sections fines du chondrophore font apparaître un patron de stries aisément identifiables. Des ajustements à la courbe de von Bertalanffy montrent qu'il existe des différences notables de croissance entre localités du Golfe. Les croissances sont également différentes de celles estimées pour la côte Est des Etats-Unis.

CANADA

Newfoundland Region and Scotia Fundy Region

Région de Terre Neuve et Région de la Nouvelle-Ecosse Fundy

(G P. Ennis)

Illex illecebrosus

A research cruise was conducted in 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 to attempt to develop an index of squid recruitment based on abundance of young stages. The overall catch rate of juveniles from midwater trawl in 1987 (27.3 per set) was greater than those from 1984 to 1986 winter surveys (0-1.9 specimens per set).

Another annual survey was conducted on the southwest slope of the Grand Bank during June. Favorable temperatures persisted throughout most of the survey area and daytime catches, using bottom trawl, averaged 143 squid per set, the highest since 1981.

Although pre-season survey indices were encouraging, the abundance of adult squid inshore at Newfoundland remained low in 1987, continuing the trend of recent years. The low level of abundance limited biological studies in the Newfoundland inshore area. However, some squid samples were acquired for detailed biological analysis. A trap was maintained at one locality to collect squid catch/effor data, to monitor the relative abundance of potential prey species, and to capture squid specimens for ageing experiments.

Abundance of adults off the Scotian Shelf was extremely low in 1987, but large numbers of juveniles were observed over much of the Shelf in fall. The low abundance of adults in 1987 represents a conti- nuation of the trend of recent years.

Loligo pealei

Although Loligo pealei were present over western areas of the Scotian Shelf, their abundance was very low - as it is in most years.

Placopecten magellanicus

Scallop stock research surveys indicated a slow rebuilding of the stocks on Georges Bank, a strong recruitment pulse on the traditional grounds in the Bay of Fundy, and a low but relatively stable exploitable biomass on the eastern Scotian Shelf. Allometric relationships were established between shell height and meat yield for the Canadian side of Georges Bank. A strong seasonal component was not found on all sets of allometric data, but interannual variability (5%) was observed.

Age and growth studies were continued. Oxygen isotope results validated the use of external rings on the shelf for ageing.

Experiments with the sea scallop examined the effects of a range of diets on gametogenesis and growth. Continued work on particle selection and physiological energetics of sea scallops on Georges Bank will be used to assess their role in processing primary publication from the water column.

A survey of the horizontal distribution of larvae on Georges Bank again indicated very high concentration on Georges Bank (up to 10,000 m^{-3}) compared to adjacent areas. The vertical distribution and condition of larvae in stratified and mixed parts of the Bank were also studied.

A survey was conducted on St. Pierre Bank to determine spatial distribution and abundance of sea scallops. Removals from NAFO Div. 3Ps amounted to 54 MT. Residual biomass points to an active fishery in 1988, with meat counts in the 35-40/500 g range. The fishery will continue to depend primarily on the 1982 year class.

Chlamys islandica

There was a fishery directed on Iceland scallops in NAFO Div. 3L. A single 9-day trip resulted in the removal of 8.3 t meats with counts approaching 60/500 g. This represents the first excursion by the offshore fleet for Iceland scallops on the Grand Banks of Newfoundland. The very attractive catch rates encountered will likely result in an intensification of effort in this area. The introduction of a mechanical shucking device is being considered.

Mya arenaria

A number of studies were undertaken in the Annapolis Basin to evaluate purported habitat changes caused by the tidal power plant and their possible impact on soft-shell clam production.

A remote sensing study of the Basin and Annapolis River was undertaken to describe present sedimentation patterns and compare them with historical areal photographs. Photography included multialtitude (scale 1:4,000 to 1:10,000) color and color infrared, and SPOT satellite imagery. Small-scale ground surveys were also undertaken to access clam stocks and to determine the feasibility of measuring fishing effort.

General beach surveys and hydrographic surveys did indicate some silt accumulation over a few clam-producing areas; but, as yet, the information is insufficient to determine the degree to which the original causeway installation or the more recent hydroelectric development may have caused this accumulation. One small area of clam flat was found to have suffered a complete mortality. Transpant experiments indicated that clams could no longer survive in this area of beach, but no specific cause of mortality could be determined. Limited population data combined with visual and anecdotal evidence suggest that overfishing is the principal cause of declining catch rates throughout the Basin.

A stock delineation and ageing study was completed. Multivariate (MANCOVA) analysis in morphometric samples from 14 major clam-producing areas in Nova Scotia and southern New Brunswick indicated three identifiable stocks: eastern Nova Scotia between Halifax and Yarmouth County, Bay of Fundy between Minas Basin and Passamaquoddy Bay, and Passamaquoddy Bay. Four stations from Annapolis Basin were significantly different to each other and other stations in the study. The von Bertalanffy curve fit to the growth data showed that clams of 80-90 mm shell height had not reached asymptotic sizes. Clams in eastern Nova Scotia took five to six years to reach 51 mm; Bay of Fundy five years; Passamaquoddy Bay, six to seven years; and Annapolis Basin, six to seven years.

Arctica islandica and Spisula polynyma

A commercial fishery for Spisula polynyma commenced on Banquereau Bank in 1987. This fishery further confirmed the results of the 1980-83 exploratory surveys and the commercial potential of the S. polynyma resource on Banquereau Bank.

Current research continues to be directed at refining estimates of growth and natural mortality and our knowledge of the population structure of Arctica islandica and S. polynyma with greatest emphasis on S. polynyma. In 1987, a research cruise was conducted over key areas of Banquereau, Sable Island, and Middle Banks using a 0.5 m^2 van Veen grab to capture smaller individuals than are taken in either the research or commercial hydraulic dredges.

The resultant data have provided information on both population structure and regularity of recruitment. Considerable effort was expanded in ensuring that commercial and test fishery log data were adequate and in the collation and analysis of these data.

Mytilus edulis

To determine abundance and distribution of subtidal (5-20 m) wild mussel stocks in southern Nova Scotia, a survey was conducted using sled-drawn television monitor, grab sampling, and quadrat sampling by SCUBA diving.

Modiolus modiolus

A time series of oxygen isotope ratio values from two Modiolus shells, collected in a cove in Nova Scotia, were used to reconstruct bottom water temperatures and were used as an independent method to age the mussels. A fine scale of resolution was achieved, with up to 15 discretes samples per year of shell deposition. Records from two shells showed similar trends. The oxygen isotope ratio values of the shells cleary tracked seasonal temperatures. Ages of mussels determined from the oxygen isotope record were consistent with those estimated from growth lines on the shells.

Denmark - Danemark

(S. Munch-Petersen)

The investigation of blue mussels in Danish Wadden Sea was continued by our institute.

In the Limfjord, experiments on growing mussels on long lines have been carried out in connection with bottom culture experiments.

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. Management advice has been formulated regarding the optimal utilization of the mussel resources in the Flensburg Fjord. There was no new occurrence of DSP in 1987 on the German coasts after January 1987, when from October 1986 to January 1987 the selling of blue mussels harvested at the Niedersachsen coast had be prohibited because of several cases of DSP.

Cerastoderma edule

Cockle beds in the Wadden Sea along the coasts off Niedersachsen and Schleswig-Holstein were monitored for management purposes at the Institut für Küsten und Binnenfischerei.

France

(D. Latrouite)

Pecten maximus

Les principaux stocks de coquilles St Jacques du littoral Atlantique et de la Manche ont fait l'objet en 1987 d'un suivi identique à celui des années passées: campagnes côtières avec des navires de l'IFREMER en vue d'estimer le recrutement, enquêtes au débarquement des captures. Les ressources des différents gisements sont exploitées de façon très intensive et la production nationale ne devait pas dépasser 8 000 tonnes.

En baie de St Brieuc, la production de la campagne 1986-87 a atteint 2 800 tonnes, en régression de 30% par rapport aux années précédentes pour un effort de pêche identique. Cette situation est directement liée aux mortalités observées au cour de l'hiver précédent, attribuées à la période de froid intense de janvier-avril 1986. La campagne du N.O. "GWEN DREZ" en juin 1987 indique que de nouvelles mortalités anormales ont été constatées qui concernent la période mars-avril. La classe d'âge 1985 qui forme le recrutement automnal est très abondante, mais de taille très inférieure à la normale. Une faible fraction aura la taille commerciale de 10,2 cm. Cette situation se traduit par un quota de 2 000 tonnes pour la campagne 1987-88.

En Manche-Est, après la forte diminution constatée entre 1976 (12 000 tonnes) et 1983 (6 500 tonnes) et une certaine stabilisation autour de 5 300 tonnes en 1984 et 1985, les captures ont de nouveau chuté lors de la campagne de pêche 1986-1987 pour s'établir à 3 500 tonnes. Les indices d'abondance et les structures démographiques obtenus lors de campagnes scientifiques à la mer (dragages expérimentaux) mettent en évidence la lente dégradation qu'ont subi les différents gisements tout au long de cette période. Plusieurs phénomènes apparaissent nettement: vieillissement du stock dû à la faiblesse des différentes cohortes; diminution progressive de la fraction exploitable du stock qui a perdu plus de 50 % de sa valeur initiale en cinq ans; mortalité par pêche trop élevée. Les indices de prérecrutement recueillis en 1987 sont assez moyens sur l'ensemble des gisements et ne permettent pas d'espérer, pour les deux années à venir et dans les conditions d'exploitation actuelles, une reconstitution conséquente des stocks. Des travaux ont été conduits sur l'effet d'une augmentation de la taille commerciale et ont amené les professionnels à se prononcer pour une taille de 11,5 cm au lieu de 10 cm.

Le programme quinquennal sur la coquille St Jacques s'est terminé et il a été décidé de le reconduire une année pour compléter les objectifs de production et de semis de juvéniles en rade de Brest et en baie de St Brieuc: 1, 6 million d'animaux de 15 à 30 mm ont été semés sur les concessions prévues à cet effet. En 1986, ont été introduits 300 000 juvéniles provenant d'un élevage d'Ecosse et placés en baie de St Brieuc. Ce lot est suivi depuis juin 1987 dans le cadre du plan CEE de stimulation de la recherche pour une comparaison entre les transplants et la population indigène.

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. Au terme de trois ans de travaux de terrain, les conclusions préliminaires relient les fluctuations de la production naturelle du stock aux fluctuations du climat et non à la taille du stock.

Chlamys varia

La pêcherie de pétoncle noir de rade de Brest a produit de l'ordre de 400 tonnes, quantité identique à l'année passée. Le captage de naissain pratiqué par les professionnels a donné de bons résultats et les pratiques de semis/recapture se développent sur cette espèce.

Buccinum undatum

La limitation à l'accès à la ressource (licence, quotas journaliers) a conduit à une stabilisation de la production estimée en 1987 entre 5 et 6 000 tonnes, dans le Golfe normand-breton.

Le marché en frais apparaît saturé et la rentabilité des exploitations a diminué. Aussi, les pêcheurs s'orientent vers une politique de qualité (calibrage de produit) et vers le marché de la transformation.

Venus verrucosa

Le recrutement se situe à un niveau faible. La production 1987 se situe à 1 800 tonnes (4 450 tonnes en 1981).

Tapes rhomboïdes, Glycymeris glycymeris, Spisula ovalis

L'année 1987 se caractérise par un développement significatif de la production de ces bivalves, sur les gisements étudiés par IFREMER en Bretagne et en Vendée, grâce à un négoce plus actif sur le marché de frais, notamment pour l'exportation et l'installation d'une première unité de décoquillage. La production est estimée en 1987 à plus de 8 000 tonnes, entre 3 à 4 000 tonnes en 1985 et 1986.

Disposant d'informations précises concernant l'évaluation et la structure démographique des gisements, les professionnels se sont rapidement orientés vers une limitation à l'accès à la ressource par l'instauration de licences de pêche et d'un quota global annuel. Sur certains gisements de Spisula ovalis, une gestion par assolement a été engagée: en effet, on observe, dans tous les gisements de Bretagne sud, une ségrégation spatiale très marquée des classes d'âge, le recrutement apparaissant dépendant de la densité des classes d'âge déjà établies.

Mytilus edulis

L'étude des moulières en eau profonde de l'Est Cotentin (section 7D), entamée en 1981, s'est poursuivie en 1987 avec une prospection (dragages) printanière des principaux gisements: Barfleur, Réville, Ravenoville.

Les rendements (kg/mn) en moules de taille commerciale observés lors de cette campagne de prospection, confirment la diminution importante des stocks enregistrée depuis 1983; diminution essentiellement imputable à la faiblesse, voire à un défaut du recrutement au cours des quatre dernières années. Cela s'est traduit au cour de la même période, tout d'abord par un déclin très rapide de la production en moules de pêche qui est passée de 15 000 tonnes en 1982 à 1 375 tonnes en 1985, puis par l'interdiction totale de l'exploitation des gisements à partir de 1986. Toutefois, en ce qui concerne le gisement de Barfleur, la fixation de naissain en 1986 a apparemment été satisfaisante et pourrait laisser présager une réouverture de la pêche en 1988.

Iceland - Islande

(H. Eiriksson)

Chlamys islandica

For various reasons, only minimal work was done on scallops in 1987, including one short dredge survey in Hunafloi, N Iceland.

Scallop landings in 1987 amounted to approximately 13,500 m. tons, down by some 2,000 tons from the previous year. Although CPUE in some fishing areas has been decreasing, there has been an overall stability in this fishery for many years. The recent drop in landings is mainly due to falling market prices and therefore lessening effort.

Research work in 1988 will be concentrated on the most important fishing area in Breidafjördur, W Iceland, including a stock abundance survey and exploratory fishing.

Arctica islandica

Hydraulic dredge surveys for Arctica were conducted for the first time in Iceland in 1987. In Breitafjörtur and Faxafloi, W Iceland, and off the southeastern coast, many beds of varying size were found and mapped. Swept area biomass estimates suggest a fishable stock of some 500,000 m. tons round weight in the areas covered in 1987. In addition, hydraulic dredging was carried out in NW Iceland with good success. However, abundance estimates are not available yet.

A small Arctica fishery started in late 1987 with total landings amounting to around 700 m. tons.

Buccinum undatum

Exploratory creel surveys were continued in 1987. A preliminary study of the distribution and density of common whelks down to 50 m depth in fjord areas around Iceland will be completed in 1988.

A small commercial fishery for Buccinum has started in Faxafloi, W Iceland.

Ireland - Irlande

(J.P. Hillis)

The Shellfish Research Laboratory, University College, Galway undertook the following studies:

Ostrea edulis

Investigations into larval concentrations, settlement patterns, growth, predator control and other factors relevant to stock assessment on formerly extensive derelict oyster beds.

Pecten maximus

Investigations on reproduction, settlement and recruitment in natural populations.

Chlamys varia

Identification of locations for spat collector trials.

Venus verrucosa

Small scale Stock Assessment.

Laevicardium crasum
Glycymeris glycymeris

Preliminary gear trials.

The Netherlands - Les Pays Bas

(A.C. Drinkwaard)

Ostrea edulis L.

This year, the Lake Grevelingen in the S.W. of The Netherlands, of which the described management functions are nature, recreation and fishery (oysterculture included), respectively in sequence of importance, following the arrangements made by the Planning Department, received more than close attention.

The high oysterspat mortalities during recent years gave rise to think about potential toxic effects of organotin compounds and to take up the offer of the Fisheries Laboratory at Burnham-on-Crouch, Essex U.K., of the English Ministry of Agriculture, Fisheries and Food, to analyse some water samples.

Several samples of the water taken in July and November proved to be EQT-positive on the biocides, coming from antifouling paints: MBT, DBT and TBT (Tributyltin).

The first clear recommendation for a quantitative estimation of butyltin compounds, for fear of a qualitative risk to the aquatic environment, has been given by the oyster farmers in 1985 (Report of Activities, CM 1986/K: 1, p. 9).

The concentation and maturation of the larvae has been followed on several locations. After a late but rather rapid rise of temperature, the production of larvae passed smoothly. The highest counted concentration of larvae mounted up to more than 4 000 larvae per water sample of 100 litres in the last week of July.

The spatfall and mortality has been followed by regular observations of the scattered musselshells. The volume of musselshells from the canneries, transported to the lake for collecting the spat, amounted to 9, 350 m^3. The intensity of the spatfall in proportion to the preceeding years showed no disturbing symptoms. In the beginning of August, an average number of 7.4 spat per shell could be calculated. However, in the beginning of October, mortality had already reduced this number to one spat per shell. Approximately the same situation occured in the course of December 1986, but ample two months later.

The remaining spat was quite well developed, but the expectation for the real production of marketable oysters by this year class on the collectors is not higher that 5 million pieces, in spite of nearly doubling the amount of shell collectors.

At the end of the year, a stock assessment survey on wild fishing locations resulted in about 12 million oysters of the year class 1985 and older. The year class 1986 was estimated on 20 million oysters. Figures concerning the stock on the leased plots for spat collection and ongrowth are not yet available.

During the last years, the reproduction score and density of oyster larvae could not be related to the extent of the oyster production. This points out the dependence on questionable extraneous factors.

The commercial fishery during the 1987-1988 season was reduced to some 5 million consumption oysters from the plots and certain not more from the wild. Coming up to the expectations in 1986, there was a market shortness of also a 5 million oysters. This gap could not be fully compensated by import from Ireland and Maine, U.S.A., respectively from some 1.5 and 1.0 million pieces.

For several reasons, the start of the repopulation of the Eastern Scheldt basin with the European flat oyster has been delayed.

The off bottom oysterculture entreprise behin' the storm-surgebarrier in the mouth of the Eastearn Scheldt was hampered by a nearly total loss of the well grown juvenile oysters from Maine. At the same time, the nearby suspended young Zealand natives did not show an abnormal mortality. This event made the need clear of permits for commercial off bottom spat collecting in Lake Grevelingen with mussel shells in nettings. The collected spats on the shells can already be replaced to the Eastern Scheldt after a couple of weeks.

All mentioned lines of action were attended with hydrographic research, shadowing the most dominating environmental parameters, that govern - or have to govern - the results in the several culture sites.

Crassostrea gigas Th.

The population of the Pacific oyster in the Eastern Scheldt could be exploited by the transfer of wild and on mussel shells collected spats to leased culture plots for further ongrowth. Together with the yield of some wild fishery, the annual total landing increased to a good 500 tons. It helps to bridge the period till the comeback of the native Zealand flat oyster. About 20 growers, more or less in the margin of other work, are occupied with this rather new farming operation since the beginning of the 80's.

Mytilus edulis L.

The research activities related to the musselculture were focused on the functioning of the mussel plots in the Eastern Scheldt. The expected changes in the hydrographic pattern became evident and with that the changes in the culture values of plots which have been used for several decades. The evaluation of the consequences of the storm-surgebarrier for the musselculture has to be carried into the effect of a re-stabilized production. A period of four years is planned for this target. The research is directed on the continuation of the hydrographic and biological surveys, but also the supporting of the exploitation of new potential culture plots will be executed.

Replacements and shiftings are on trial, but this means not only the necessity of a good control by the farmers. Attention is being paid to the carrying capacity of the whole area. The horizontal tide has been reduced and, consequently, the current speeds and influx of North Sea water, while the residence time of the water is lengthened. The expected increase of the profit of the primary production has to be checked up. Managing this all is important in order to enlarge the personal experience and to set bounds to possible errors. The results of the preceedings studies did not clearly identify the adequate locations, a number of uncertainties remained.

Not only in the Eastern Scheldt by this time, but also in the Wadden Sea, there is a continuous necessity for maintaining the real culture surface. In this sometimes wind and wave dominated coastal environment, mobility has to be accepted as a term for an acceptable culture-efficienty and for stabilizing the production too.

The total design capacity for The Netherlands is now 110,000 tons of which the Eastern Scheldt produces 35,000 tons (1987-1988: 30,000 tons) and the Wadden Sea produces 75,000 tons (1987-1988: 58,000 tons). For the season 1987-1988, a shortage of 22,000 tons was observed. At least 30,000 tons can be imported (1987-1988): 22,500 tons. The production figures for the German and Danish Wadden Sea may be elucidative in this connection.

For the Wadden Sea, the potential for resource enhancement has been determined. There are no objections for ecological reasons to create new beds for musselculture in the easterly section. However, one of the conditions is that extension to this site has to be escorted by the research institutes for nature management and fishery investigations.

The first delivery of consumption mussels for the season 1987-1988 took place on July 1st. The mussel landings from the Dutch Wadden Sea were better than in the season 1986-1987, but still too low. This was not caused by less stormy weather, but by less harmful wind directions such as on June 6th. A lot of medium size mussels were already lost at the end of March. The difficulty for estimating the natural mortality in this area is that not only the action of biological factors play a role. Research in this direction is planned for the Eastern Scheldt area, starting from the planting of seed, vs re-seeding to the final catch for selling. The fishery on mussel seed in spring was also affected by the unfavourable wind effect in the intertidal zone. The fishery on small mussel seed in autumn shaped quite well. The consequences for the season 1988-1989 are not rated highly.

In October, a two-days mussel workshop has been held at the Nethertherlands Institute for Sea Research on the Isle of Texel. About 30 researchers from governmental and semi-governmental bodies joined in the five sessions and ultimate conversation. The program included the role of the mussel and the musselculture in the ecosystem of the Wadden Sea, but not the environmental impact. The other research experiences were all in a close relationship to eutrophication, development of other macro-zoobenthos, etc. A lot of scientists working on the Ecological Model for the Wadden Sea took part in the discussions with an expected spin-off to the decision-makers.

The cultured mussels have to share the place and food with other subtidal creatures, but it became clear that in the Wadden Sea, only 25 % of the available organic matter is decomposed by the macrobenthic fauna, 15 % by pelagic consumers, 50 % by pelagic micro-organisms and 10 % by the combined meiofauna/microfauna complex, inclusive anaerobic bacteria. Research on the bacterial biomass, adsorbed to detritus, may give a better outlook on the food budget of mussels.

Cerastoderma edule L.

The total fleet of cockle dredgers remained limited to 36 vessels because of maintaining an able-bodied fishery. This fishery was especially centred on the cockle habitats in the S.W. of The Netherlands. The effect of a complete turn-out was attained during the months of September, October and November, resulting in a harvest of 8,000 to 10,000 tons of meat (exact figures not yet available) or about 70,000 tons fresh weight.

Reports indicated that the stock of cockles in the Wadden Sea was hardly in the planning of the fishery. The depletion by the fishery and two successive strong winters has been too much for a reasonable exploitation. It is expected that the 1988-fishery can be scheduled again in the North.

The relaying of cockles in April, to areas where the outlook for ongrowing was better, did not came up to all expectations. The thinning out of dense populated cockle fields is of secondary importance, but it helps in the margin. The remaining cockles also come better in reach of a higher food supply. For this purpose, plots to a surface of 130 hm^2 are leased. The mortality rate in the relayed cockles must be reduced further by a better mechanical handling.

The catches in the Eastern Scheldt area are extended to the Delta foreshore waters. Here new sand and muddy shallows are developing as a consequence of alterations in the sedimentation and erosion balance by changing currents. During the last ten years, broad sandbanks have developed parallel to the coast as a result of the disappearance of strong ebb tidal currents, a.o. from the former sea-arm Grevelingen. The ebb stream in front of the Eastern Scheldt mouth has decreased by 20 %, so in that region a much slower development of the same phenomenon is expected. For some tidal channels, the conclusion has been drawn that they will be filled up with sediment till a new balance is reached.

Geomorphologic research is supporting the knowledge of the abiotic conditions for the biological processes in this region. Morphological calculations are going on, but the cockle explorers with a very modern and mobile fishing crafts are the first in gaining practical experience in chancing upon the niches with the more or less temporal invading bivalves in the so called "Voor Delta". They are keeping pace with the alterations induced by nature's whimsical behaviour.

In May, a start has been made with an exploration research survey in this area for mapping the cockles by using echo sounding and transit sonar scanning apparatus. Notwithstanding cockle beds were found with far more than 2,000 cockles per m^2, it became clear that, for this purpose, more advanced tracing systems must be found. Particularly, when further information to a depth of ten metres is needed.

There are several indications that the cockle banks in the foreshore waters are very important for the recruitment of cockle spat in the coastal waters like the Eastern Scheldt and Wadden Sea. These banks perhaps have even to be safeguarded of depletion. In spite of a high fishing effort, massive spatfalls continue. No delay or inhibition of the embryonic and larval development has been observed.

Molluscan shellfish toxicity

The delivery of mussels from several parts of the Wadden Sea to the auction at Yerseke, for further rewatering in the Eastern Scheldt and putting on sale for human consumption, has been banned during a period of about 6 weeks, from September 29th until November 11th, owing to the presence of diarrheic shellfish toxin, producing positive toxicity test results. This closed period was an ample week longer than the occurence (till November 2nd) of DSP, assessed by rat bioassay, in all sizes of mussels from shallow waters.

The agent responsible for the toxicity was Dinophysis acuminata. Samples were taken with nethauls of 60 litre water on a weekly basis in th Eastern Scheldt and Wadden Sea and analysed for the presence of toxic micro-algae. The maximun concentration of this dinoflagellate record was 30 cells per litre. Even low cell concentrations of Dinophysis acuminata are able to intoxicate mussels, if present over a sufficient length of time. Since October 19th, any presence is not observed. No bloom studies in the North Sea have been performed and no discoloured water has been reported.

The environmental conditions are noted as follows: Temperature range decreasing from 16 to 10 °C, oxygen saturated, salinity mixed 25-30 %. Stormy weather in the middle of October with Wind-force 9-10 SSE on October 15. This was not a good situation for species succession. The drop in temperature was delaying the release of the toxin from the biomass of the mussels.

Previous DSP inconvenient incidences: 1961, 1971, 1976, 1979, 1981 and 1986.

Diseases and pests

The last year allowed commercial transplanting of flat oysters from the Lake Grevelingen to the Eastern Scheldt basin has not been performed, due to shortness of oysters in the lake. On the Yerseke Bank, the formerly Bonamiasis infected area, only oysters could be checked for Bonamia ostreae, which are left behind from plantings in 1984 and 1985.

As the result of several observations, only one indication of a very low incidence of Bonamiasis could still be found in spring. The samples taken in autumn showed no Bonamiasis.

The oysters from the Lake Grevelingen have always been free of this infection. After a checking up on this disease at La Tremblade, these oysters are now also accepted for hatchery purposes.

The planning of transplanting young oysters spat from the Lake Grevelingen to the Eastern Scheldt basin is still in discussion. However, the situation is now that the factor Bonamiasis is even hardly playing a role in this question.

Molluscan shellfish sanitary control

In addition to the cultures-supporting environmental research, the micro-biological monitoring of the Zealand molluscan shellfish waters and their denizens up to the processing, are concentrated at the laboratories established in Yerseke, both governmental and private. A new pulse of action in the sanitary control was given by the co-operation in relations of causes and effects, when variances are observed. Also some landbased installations, more or less affecting the quality of the sea-water, are drawn into the sphere of the investigations.

Norway - Norvège

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

Chlamys islandica

Quantitative research-surveys of the distribution and biomass of the Icelandic scallop in the northern Barents Sea, and the waters surounding Jan Mayen, Bear Island and Spitsbergen were carried out by the University of Tromsö in conjunction with the Directorate of Fisheries (Institute of Marine Research, Bergen). The investigations conducted in 1987 were aimed at obtaining the optimal estimates of the stocks in the areas previously mapped in 1986. Underwater photography and dredge sampling were used as the major methods for stock assessment in the various fields examined. Calculations made in 1987 indicated that there were four main areas with harvestable amounts of scallops in the Svalbard zone and the Jan Mayea area; these resources were estimated at ca. 220 000 tons of scallop of a harvestable size. A mapping of the resources along the coast of northern Tromsö and western Finnmark was carried out, but did no fields that were not previously registered, were identified.

In order to elucidate the population structure of Icelandic scallop, the genetic variation within and between stocks along the coast of northern Norway, and in the water around Jan Mayen, Spitsbergen and Bear Island are being studied by the University of Oslo in conjunction with the University of Tromsö, by means of enzyme electrophoresis. Preliminary results indicate that despite the potential for extensive gene flow, there is significant differences in allege frequency among the stocks within the different geographic areas.

Todarodes sagitatus

Two cruises were carried out by the University of Tromsö to examine the acoustic characteristics of the European flying squid (Todarodes sagitatus) in northern Norway. Samples of stomach content were also taken. The results from these cruises have provided a preliminary estimate of this squid's target strength as varying from -50 to -35 dB when using a calibrated echosounder of 38 kHz.

Ostrea edulis

Experiments with growth and mortality of oysters on the Skagerrak coast were continued during 1987. Hydrographic conditions in potential oyster polls were studied in the same region.

Mytilus edulis

Field experiments involving lowering blue mussels below the pycnocline for cleansing of diarrheic shellfish poison were concluded. Monitoring af algae, possibly containing toxins, were performed throughout the year. Veterinary authorities monitored the PSP from March to August. Warnings had to be given in May. DSP and other toxins were monitored by mouse bioassay. The content of DSP phohibited sale of mussles thoughout most of the year, especially the area between the Skagerrak and the Sognefjord.

Poland - Pologne

(Anna Garbacik-Wesolowska)

Biology as well as stock assessments of species of squid such as Illex argentinus and Loligo gahi were studied off Patagonian and Falkland waters. Bio-statistical data were collected since the month of january in the frame work of a special scientific cruise in collaboration with British Scientists which is now being organized in the Falkland 150 miles zone (May-October 1988). Other cruises on ommastrephid squids are planned for supplying the fishery and will also be submitted to ICES at a later date.

Portugal

(A. Cascalho & M.J. Figueiredo)

Spisula solida

(1) Studies were carried out on the dynamics of the populations in Espinho area (Portuguese west coast).

Cerastoderma edule

(1) Studies were carried out on the dynamics of the populations in Ria de Aveiro (Portuguese west coast). (2) Studies were carried out on the population dynamics of Cerastoderma spp. in several lagunary systems of the south western part of Portugal (biometry, trophic level and biomass variation.)

Commercial valuable litoral bivalvia of the south coast

(1) Studies were carried out on the distribution, abundance and biological characteristics of Ensis siliqua, Pharus legumen, Spisula solida and Denus triatula in the region of Algarve.

(2) The studies on the population dynamics and life cycle of Spisula solida, Solen marginatus, Cerastoderma edule and Ruditapes decussatus from Ria Formosa, were concluded.

Scrobicularia plana

(2) Studies were carried out on the population dynamics of Scrobicularia plana in the estuaries of the rivers Mira and Tagus: distribution, abundance, population structure and temporal variations (west coast of Portugal). (3) Distribution, systematics and ecological studies on the molluscs of the estuary of the river Mondego were concluded, including results on the biology of a population of the species Scrobicularia plana.

Octopus vulgaris

(2) The studies on modelling the life cycle of this species on the Portuguese south coast, were concluded.

Sepia officinalis

(2) Studies on the life cycle of this species and its aquaculture potentialities were carried out in the coastal lagoon Ria Formosa (Portuguese south coast).

Patella spp.

(4) Limpets are heavily exploited in the Azores and the stocks have been diminishing despite of regulations followed by our recommendations to the regional government. The lack of fiscalization is a serious problem. Assessment studies have been continued on several islands as well as studies on growth and reproduction on islands of the central group. In October, a study of the limpets on the island of Flores in the western group, was carried out.

Loligo forbesi

(4) Adult females have been caught and kept in captivity for spawning. Eggs produced from these have been sent alive to Marine Biomedical Institute, University of Texas, for experiments and cultivation. Studies of behaviour of adult males and females in captivity have been conducted as well as studies on embryonic development.

Tapes decussatus

(4) Ecological studies on the only natural population of this species in the Azores, from Santo Cristo Lagoon, have been continued. An experiment on transplanting shells from S. Jorge to S. Pedro Lagoon at Lajes (Pico Island), has been carried out and is followed up with growth studies.

(1) Instituto Nacional de Investigaçao das Pescas (INIP)
(2) Faculty of Sciences (Lisboa) Guia laboratory
(3) University of Coimbra - Zoological Museum and Laboratory
(4) University of the Azoves (Horta) - Department of Oceanography and Fisheries.

Spain - Espagne

(M. Torre & A. Perez-Camacho)

During the year 1987, the natural stocks of cockles (C. edule) were studied in N. Spain.

The nutrition of larvae and spat of oyster. (O. edulis) and two species of clams (V. decussata and V. semidecussata) as well as the effet of phytoplanktonic composition on the larval and spat survival were studied.

Experiences on natural settlement on collectors, of pectinidae and oysters, and on the ongrowing of the spat so obtained were monitored.

Research was conducted on the biochemical composition and oxygen consumption of mussels (M. edulis) and the energetics of oyster (O. edulis), mussel (medulis) and cockle (C. edule).

The systematics, biology, ecology and fisheries of Cephalopoda were studied.

The pathology of cultured mussels continued to be investigated in Galicia (N.W. Spain).

The genetical characteristics and productive characteristics in the flat oyster and mussel were also studied.

Sweden - Suède

(H. Hallback)

Mytilus edulis

There are still problems with toxin from Dinophysis. About 2,500 tons of Mytilus were landed during last season.

United Kingdom - Royaume Uni

1. England and Wales

(R.C.A. Bannister)

Pecten maximus L.

Dredge surveys were undertaken off Sussex (VIId) and in the Irish Sea (VIIa). Further hydroid samples were collected for settlement studies, and more development work with the epibenthos sampler was undertaken. Age determination and growth studies were begun in VIIa and VIIe.

Ostrea edulis L.

The annual grab survey of adult stock in the Solent (VIId) continued. Solent oyster larvae were again surveyed and further observations made of fecundity and larvae lipid levels. Spatfall monitoring using tiles continued.

Monitoring of the disease Bonamia ostreae continued. No new areas of infection were identified. Cultivation had continued in infected areas at a low level of production. Strict adherence to the Ministry Code of Practice has enabled some production to be maintained except in one area in VIId.

Cerastoderma edule L.

The annual quadrat survey of stocks in the Burry Inlet, Wales (VIIf) was undertaken. In the Wash (IVc), survival and growth of 1986 and 1987 spatfalls was monitored in a study area subjected to suction dredging.

Mytilus edulis L..

Further surveys of intertidal stocks were undertaken using quadrat surveys in conjunction with aerial photography.

United Kingdom - Royaume Uni

2. Scotland

(J. Mason)

Pecten maximus and Chlamys opercularis

Monitoring of the major scallop (Pecten maximus) and queen (Chlamys opercularis) fisheries continued. Scottish landings of scallops and queens remained around 4000 and 3000 tonnes respectively. There was little change in catch per unit effort (CPUE) for either species from any of the main fisheries and pre-recruit dredge surveys by FRV "Goldseeker" in three major west coast fishing areas indicated recent improved recruitment for scallops.

The study of settlement of both species on artifical collectors continued on the west coast and settlement of queens was heavier than that of scallops. Nineteen eighty seven was generally a good year for settlement of both species, although there was much variation in numbers from place to place. Settlement of scallops was again heavier in the north west sea lochs than in the west of Kintyre and Clyde Sea areas respectively. The studies will continue in an attempt to establish a relationship between settlement of both species on artificial collectors and their future recruitment to the fisheries.

During May 1986, time lapse photography was used to study the movement and behaviour of "0" group scallops for 21 hours after being placed on the sea bed in Loch Ardvar. The scallops moved in a preferred direction of 150° (significance 5%) which was apparently unrelated to light or tidal movements. Only one of the 18 animals studied recessed during the period of observation. In a similar experiment carried out during December 1986, there was no significant preferred direction of movement but 17 scallops out of the 24 observed had recessed in 21 hours.

Squids

Studies were carried out in collaboration with the Zoology Department of Aberdeen University. The growth and population structure of Loligo forbesi from different areas was studied.

Pests and diseases of molluscs

Examination and certification of bivalve molluscs in connection with imports and exports has continued. Mussel samples were taken at a number of east and west coast sites during the summer for examination for PSP. No dangerous level of toxin was detected in any of the samples from Scotland.

Registration of shellfish farms under the Registration of Fish Farming and Shellfish Farming Businesses Order 1985 was continued. Some 168 farms have been registered with the Department of Agriculture and Fisheries of Scotland. Visits were paid to farms in order to take samples and establish their status as regards pests and diseases.

Anti-fouling and molluscs

Investigations were made into the effects to TBT in anti-foulant paints on the settlement and growth of oysters and mussels.

United States of America - Etats Unis d'Amérique

(S.A. Murawski)

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 epibenthic bivalves and squids. Summer surveys were also completed in the same region for scallops (sea scallop = Placopecten magellanicus, and Icelandic scallop = Chlamys islandica). State agencies, i.e. those of Massachusetts, Rhode Island and Connecticut conducted inshore bottom trawl surveys which provided data for mollusc species. NEFC personnel continued development of aging techniques for sea scallop, and conducted route ageing of surf clam and ocean quahog.

A multispecies study of the effects of bivalve dredging practices and culling (=discarding) of sea scallop, surf clam = Spisula solidissima, and ocean quahog = Arctica islandica, was completed by NEFC researchers. These studies utilized research submersibles in conjunction with commercial fishing operations to document the impacts of sea scallop and hydraulic clam dredges, as well as the mortality rates induced by discarding to meet minimum size regulations. In situ survival experiments were undertaken coicident with dredge path analysis.

Inventories of bivalve resources were either completed or are currently ongoing in several states (Maine, Rhode Island, Connecticut, New York, New Jersey, Maryland, Delaware, Virginia, South Carolina, Georgia). These estuarine inventories have focused primarily on hard clam, Mercenaria mercenaria, soft-shell clam, Mya arenaria, and American oyster: Crassostrea virginica. Aspects of these monitoring programs include abundance, distribution, disease prevalence, size composition, and augmentation of natural populations through stocking and transplanting.

American Oyster (Crassostrea virginica)

Much of the ongoing research on natural populations of American oyster relates to the prevalence and effects of the halosporidian pathogen MSX. Researchers at Rutgers University and with the State of Delaware have been studying this problem in Delaware Bay, an area significantly impacted by the disease. An innovative program conducted by researchers at Rutgers University seeks to (1) improve and evaluate the genetic robustness of MSX-resistant strains of American oyster in laboratory culture, (2) propagate significant quantities of these resistant oysters and (3) construct a 3-dimensional model of Delaware Bay, so as to maximize the potential for incorporating disease resistance in wild populations by stocking cultured oysters in areas that would result in retainment of their larvae. Studies on pathology, depuration, and acquired immunity are also ongoing at the Virginia Institute of Marine Sciences.

Sea scallop (Placopecten magellanicus)

Stock assessments were produced for Mid-Atlantic, Georges Bank and Gulf of Maine populations, based on research vessel survey and commercial sampling data. Submersible studies concentrated on the effects of dredging and culling practices, and a project conducted by the State of Maine evaluated scallop bed ecology and micro-scale distribution and abundance of scallops. A cooperative project between industry, NMFS and the Virginia Institute of Marine Sciences was undertaken to evaluate seasonal changes in meat weight, reproductive condition and size composition of landings in the Mid-Atlantic Bight. The results of these ongoing studies will be of critical importance in evaluating management options with the current system based on maximum meat counts (number of scallop adductor muscles per pound of landed meat). Bioeconomic studies of the USA fisheries were initiated by NEFC.

Bay scallop (Argopecten irradians)

Several state agencies continued monitoring work (Rhode Island, New York, North Carolina) to evaluate trends in abundance, size composition and survival. The state of Rhode Island instituted a study to perform histological examinations of gonad development and gamete transport in coastal ponds to ascertain differences in spawning patterns and strategies. The effects of brown algae blooms in Long Island Sound New York, on the survival and distribution of bay scallop were evaluated by New York state fishery researchers.

Hard Clam (Mercenaria mercenaria)

A major research initiative on hard clam recruitment and growth in Long Island Sound was continued by researchers at NEFC, the University of Connecticut, and other institutions. This series of projects seeks to identify the relative impacts of marine contamination and exploitation in determining hard clam year class strength. A series of studies (population biology, transplant studies, biochemistry, plankton monitoring) are conducted at various stations along a strong pollution gradient from western to eastern Long Island Sound. Researchers at Rutgers University have initiated a study of the utility of hard clam "spawner sanctuaries" for maintaining spawning stock biomass and hopefully contributing to increased recruitment rates. State of New York researchers completed a project aimed at monitoring the site-specific population dynamics and locating areas that appear to exhibit strong recruitment over relatively long time periods. The South Carolina Wildlife and Marine Resources Department has maintained an active research program including genetics, growth and reproductive biology, in cooperation with Clemson University and other academic institutions. The state of Georgia completed a project evaluating comparative population dynamics (growth, survival, recruitment) in representative coastal areas throughout the state. A project conducted in Narragansett Bay (Rhode Island) by investigators at NEFC, the University of Rhode Island and the University of Florida evaluated comparative growth rates, periodicity of internal shell banding, and geochemical aspects of shell microstructure.

Ocean Quahog (Arctica islandica)

Aspects of the life history and population biology of ocean quahog was investigated by researchers at Maine DMR and the University of Maine, NEFC, Rutgers University and Virginia Institute of Marine Science. Age validation studies continued, based on mark-recapture studies of individuals off New Jersey and New York.

Surf Clam (Spisula solidissima)

A simulation study of the potential effects of constant catch policies on surf clam stock size, catch and fishing mortality was initiated by NEFC investigators. CPUE, catch and size/age composition of surf clam landings was monitored by NEFC scientists. NEFC researchers have been conducting a field-oriented study of the effects of heavy metals on the survival of post-settlement sizes of a number of benthic invertebrate species including surf clam. Bioeconomic modeling studies were continued at the University of Delaware and the Virginia Institute of Marine Sciences.

Soft-shell Clam (Mya arenaria)

Studies of survival, growth and reproductive biology continued at the University of Connecticut. The State of Maryland initiated a project to assess the pathogenicity of a Neoplasia disease in Chesapeake Bay.

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

NEFC personnel continued biological and stock assessment related research and completed a project examining seasonal occurences of squids and butterfish in relation to environmental variables (temperature and depth). The latter project evaluated the seasonal aggregation patterns of the squids and butterfish in relation to fishable concentrations, and the potential to minimize by-catch, by manipulating the seasonal distribution of fishing effort. Stock assessment studies were also directed at the development of alternative measures of abundance based on presence/absence in survey trawl tows as an alternative to continuous measures. These alternative statistics proved more robust then traditional calculations in predicting commercial fishery performance.

USSR - URSS

(S. Studenetsky)

In 1987, the Soviet investigations on commerical molluscs carried out in the Barents and Norvegian Seas and off Spitsbergen (Subarea I, Divs. IIa, IIb) were predominantly directed to the studying of stocks, regularities of distribution and biological peculiarities of squids (Todarodes sagittatus and Gonatus fabricii) as well as of the Icelandic scallop (Chlamys islandicus).

Chlamys islandicus

The iceland scallop investigations in the Barents Sea and off Spitsbergen took place in May, July and September. With the aim of studying commercial invertebrates, five special research cruises were made, a total of 21 962 specimens of scallops were examined.

Squids

During the same cruises, 1 943 specimens of squid were examined. Minor concentrations of Todarodes sagittatus were observed off the Northern Norway coast in September-October.

OTHER TAXA

Canada

Région du Québec

Ascophyllum nodosum

Les travaux visant à déterminer la stratégie de coupe (hauteur et fréquence) permettant de maximiser la récolte d'A. nodosum se sont poursuivis en 1987 sur la rive sud de l'estuaire du fleuve Saint-Laurent. L'exploitation de cette espèce a débuté en 1987 sur une base expérimentale.

Iceland - Islande

Studies were continued on two species of sea-urchins (Strongylocentrotus droebachiensis and Echinus esculentus). Main emphasis has been on seasonal and areal variations in the filling of gonads with a potential export market in mind.