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SHELLFISH COMMITTEE

COMITÉ DES CRUSTACÉS ET MOLLUSQUES

by par

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FOREWORD

Input on research and assessment activities was provided this year by all member countries participating to Shellfish Committee Activities. Survey activities of crustacean and molluscs populations have taken a great importance in all countries.

After trying and developing models such as surplus production, yield per recruit and virtual population analysis, there is now a tendency to return to more simple approaches such as the monitoring of fishable biomasses and landings. There is also a growing interest in experimental approaches such as introduction of pectinid spat on new grounds, introduction of postlarval lobsters on new grounds and subsequent monitoring of the effects of predation and density dependent growth and mortality. Information on such experiments is now fully available for oysters and mussels. The effects of diseases, parasites, and pollution are well documented experimentally.

A second generation of models based on experimental results and life history observations rather than a priori logical concepts is emerging. Multispecies spatial variability and environmental parameters are now being introduced for modelling shellfish stocks.

Experiments on the technology of survey methods are conducted using approaches such as aerial photography for estimates of efforts, underwater photography and television from sledges for biomass estimates. New statistical techniques for processing such unconventional transect are being developed (spline approximation, kriging) and may challenge such well established concepts as random and stratified sampling.

There is a regain of interest for squids and for scallops. These interests have motivated requests for the creation of two working groups which should integrate new knowledge on life histories and environmental effects with new modelling and assessment techniques in order to provide improved management advice.

Shellfish research may take a leading role in future advances of fisheries biology.

PRÉAMBULE

Tous les pays membres participant aux activités du Comité des crustacés et Mollusques ont fourni des informations cette année. Les activités d'estimations directes de populations de crustacés et mollusques ont pris une grande importance dans tous les pays.

Après une étape d'essai et de développement de modèles tels que ceux de production excédentaire, de rendement par recrue ou d'analyse des populations virtuelles, il se dessine maintenant une tendance au retour à des approches plus simples, telles que le suivi des biomasses pêchables et des débarquements. Il y a également un intérêt grandissant pour des approches expérimentales telles que l'introduction de nassain de pectinides ou de postlarves de homards sur de nouveaux fonds de pêche, et le suivi ultérieur des effets de la prédation et de la densité sur la croissance et la mortalité. L'information sur de telles expériences est déjà très complète pour les huîtres et les moules. Les effets de maladies, de parasites et de la pollution sont bien documentés expérimentalement.

Une deuxième génération de modèles basés sur des résultats expérimentaux et des observations de cycle de vie, plutôt que sur des concepts logiques définis à priori, apparaît. Des paramètres relatifs aux effets entre espèces, à la variabilité spatiale, et à l'environnement sont maintenant introduits dans la modélisation des stocks de mollusques et de crustacés.

Des expériences de technologie pour l'estimation directe de l'effort de pêche (reconnaissance aérienne) ou de la biomasse (photographie et télévision sous-marine à partir de traineaux) sont en cours dans nombre de pays. De nouvelles techniques permettant le traitement de ces données peu conventionnelles provenant de radiales sont à l'essai (approximation par spline, kriging) et sont susceptibles de remettre en cause des concepts aussi traditionnels que l'échantillonnage aléatoire et l'échantillonnage stratifié.

Il y a un regain d'intérêt pour l'étude des calmars et des pétoncles. Cet intérêt a suscité des demandes pour la création de deux groupes de travail, qui devraient intégrer les nouvelles reconnaissances sur les cycles de vie, les effets de l'environnement et les nouvelles techniques mathématiques pour modéliser l'évolution d'une population et estimer la taille d'un stock, et permettre par suite de meilleurs conseils pour la gestion des stocks.

La recherche sur les mollusques et les crustacés peut prendre un rôle moteur pour les progrès futures en biologie des pêches.

CRUSTACEA

Belgium - Belgique

(F. Redant)

Crangon crangon

Biannual sampling (in spring and autumn) of the brown shrimp stock and its predators and competitors in the Belgian coastal waters was continued in 1986. Samplings consisted of 15 minutes' hauls with a small meshed beam trawl on about 35 fixed stations. The investigations included qualitative and quantitative analyses of the epibenthic and demersal fauna, and measurements of the length composition of the shrimp stock.

A study on long term changes in the exploitation pattern of the Belgian brown shrimp fishery, covering the period 1967-1986, was started. These investigations, which are intended to continue in 1987, included the assessment of long term trends in catches, effort and cpue, and their relationship with physical, biological, technical and economic parameters.

Nephrops norvegicus

The sampling of commercial Nephrops landings was continued in order to monitor possible long term changes in the catch composition and the exploitation pattern of the Norway lobster stock in the Central North Sea (Botney Gut - Silver Pit stock). Up to 1986 no major changes in the average length composition of the landings could be detected, except for the "smalls", whose average length appeared to have decreased by about 3 mm carapace length.

A preliminary study, covering a one year period, on the reproductive cycle of female Nephrops and on the seasonal behaviour pattern of both male and female Nephrops was completed in March 1986. The results of these investigations are to be confirmed by a complementary series of observations which will continue until mid-1988.

Canada

(G.P. Ennis)

Homarus americanus

Studies on the ecology of lobster larvae have shown that Stage I larvae were most frequently caught between 15 m and 30 m depths during daylight but were rarely caught below 10 m at night. Stage II larvae were more scarce than Stage I larvae but appeared to have a similar day-night pattern. Stage IV larvae were caught almost entirely at the surface, both day and night. Stage III were rarely caught; the few

captured were distributed throughout the upper 20 m of the water column. These findings have important implications for both the ecology and dispersion of the larval forms and stock-recruitment relationships.

Lobster habitat studies included a 2000 km diving survey of Nova Scotia's eastern and southern shores using a point transect system. This is an area which has recently recovered from sea urchin overgrazing of seaweeds. Mass mortalities of urchins, caused by an amoeba, occurred along the entire shore. About 270,000 t of urchins were killed. The pathogen is still active but much reduced from the early 1980's.

An anticipated increase in the harvest of the intertidal macroalga Ascophyllum nodosum (rockweed) precipitated a study to assess the physical relationship between commercially important crustaceans and finfish. Lobster and commercial crab were rare in the intertidal. Most finfish captured were small (less than or equal to 15 cm) and of no commercial value (e.g. sculpin, cunner, tomcod). The few commercial species observed (e.g. pollock and winter flounder) occurred in low densities and hence were of low commercial value.

A long-term ecological study of juvenile lobster on Nova Scotia's southern shore has shown that although the average density of juvenile lobsters has declined over the past year, the mean lobster size has not decreased. A tagging study of juvenile lobsters yielded a 20% mortality rate induced by the tagging technique.

Data from a tagging study along the edge of the Scotian Shelf give the first evidence that some lobster undertake annual long-distance return migrations which return the lobster to specific sections on the Shelf. Movements of individual lobster were followed through the use of multiple recaptures of tagged animals. One lobster was captured 152 km from the initial release site after three months at large, but returned to within 12 km of the initial release site after migrating a total distance of at least 248 km in two months.

Extensive tagging of lobsters was conducted in Cape Breton (Nova Scotia), Baie des Chaleurs (New Brunswick and St. John Bay (Newfoundland)). These series of tagging are part of a general survey of short- and long-term patterns in movements of lobsters in the Gulf of St. Lawrence. The information on recaptures is also used for growth and mortality studies.

At sea sampling of commercial lobster catch is conducted from Baie des Chaleurs to the Labrador coast. The information is used for providing management advice for local adjustments in fishery regulations.

Detailed surveys on relative performance of several mechanisms designed for allowing the escape of lobsters smaller than the minimum legal size, were conducted in New Brunswick and Prince Edward Island. A computer model was designed for forecasting the performance (retention of lobsters of commercial size vs escape of lobsters smaller than the minimum legal size) of escape mechanisms of any gap width and therefore the best option for a gap width as a function of minimum legal size.

Underwater television and diving observations on behavior of lobsters entering traps provided complementary information on daily rhythms in foraging activity of lobsters and competitors and on the efficiency of gear.

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

L'analyse des statistiques de débarquement et des journaux de bord remplis volontairement par les pêcheurs des Îles-de-la-Madeleine a permis d'évaluer l'état du stock. Une étude sur l'influence de la température de l'eau sur les mouvements du homard sera entreprise afin de pouvoir corriger les taux de capture en fonction de la capturabilité.

Des expériences de marquage magnétique ont été entreprises afin d'obtenir une estimation de population et une évaluation des migrations de deux stocks de homard en Gaspésie et à l'Île d'Anticosti.

Pandalus borealis

Annual research surveys using bottom trawls were carried out in May and October on the Scotian Shelf. Biomass estimates show only a modest recovery from the observed minimum seen in 1985. The abundance of finfish observed in the same surveys did not show significant change over previous years, with the exception of an unprecedented abundance of silver hake in the spring survey. Larval samples were again collected in conjunction with the spring survey.

Logbook records from fishermen and detailed observer reports provided the data on the shrimp fishery off coastal Labrador in 1986. TAC's were taken in both the Hopedale and Cartwright Channels for the first time since the fishery began in the late 1970's due to a substantial increase in fishing effort. A research cruise was conducted in Divisions 2HJ3K from July 29 to August 13 during which Hopedale (Division 2H) and Cartwright (Division 2J) Channels were surveyed extensively. Data obtained from both research and commercial fishing are being analyzed for resource assessment. Several stations also were fished in Hawke Channel (Division 2J) and St. Anthony Channel (Division 3K) but shrimp catches generally were low.

Des recherches se sont poursuivies en vue d'évaluer l'intégrité des unités de gestion présentement utilisées pour cette espèce dans le golfe du Saint-Laurent. Des expériences, portant sur la mesure de la variation génétique entre des concentrations de crevettes effectuée par focalisation isoélectrique de protéines et par une technique de génie génétique, indiquent une certaine hétérogénéité à l'intérieur du Golfe malgré des distances génétiques faibles entre les concentrations étudiées.

Des échantillonnages ont été effectués dans le nord-ouest du Golfe afin de cerner la distribution spatio-temporelle des larves. Ces échantillonnages s'inscrivent dans le cadre d'un projet à long terme visant à identifier les zones de production larvaire et à évaluer les relations existant entre les différentes concentrations de crevettes exploitées commercialement.

L'état de la ressource pour les cinq unités de gestion du Golfe a été évaluée à partir des données obtenues de l'exploitation commerciale. Les journaux de bord obtenus des pêcheurs et les échantillons des captures commerciales ont été analysés en vue de comparer la saison de pêche 1986 avec les saisons antérieures.

Chionoecetes opilio

In the Newfoundland fishery, sampling of commercial catches continued. Catch and CPUE data for the various management areas were analyzed and biomass estimates based on 1985 data derived. Landings have declined dramatically in the southern zone apparently because of sustained recruitment failure since 1982. In 1982 there was a sharp reduction in the level of molting activity in the population that has persisted and appears to be related to lower bottom temperatures throughout the area over this period. CPUE in some areas increased over 1986 levels due to a late season (1985) molt of pre-recruits into the commercial fishery. Studies of various aspects of molting and egg development were continued. A breeding migration of snow crab into shallow water during April-May was discovered in Bonne Bay on the west coast of Newfoundland in 1982. Research aimed at fully documenting behavioral, ecological and biological aspects of the phenomenon continued during the 1986 migration.

Catch and effort trends for Gulf of St Lawrence inshore fisheries off western Newfoundland, western Cape Breton Island, northern Prince Edward Island and the off-shore fishery in the southwestern Gulf were monitored and used in Leslie analyses to determine biomass and exploitation levels for each area. Sea sampling and port sampling programs were supplemented by trawl and camera surveys to estimate distributions and other biological parameters of the Gulf's snow crab populations. An aerial survey of fishing effort was performed for the northern Prince Edward Island inshore fishery. All of the Gulf fisheries appear to have reached or exceeded their maximum sustainable levels of fishing effort. Effort may need to be decreased in some areas to maintain the long-term viability of the stocks. The opportunity of modifying management policies as a result of recent advances in the knowledge of the maturation and reproductive processes of snow crab (terminal molt at maturity) is being considered.

Studies were conducted on molt stage determination based on setal morphogenesis and also on integumental development. Studies on functional and morphometric maturity using a bivariate discriminant technique were completed. Tagging surveys using T-bar tags were continued in the Prince Edward Island fishery to determine movement of crabs in this area. Monitoring of short-term movements of crab were continued in Bonne Bay by using biotelemetry. A geostatistical technique for biomass analyses was developed.

Une évaluation de l'état des stocks de crabe des neiges de l'estuaire et du nord du golfe du Saint-Laurent a été produite à partir d'une analyse des statistiques de pêche et des journaux de bord des pêcheurs.

Du marquage magnétique a été fait pour une troisième année consécutive dans l'Estuaire et une analyse globale est en cours. Une nouvelle expérience de marquage débutera sur la Basse Côte-nord.

Deux relevés expérimentaux sur les juvéniles de crabe ont été effectués et l'analyse des résultats est en cours.

Denmark - Danemark

(NO REPORT ON CRUSTACEA)

France

(A. Charuau)

Cancer pagurus

Le suivi des apports et des captures des caseyeurs français travaillant en Manche et en Iroise a été poursuivi.

Une expérience de marquage-recapture a été entreprise sur les migrations de tourteau dans la Manche. En contrepartie les données obtenues sont insuffisantes en quantité pour établir un schéma de croissance.

Suite au constat de mortalités anormales sur des tourteaux récemment pêchés, des recherches d'agent pathogène ont abouti à l'identification d'un parasite dinoflagellé du genre Hematodinium. Un suivi épidémiologique est engagé. Un parasite appartenant au même genre a été trouvé sur l'étrille Macropipus puber et serait responsable de mortalités importantes sur cette espèce en milieu naturel.

Homarus gammarus

Le programme d'aquaculture extensive et repeuplement visant à déterminer le taux de survie de homards juvéniles nés en éclosérie puis remis dans le milieu naturel (après marquage magnétique) a été poursuivi.

La dernière tranche d'immersion a porté sur 5 785 individus; elle solde la première partie du programme et porte à 22 620 le nombre total d'individus marqués ré-immergés sur les secteurs témoins du sud de Houat et du sud de Belle-Ile.

La mortalité au marquage est voisine de zéro et le taux de perte des marques déterminé en laboratoire sur un lot témoin est de 10% en six mois.

Les tests effectués sur le détecteur mis au point par l'équipe du laboratoire de géomagnétisme de Jussieu ont permis de qualifier ce matériel, qui s'avère plus sensible et moins cher que son équivalent américain. Le recours à la radiographie par rayons X apporte en complément les informations sur la validité de la détection et sur la localisation de la marque.

Une enquête cadre sur la distribution spatio-temporelle et sur la composition en taille des captures a été conduite sur le secteur allant de Kerrock-Lomener à Houat. Elle servira de base à la définition de la stratégie d'échantillonnage à mettre en oeuvre en 1987 et 1988 pour évaluer le taux de recapture des homards marqués. L'effort de pêche, en terme de nombre de jours de mer, et les apports réalisés ont ainsi

été évalués. Toutefois, l'insuffisance du réseau mis en place et la nécessité de le renforcer dès 1987 sont apparus nettement.

Les essais d'élevage communautaire de juvéniles ont été développés pour améliorer le taux de croissance, et la rusticité, et abaisser les coûts de production unitaires.

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 dragage (sans caméra vidéo).

Cette espèce a servi de modèle pour valider une méthode de détermination de l'âge d'une carapace (temps écoulé depuis la dernière mue) à partir des radio-isotopes naturels Radium 228 et Thorium 228.

Nephrops norvegicus

Les échantillonnages concernant la langoustine ont couvert les pêcheries exploitées par les langoustiniers français dans le Golfe de Gascogne, en Mer Celtique et sur la pêcherie du Banc Porcupine à l'ouest de l'Irlande.

Le taux d'échantillonnage a été basé sur le principe d'un échantillon par mois, par port principal et par pêcherie. La couverture statistique en production et en effort est effectuée par l'intermédiaire des livres de bord communautaires.

Le fait marquant concernant ces pêcheries est surtout l'introduction des nouveaux maillages en accord avec l'augmentation préconisée par la CEE avec cependant pour certaines flottilles anciennes du Golfe de Gascogne un sursis dans l'application de la réglementation. Un suivi est effectué pour apprécier les conséquences de ces augmentations de maillages sur la composition des captures.

Federal Republic of Germany République Fédérale d'Allemagne

(K. Tiews)

Crangon crangon

In order to determine abundance indices for fish and crustaceans of commercial and non-commercial importance occurring on the shrimp fishing grounds by-catch samples of the German brown shrimp fishery were analyzed at the by-catch samples of the Institut für Küsten- und Binnenfischerei der Bundesforschungsanstalt für Fischerei in a conti-

nuing effort which was started in 1954. Year-class strenghts of important fish and crustacean species were determined and the loss of shrimp stock caused by predation calculated.

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

Iceland - Islande

(H. Eiriksson and I. Hallgrímsson)

Nephrops norvegicus

Two research vessel surveys were carried out during the Nephrops season (May-July). These included further observations on Nephrops gear and behaviour by a submersible video unit that was initiated in 1985.

Landings of Norway lobster amounted to approximately 2.530 m. tons, compared with 2.385 tons in 1985. Average cpue remained very high or 61 kg per trawling hour as compared to 56 kg/hour in 1985. The last two seasons seem to have benefited from increased recruitment as compared to the previous years 1983-1984.

In accordance with stock assessment a TAC of 2.700 m tons has been proposed for 1987. One Nephrops survey is planned for May-June 1987.

Pandalus borealis

Research vesel surveys were carried out as usual for sampling P. borealis and obtaining information on bycatch in the inshore areas. Moreover stock assessments have been made, using area swept for many inshore areas.

The effort in the offshore fishery increased tremendously in 1986. As the trawls varied greatly in size in this fishery catch per trawling hour was transformed into CPUE by complicated calculations based on the comparison of all trawl-sizes used in the offshore areas. The CPUE was 88 kg in 1986 against 93 kg in 1985 for the Northwest areas and 125 kg in 1986 for the Northeast areas, most of which were new to the fishery.

In 1987 research will be carried out along similar lines as before. In addition stock assessment based on area swept is planned for the offshore areas.

Ireland - Irlande

(J.P. Hillis)

Nephrops norvegicus

Sampling of catch, landings and discards in the Irish Sea Division VIIa, and on the Porcupine Bank Divisions VIIc and VIIk, continued with increased emphasis on the later area. Work was also undertaken to computerise the data, including the calculation of total numbers of each length-group caught (marketed whole and as tails) and discarded.

Cruises to recapture Nephrops marked internally with binary-coded magnetic were tags in 1985 yielded meagre results, so those marked in 1986 were rendered externally recognisable by having the rostrum amputated, a condition seen occasionally in the catch and one which appears to cause little disadvantage to the individual. It is planned to advertise a reward scheme to recover marked individuals from the processing and fishing industries.

Experiments comparing the catches obtained with Nephrops trawls of 60 mm and 70 mm mesh were conducted during the winter of 1985-86 and summer of 1986. These gave somewhat differing results, the former indicating the catch of marketable Nephrops blamed by the 70 mm trawl as being around 60% of that obtained by the 60 mm trawl by weight, whilst the summer 1986 experiment indicated the value as being about 83%.

Liocarcinus puber

The Shellfish research laboratory, University College Galway undertook some stock assessment studies.

Homarus gammarus

No work to report

Numbers sampled were as follows:

Division	Quarter	# samples	Sex	Catch	Landings	Discards	Total
VIIa	1	2	Male	681	445	345	1471
			Female	476	197	303	976
			Unsexed	-	-	-	-
			Total	1157	642	648	2447
	2	10	Male	1317	721	526	2564
			Female	1125	179	589	1893
			Unsexed	-	2321	-	2321
			Total	2442	3221	1115	6778
	3	6	Male	1129	241	709	2079
			Female	1236	185	1060	2481
			Unsexed	-	1298	-	1298
			Total	2365	1724	1769	5858
	4	5	Male	843	453	239	1535
			Female	710	135	364	1209
			Unsexed	-	591	-	591
			Total	1553	1179	603	3335
	Total	23	Male	3970	1860	1829	7659
			Female	3547	696	2316	6559
			Unsexed	-	4210	-	4210
			Total	7517	6766	4145	18428
VIIc/k	2	6	Male	1211	-	-	1211
			Female	1767	-	-	1761
			Unsexed	-	-	-	-
			Total	2978	-	-	2978
	3	7	Male	1188	297	-	1485
			Female	1113	132	-	1245
			Unsexed	-	-	12	12
			Total	2301	429	12	2742
	Total	13	Male	2399	297	-	2696
			Female	2880	132	-	3012
			Unsexed	-	-	12	12
			Total	5279	429	12	5720
VIIb	Total	4	Male	371	173	-	544
			Female	460	182	-	642
			Unsexed	-	-	209	209
			Total	831	355	209	1395
Overall	Total	40	Male	6740	2330	1829	10899
			Female	6887	1010	2316	10213
			Unsexed	-	4210	221	4431
			Total	13627	7550	4366	25543

The Netherlands
Les Pays Bas

(R. Boddeke)

Crangon crangon

During the regular surveys carried out as usual in March, June and September along the Netherlands west coast, special attention was paid to Portunus holsatus as a possible predator of Crangon. Extensive stomach research and aquarium experiments have clearly showed the relevance of this species as a predator of C. crangon. The results will be published in 1987.

The relation between the numbers of ripe eggs in spring and the stock of consumption shrimps in summer-autumn that existed during 1978-1984, disappeared in 1985 and 1986 most probably due to the lower mortality during winter by the rapidly declining cod stock in the North Sea.

The monthly sampling of consumption shrimps in all important shrimp harbours continued as described in the report over 1985.

Norway - Norge

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

Cancer pagurus

A temporary reduction in the minimum size of crabs from 13 cm to 11 cm (cpx. width) was endorsed for southern Norway.

Homarus gammarus

The monitoring program for CPUE and length measurements of the commercial catches of lobsters at five different localities was continued in 1986. In the Skagerak area a slight increase in the trend compared with 1985 was registered. Nearly 100 000 small lobsters reared for one year in warm water were released at different localities. There was no catch of under-sized lobsters from the first release in 1983 as might have been expected.

Pandalus borealis

Abundance estimates (numbers 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, Skagerak, Norwegian Sea, Barents Sea and the Wet Spitsbergen Shelf in 1986. By-catches of fish (species and year-class) were also recorded. In the Norwegian deeps the catches of prawns were at the same high level as in 1985, with a slight decline towards the end of the year; by the swept area method the biomass was

reduced by 50% relative to a cruise in the autumn of 1985. This result was confirmed by VPA analysis based on commercial compositions of commercial catches. Scientific cruises were also continued in East Greenland waters to extend knowledge about stocks found between Greenland and Spitsbergen.

Population density, demography, maturity stages, fecundity, and growth and mortality studies in selected north Norwegian and Spitsbergen fjords were continued by the University of Tromsø in 1986. Classification of populations on the basis of the above mentioned parameters using multivariate statistical techniques (e.g. Factor Analysis) has been initiated. Latitudinal life-cycle responses are also being investigated. A mathematical model, using individual growth and mortality inputs, has been developed to estimate biomass, production, and P/B.

Selection of prawns in different areas of demersal, prawn trawls are also being investigated by biologists and gear technologists at the University of Tromsø. Loss/evasion of prawns under the mouth of the trawl, between the fishing line and coco has also been examined, and demonstrated to be significant. The development and testing of prawn-trawls designed to avoid high by-catches of fish continues at the University of Tromsø and the Institute of Fishery Technology Research (gear technology dept., Trondheim).

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

Poland - Pologne

(J. Porebski)

NO REPORT ON CRUSTACEA

Portugal

(A. Cascalho and M.J. Figueiredo)

Nephrops norvegicus (INIP)

The sampling program on size composition of the landings on the west and south coasts of Portugal was continued in the same terms as over the previous years, but the number of samples has significantly decreased.

Three research surveys were carried out along the Portuguese coast in May, August and November on board the R/V "Mestre Costeiro" and "Noruega". Information on abundance and on size and sex composition, gonadal development and occurrence of moulting was obtained for the several areas and sub-areas of the Portuguese coast. A total of 17,666 individuals were measured.

Preliminary experiments on tagging were carried out in a selected area of the Portuguese south coast. A total of 1139 individuals captured by trawl in depths ranging from 300 to 600 meters, were tagged. Four of them were recaptured by commercial trawlers in depths between 550 and 600 meters, over a period ranging from 19 to 116 days. These experiments only demonstrated the possibility of survival of Nephrops released at great depths.

An analysis of the effects of a change in mesh size in Alentejo (southern west coast) and in Algarve (south coast) stocks, based on the method of length cohort analysis, was made with data recollected in research surveys carried out in 1981-85. The analysis shows that provided M is less than 0.43, an increase in mesh size to 80 mm should lead to gains in yield per recruit and in biomass in both stocks. The magnitude of these gains is about 90% in the case of biomass and 27% in the case of yield per recruit, for females and males combined.

Parapenaeus longirostris and Aristeus antennatus: (Shrimps)

The sampling programme on the Portuguese south coast (Olhao) was continued with a regular twice in a week frequency.

Four research surveys on board the R/V "Mestre Costeiro" and "Noruega" were carried out in Algarve (south coast) and Alentejo (southern west coast) with the purpose of identifying new fishing grounds, studying the spatial distribution and abundance, carrying selectivity studies and detecting concentration areas of juveniles. A total of 11,852 individuals of P. longirostris and 4,238 individuals of A. antennatus were measured. Observations on the biological characteristics of both species were made and frequency and amount of by-catch species were registered.

Carcinus maenas

A program on the life cycle of this species was started in a coastal lagoon of the Portuguese central west coast (Ria de Aviero).

Ecological studies on Crustacea

A study on the ecology and larval development of brachiura decapod (Uca tangeri and other species) was developed in the estuary of the river Mira (southern west coast of Portugal) by the Faculty of sciences of Lisboa (Guia Laboratory) .

Studies on Amphipods in the benthonic communities of the estuary of River Mondego (Central part of the Portuguese west coast) were conducted by the University of Coimbra .

- a) Characterization of benthonic intertidal communities;
- b) Studies on the biology and population dynamics of the amphipod Echinogammarus marinus, a relevant species of the intertidal rocky biotops.

Spain - Espagne

(A. Perez and M. Torre)

Studies about the deep stocks of Senegal Fisheries have been conducted since 1982 and will be pursued. The species studied are Parapenaeus longirostris, Aristeus varidens, Geryon maritae, Palinurus mauritanicus and Nemotocarcinus africanus.

Liocarcinus puber "velvet swimming crab"

The development of the eggs and the subsequent larval development were studied (length of stages and mortality in relation to the temperature). The postlarval growth was also studied in the laboratory.

Polybius henslowii

Studies were made on the nutrition, reproduction, growth, spatial and time abundance. These studies are on going.

Sweden - Suède

(H. Hallback)

Homarus vulgaris

Commercial catches are still decreasing. Collection of catch data continued.

Nephrops norvegicus

The results from the trawl fishery are still good. Nephrops are economically the main species for the coastal fishery. The new creel fishery has been successful and the numbers of creels have during the last two years increased from some hundreds to about 15,000 and the numbers will still increase. Trawlers have caught quite a lot of dead Nephrops because of lack of oxygen along the bottom in different areas in the south of Kattekat, mainly during the month of October. Collection of catch data continued in some areas more in detail.

Cancer pagurus

Catches are still good, collection of catch data continued.

Pandalus borealis

The study of stocks in the biggest fjord in Sweden was continued. Collection of catch data continued from some trawlers more in detail.

Environmental studies

Dioxin was some years ago found in marine species in the Baltic. During 1986, we started to investigate Homarus, Nephrops and Cancer along the Swedish west coast, specially outside a paper pulp mill to see if this area was a "hot spot". The results from about 15 samples, hepatopancreas, showed a very high level of dioxin in male Homarus and Cancer, outside the paper pulp mill. We also found the same type of dioxin in the process of the factory which showed that this area is a "hot spot". Even some samples of Nephrops from the southern part of the Kattegat showed high levels of dioxin. These investigations will continue during 1987 in other areas and on other species.

United Kingdom - Royaume Uni

1) England and Wales

(C. Bannister)

The numbers of crustaceans measured in 1986 in the coastal fisheries are listed in Table 1. In addition, 50 fishermen's log-books were issued for the collection of catch and effort information.

Homarus gammarus L.

Plans are being developed for a trial period of Status quo effort limitation in the South Wales lobster fishery. Modelling work on the problems of stock and recruitment continues.

Previous observations from comparative fishing in Norfolk, showing that the Norfolk creel catches significantly smaller lobster and crabs than Yorkshire parlour pots, were confirmed by a final series of comparative fishings in Yorkshire.

Small-meshed Nephrops creels were deployed at Bridlington in order to catch pre-recruit lobsters. Lobsters caught were in the size range 47-89 mm carapace length.

Studies on the survival and recruitment of juvenile lobsters continued on a study site near Bridlington. A total of 12,640 microtagged juveniles were released, the majority from cages deployed by divers. Monitoring trials were undertaken of commercially-caught undersized lobsters landed by special arrangement, but no microtagged animals were detected. A short-term mark-recapture experiment was conducted at Bridlington using undersized lobsters. Experimental laboratory observations of juvenile burrowing and shelter-related behaviour commenced. Releases of hatchery-reared lobsters, and monitoring trials, continued at other sites, Aberystwyth in Wales, and Ardtoe and Orkney in Scotland.

Cancer pagurus L.

Work commenced to update the assessment of the Channel crab stock, beginning with an analysis of landings and historic size composition data. Spot estimates of the dis-

tribution and abundance of crab larvae in the Channel were obtained from plankton hauls made in 1981 to study the distribution of sole.

Nephrops norvegicus

Size composition monitoring of the landed catch in the north-east coast fishery was coupled with the collection of 19 discard samples. For the Irish Sea, spawning biomass was estimated from plankton samples collected in 1985. Larval development studies were concluded. Studies of gastric evacuation rates in Gadus morhua, a Nephrops predator, continued.

Table 1. - Crustacean measurements, England and Wales, 1986.

ICES Division	<u>Cancer pagurus</u>	<u>Homarus gammarus</u>	<u>Nephrops norvegicus</u>	<u>Maia squinado</u>
IVb	3130	6076	10 519	-
IVc	135	62	-	-
VIIId	211	438	-	73
VIIe	512	-	-	-
VIIa/g	-	-	-	-
VIIa	-	-	4 311	-

United Kingdom - Royaume Uni

2. Scotland

(J. Mason)

Nephrops

Sampling of trawl and creel landings at major fishing ports continued on a regular basis. Research vessel surveys were also conducted on the most important grounds. During those cruises further observations were made on the relative abundance, size composition, growth and maturity of Nephrops living on different sediment types. The results tend to confirm that the silt/clay and organic carbon contents of the sediments may have some influence on the growth rate and density of Nephrops.

A new method of tagging crustaceans was developed in collaboration with scientists at Leicester University. The tag consists of a living cuticle and epidermis, derived from a host animal, which is implanted into the body cavity of the host. The implant forms a cyst and produces a new layer of cuticle in step with the host moulting cycle. From histological examination of the cyst the cuticle layers can be counted to provide a record of host moulting frequency. The method was successfully evaluated in Laboratory experiments on Nephrops and Homarus and field trials have been initiated.

Further work was conducted on the damaging effect of light on the sizes of Nephrops. Susceptibility to retinal damage appears to be greater in deep water Nephrops than in shallow water animals given comparable exposures. The eyes of recaptured streamer-tagged Nephrops show some retinal damage 4-6 years after they were released.

Pandalus borealis

Routine monitoring of the North Sea fishery at Fladen was continued. Samples for length frequency and sex determination were obtained at regular intervals. Data on landings from the Farn Deep were obtained.

Crangon crangon

Continued monitoring of the Solway Firth fishery was undertaken, together with studies on the fish by-catch.

Homarus gammarus

Sampling of commercial catches continued and catch and effort data were obtained from selected fishermen. The percentage of undersized lobsters in catches remained relatively high, indicating a steady influx of recruits. Catches of commercial sized lobsters decreased slightly, mainly owing to extremely bad weather during the fishing season.

Trial tows using modified neuston nets were carried out in an effort to capture lobster larvae. Only three stage II larvae were captured in forty fifteen-minute tows. Further tests will be carried out from a commercial vessel during the larval season in 1987.

Preliminary analysis of a tagging experiment on the west coast of Scotland was made. A total of 1339 lobsters were tagged with streamer tags. Over a period of two years, 609 of these were captured at least once, and including multiple recaptures 1500 recaptures have been made in all. Most lobsters had remained at the point of first release. In males, moult increments remained constant with increasing size while in females the moult increment declined. First estimation of L_{∞} and K were derived. Total mortality was estimated at $Z = 1.15$ made up of a fishing mortality of about 0.9 and mortality from other causes of 0.25.

Cancer pagurus

Sampling of commercial catches continued and catch/effort data were collected. Bait trials carried out from a commercial vessel proved inconclusive owing to poor catches. It is hoped to repeat the experiment at some future date.

Liocarcinus puber

Commercial catches were sampled and limited catch/effort data collected. Landings of this species continued to increase.

A tagging experiment to study growth has been initiated on the west coast. Fecundity studies are also being carried out.

Sampling data for crustaceans 1986

Area	1. Season	No of samples		No of animals	
	2. Species	Research vessel	Market	Measured	Aged
IV A	<u>Jan-Mar</u>				
	<u>Nephrops</u>	1	2	4921	
	<u>Apr-June</u>				
	<u>Nephrops</u>	1	3	6619	
	<u>Lobster</u>		1	396	
	<u>Crab</u>		3	1058	
	<u>July-Sept</u>				
	<u>Nephrops</u>	1	2	5417	
	<u>Crab</u>		2	1561	
	<u>Oct-Dec</u>				
	<u>Nephrops</u>	1	5	9791	
	<u>Lobster</u>		3	1665	
	<u>Crab</u>		2	132	
IV B	<u>Jan-Mar</u>				
	<u>Nephrops</u>	2		542	
	<u>Apr-Jun</u>				
	<u>Nephrops</u>	1	2	6130	
	<u>Lobster</u>		3	1179	
	<u>Crab</u>		3	1449	
	<u>Jul-Sept</u>				
	<u>Nephrops</u>		2	6572	
	<u>Lobster</u>		1	275	
	<u>Crab</u>		1	37	
	<u>Oct-Dec</u>				
	<u>Nephrops</u>		3	10632	
	<u>Lobster</u>		1	3166	
	<u>Crab</u>		1	685	
VI A	<u>Jan-Mar</u>				
	<u>Nephrops</u>	2	8	29390	
	<u>Apr-Jun</u>				
	<u>Nephrops</u>	2	7	23292	
	<u>Lobster</u>		4	1161	
	<u>Jul-Sept</u>				
	<u>Nephrops</u>	3	10	25815	
	<u>Lobster</u>		5	2688	
	<u>Crab</u>		7	1987	
	<u>Oct-Dec</u>				
	<u>Nephrops</u>	3	7	18486	
	<u>Lobster</u>		2	100	
	<u>Crab</u>		2	425	

United States - Les Etats Unis

(S.A. Murawski)

Pandalus borealis (Northern Shrimp)

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.

The Maine DMR initiated research on the effects of temperature on survival of larval shrimp, as well as continuing trials of various designs for shrimp separator trawls to minimize the catch of groundfish. Researchers at the University of New Hampshire monitored discarding of small fishes (primarily flounders) in the shrimp fishery. 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.

White shrimp (Penaeus setiferus)

Pink shrimp (P. duorarum)

Brown shrimp (P. aztecus)

Researchers supported by North Carolina State University developed a model for optimal opening time for two North Carolina shrimp fisheries, based on a seasonal harvesting model incorporating growth and natural mortalities. 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.

Homarus americanus (American lobster)

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 initiated 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. New York investigators evaluated the size and sex composition of commercial landings. NEFC research focused on improved models of yield and egg production per recruit, and the application of time series models for evaluating long-term patterns in lobster landings.

USSR - URSS

(A.A. Elizarov)

Pandalus borealis

In 1986 the stocks of the deep-water prawn Pandalus borealis in the Barents Sea and off Spitsbergen were further investigated (357 trawlings were made). In April-June PINRO conducted investigations in the Barents Sea, in July PINRO and VNIRO conducted investigations off Spitsbergen. A total of 214 samples were taken and examined, 26,929 individuals were analysed. A further decline of shrimp stocks was observed in the Barents Sea. In the West Spitsbergen area no decrease of shrimp biomass as compared to 1985 was observed. A method for the analysis of shrimp trawl survey was developed by spline approximation of stock density. The importance of shrimps in the feeding of cod in the Barents Sea was analysed.

MOLLUSCA

Belgium - Belgique

(Reporting only on Crustacean)
(Rapport sur les Crustacés seulement)

Canada

(G.P. Ennis)

Illex illecebrosus

One research cruise was conducted in January to provide further information on the distribution and abundance of larval and juvenile Illex and associated species, in the Gulf Stream/Slope Water Frontal Zone and the Shelf and Slope Waters off Florida between 25°30'N and 32°00'N and the oceanographic processes involved in their dispersion and transport. A second cruise in February was conducted to provide similar information in the Slope and Gulf Stream Waters of the Scotian Shelf.

A study of feeding and predatory/prey relationships using immunoelectrophoresis was begun in concert with biologists at Dalhousie University and the University of Aberdeen.

Abundance of adult squid on the Scotian Shelf was extremely low in 1986, continuing the trend of recent years.

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

Another annual survey was conducted on the southwest slope of the Grand Bank during June. Despite favorable temperatures throughout much of the survey area no squid were captured. A poor inshore squid fishery at Newfoundland was forecast and later realized. The low level of abundance limited biological studies in the Newfoundland inshore area. However, some squid samples were acquired for detailed biological analysis and the relative abundance of potential prey species was monitored at one locality using traps.

Loligo pealei

Although Loligo occurs regularly in the Bay of Fundy and off southwestern Nova Scotia, in 1986 their abundance was much higher than normal in both these areas and along more eastern areas of the Scotian Shelf. The species was taken in Newfoundland inshore waters for the first time in 1986.

Placopecten magellanicus

Research abundance surveys to estimate biological parameters for the assessment process were carried out on Georges Bank, the Bay of Fundy, and the Scotian Shelf. Further refinements incorporated into the annual assessment of the Georges Bank stock included a seasonal sequential population analysis. Age and growth studies are continuing. As well as rings on the shell and resilium, oxygen isotope techniques were investigated to gain insight into growth processes. The industry has initiated a quota system on Georges Bank this year which increases the importance of growth studies and stock assessments.

The large-scale juvenile tagging study was continued in 1986, with approximately 23,000 more animals tagged, bringing the total number of tags to the order of 35,000. Sampling of scallops was carried out with a bottom trawl, and the gear performance was compared to scallop drag and SCUBA diver estimates. Juvenile growth studies were also extended another year. The grow-out experiments are conducted in conjunction with a study of spat biology.

Another larval survey was completed in the Georges Bank-Scotian Shelf area in October. Early results indicate very high numbers on Georges Bank (up to 800 m^{-3}) compared to the Scotian Shelf (generally less than 5 m^{-3}).

Prerecruits contingents located on St. Pierre Bank (Newfoundland) in 1984 were resurveyed for biomass estimates. The fishery for sea scallops was primarily based on the relatively strong 1982 year-class at an overall meat count estimated at 54/500 g. Total removals for 1986 were 147 mt meat.

A new voluntary logbook system was designed for monitoring catches of the giant scallop in the southern Gulf of St. Lawrence. Observers embarked on fishing vessels for collecting detailed biological information on the catch. Experimental surveys were performed from chartered vessels in the Northumberland Strait. It was shown that the relative abundance of prerecruits (scallops $< 70 \text{ mm}$) had increased in 1986. These new classes may ensure the renewal of the fishable stock which had been mostly limited to 1978 and 1979 year-classes over the last 4-5 years.

Research on geographic variability in selectivity, maturity and growth was pursued.

Un relevé expérimental et l'analyse des données de l'exploitation commerciale ont permis d'évaluer l'état des stocks de pétoncle des Îles de la Madeleine; les débarquements commerciaux et l'abondance des pré-recrues sont faibles et à un niveau comparable à celui de 1985.

Des expériences de photographie sous-marine ont été menées afin de préciser l'efficacité des engins de pêche. Les résultats préliminaires suggèrent une efficacité de l'ordre de 6 à 13% pour la drague utilisée lors des relevés expérimentaux. Un projet de recherche a été entrepris en vue d'étudier le recrutement: des collecteurs sont immergés au printemps et relevés à l'automne afin d'évaluer la fixation du naissain.

Chlamys islandica

The Icelandic scallop stock in the Strait of Belle Isle was surveyed through logbook and landing statistics analysis and by experimental fishing. The fishing grounds and

the fishing effort were mapped. Historical records show that the fishery expanded in the area until 1985. Since then all productive grounds have been harvested.

Une pêche exploratoire menée dans le nord-est du Golfe a révélé de petits gisements de pétoncle dont les rendements sont élevés et qui n'étaient pas déjà exploités par les pêcheurs. Les données obtenues de l'exploitation commerciale ont permis d'évaluer l'état des stocks de la côte nord du Golfe.

Mya arenaria

In the Annapolis Basin the ongoing resource assessment program was continued, but at a significantly smaller areal coverage. A 2.5 ha area in the Annapolis Basin was surveyed to reevaluate the status of the stock, with respect to the assessment carried out in 1983. Sampling at 0.025% intensity indicated a slight decrease in abundance of clams 43 mm and larger (prerecruits and recruits), while smaller clams showed substantial decreases since 1983. Additionally, approximately 39% of the area surveyed in 1983 was not accessible due to mud accumulation. These results, although from a very small area, seem to corroborate statements from the fishing community reporting stock depletions in the area.

A long-term comparative study of settlement, growth, and survival of clams in open and closed areas on the flats was extended with additional experimental plots. More than 2000 tagged animals planted in 1984 and 1985 were recovered in 1986 at a recovery rate of 14-30%. New information on overwintering shell growth and annual growth was recorded.

Arctica islandica and Spisula polynyma

Based on the results of exploratory surveys, conducted between 1980 and 1983, a "test fishery" for these species was carried out, in 1986, on several areas of the Scotian Shelf by private companies. The test fishery confirmed the potential indicated by the research surveys and appears likely to lead to new fisheries for both the species.

Current research is directed at refining estimates of growth and natural mortality, with the primary emphasis on Spisula polynyma. In 1987, a research cruise will be carried out to recover marked Arctica from Sable Island Bank and Spisula from Banquereau Bank for growth studies, and additionally to gather information on population structure and recruitment patterns.

Spisula solidissima

Biological studies on bar clams were completed at sites on the Northumberland Strait and Gulf of St. Lawrence coasts of Prince Edward Island. The results of two consecutive years study of the reproductive cycle showed that gonads developed quickly to the ripe stage by June and July as water temperatures warmed, followed by a prolonged spawning period from late July to October and spawning ceased as water temperature decreased in October. The sex ratio was 1:1 and no hermaphrodites were found. A study to determine age and growth rates (from chondrophore sections) of clams from different areas of PEI and a mark-recapture field experiment will be completed in 1987.

A voluntary logbook program was initiated during the 1986 fishing season and the catch and effort data were analyzed to provide a first estimate of catch per unit of effort for the PEI fishery.

Mytilus edulis

Les travaux sur la répartition spatiale des structures d'élevage des moules se sont poursuivis. 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.

Denmark - Danemark

(S. Munch-Petersen)

During September-October 1986 an investigation of the mussel beds in the Danish Wadden Sea was carried out. The main aim was to collect data for a preliminary stock assessment. The investigations will continue in 1987.

France

(D. Latrouite)

Pecten maximus

Le suivi des principaux stocks de coquille Saint-Jacques du littoral Atlantique et de la Manche a fait l'objet en 1986 de campagnes côtières soit avec des navires océanographiques de l'IFREMER (baie de Saint-Brieuc, Manche-Est), soit à bord de bateaux de pêche.

D'une manière générale, les ressources de coquille Saint-Jacques sont exploitées en hiver de façon très intensive et les captures dépendent essentiellement du recrutement estimé moyen à faible depuis les dix dernières années. La production nationale devrait approcher 10 000 tonnes.

En baie de Saint-Brieuc, les observations ont été faites à bord du N.O. "GWEN-DREZ" et de bateaux de pêche. Les échantillonnages ont été réalisés par le couplage de plusieurs techniques: dragages expérimentaux, vidéo et plongée sous-marine. Les captures sont suivies au débarquement et l'on dispose de données sur l'importance et la distribution des ressources par tonnes, en régression de près de 40%. Cette situation est due à un recrutement très moyen mais aussi à une mortalité hivernale importante: près de 30% du stock a disparu entre mars et avril 1986 au cours de la période de froid intense qui a régné à cette époque.

En Manche-Est, après la forte diminution constatée entre 1976 (12 000 tonnes) et 1983 (6 500 tonnes), les captures se sont stabilisées au cours des trois dernières années autour de 4 500-5 000 tonnes. Toutefois, les observations faites en septembre 1986 à bord du N.O. "GWEN-DREZ" (dragages expérimentaux) ne laissent pas augurer une forte production pour la saison de pêche 1986-1987 en raison d'une part de l'appauvrissement de la partie centrale de la Manche orientale, et d'autre part d'une certaine stabilité de la baie de Seine proprement dite. Cette production pourrait être de l'ordre de 3 500 à 4 000 tonnes. Par ailleurs, les indices de prérecrutement recueillis sont assez moyens sur l'ensemble des gisements et ne permettent pas d'espérer, pour les trois années à venir, une reconstitution conséquente des stocks.

Sur le plan des recherches, la coquille Saint-Jacques est suivie dans le cadre d'un programme quinquennal (1983-87). Celui-ci vise à assurer le repeuplement du gisement de la rade de Brest et à mettre au point en baie de Saint-Brieuc de nouvelles formules d'exploitation qui combinent la pêche et l'aquaculture par semis de juvéniles. L'année 1986 a pu permettre de confirmer la production de juvéniles en éclosierie-nurserie avec préélévage et 1.5 millions d'animaux devraient être semés.

Une contribution plus fondamentale à la maîtrise de l'exploitation de cette espèce est apportée par le programme national sur le Déterminisme du Recrutement mené en commun par l'IFREMER et les laboratoires universitaires.

Chlamys varia

Le pétoncle noir objet d'une exploitation spécifique en rade de Brest, assure une production d'environ 400 tonnes. La constatation de peu de prérecrues dans les captures de cette année montre que l'incidence de la mauvaise reproduction de l'été 1985 se fera sentir dans les captures de la saison 1987/1988.

Le semis de 45 millions de juvéniles, captés en 1984, sur une zone de 100 hectares enrichie en supports, n'a pas donné de résultats; la petite taille du naissain semé en est probablement la cause principale.

Buccinum undatum

La production de buccin, estimée à près de 5,000 tonnes, apparaît stabilisée ainsi que l'effort de pêche. Les éléments fournis par l'IFREMER ont permis à la profession de mettre en place en 1986 un système de licences de pêche (nombre de casiers et de jours de pêche) et une taille marchande minimale de 4,5 cm. Un système de collectes de données de production et d'effort à répartir aux nombreux points de débarquement est actuellement étudié.

Mytilus edulis

L'étude des moulières en eau profonde de l'Est Cotentin (SEcteur 7D) a débuté en octobre 1981 et s'est poursuivie en 1986 par la prospection des gisements de Barfleur et Ravenoville, au cours d'une campagne océanographique (GWEN-DREZ) réalisée au printemps (14 avril - 2 mai). Un nombre de 338 dragues et 59 prélèvements à la benne Hamon ont permis d'estimer l'état du stock en place et l'intensité du pré-recrutement.

Les rendements en moules de taille commerciale (cf. tableau) montrent une diminution importante des stocks essentiellement due à la faiblesse du recrutement observée depuis 1983.

Rendements en moules commerciales en kg/mn

	1982		1983		1984		1985		1986
	Mai	Oct	Mai	Oct	Mai	Oct	Mai	Oct	Avril
Barfleur	63,0	71,8	103,8	38,2	49,0	30	47	8	8,5
Ravenoville	161,6	54,7	120,2	390,1	44,3		20	15	4,4
Reville	186,4	104,4	85	46,1					

Cette situation a abouti à la fermeture de ces gisements à l'exploitation en 1986.

Production en tonnes - Gisements de l'Est Cotentin

1982	1983	1984	1985	1986
15,000	5,000	3,600	1,375	fermé

Venus verrucosa

La production connaît une relative stabilisation en 1986 à un niveau inférieur à 2 000 tonnes, en raison d'une augmentation de l'effort de pêche. Le recrutement observé en 1986 reste très faible.

Tapes rhomboïdes, Glycymeris glycymeris, Spisula ovalis

Les principaux gisements de ces bivalves de substitution connus en Manche Ouest et en sud Bretagne ont été évalués. Ces ressources apparaissent sous-exploitées. Les potentialités estimées à plusieurs milliers de tonnes permettent le développement d'une exploitation dirigée à la fois vers le marché de frais et de la transformation (chair de bivalves).

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. From October 1986 to January 1987 the selling of blue mussels harvested at the Niedersachsen coast was prohibited because of several cases of DSP. This is the first time since several decades that this happened. The mussel beds of the Schleswig-Holstein coast were free of DSP.

Cerastoderma edule

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

Iceland - Islande

(H. Eiriksson and I. Hallgrímsson)

Chlamys islandica

Three dredge surveys were conducted in May, June and July. These included scallop abundance estimates of the major fiord stocks in west and northwest Iceland and exploratory tows in deeper offshore waters off the north and east coasts. A few small localized beds were discovered.

Scallop landings in 1986 amounted to approximately 17 000 m tons and were similar to those of the previous year. In most areas cpue continued at similar levels as in 1985.

Surveys in 1987 will be limited to stock abundance estimates of two of the most important fishing areas - Breidafjörður and Hunaflói.

Ireland - Irlande

(J.P. Hillis)

Buccinum undatum

The Shellfish research laboratory of University College Galway undertook some stock assessment studies.

The Netherlands - Les Pays Bas

(A.C. Drinkwaard)

Ostrea edulis L.

Lake Grevelingen in the S.W. of The Netherlands was functioning quite well again as spatting pond for the flat oyster, Ostrea edulis L. The monitoring methods were the same as in have been the preceding years.

The concentrations of oyster larvae reached a maximum of 1000 per 100 litres of water. The intensive spatfall in the beginning July resulted in about 300 to 350 million spats at the end of the year, after a first mortality of 88%. For this result 5000 m³ mussel shells from the mussel canneries were scattered on the culture plots. In November the average length of the spat was 7,5 mm.

This yearclass will be good for a 20 million consumption oysters in the years 1989 - 1990. Besides a lot of spats settled also in the wild. By this success the real repopulation of the Eastern Scheldt with the flat oyster got big chances in the coming years. The nearly lost yearclass 1984 however will be the cause of a decline in the total production, probably next year. At the least the culture area in the Lake Grevelingen will be doubled and more farmers will be admitted in 1987.

Off bottom professional oyster culture started already in the western part of the Eastern Scheldt, sheltered by the storm-surge-barrier. In addition to Lake Grevelingen spat, collected by mussel shells in off bottom network, the lanternnets were populated by 200,000 hatchery spats from Maine - USA. For a big part periwinkles in these nets averted the fouling of the growing oysters in this experiments.

The shell disease in the Lake Grevelingen, caused by the fungus Ostracoblabe implexa needed serious attention. Looking to the total ecological situation in this lake, there are no thoughts in the direction of using artificial fungicides. An adequate approach can be found in culture technical measurements, of which a good cleaning of the bottom leads the way.

On the Yerseke Bank 1400 m³ mussel shells were scattered for collecting spat of the cupped oyster, Crassostrea gigas. Based on the asymptotic feature of bonamiasis in 1985, no bottom culture experiments with the flat oyster were conducted in that area. Next year new flat oyster experimental and commercial relaying activities will be conducted once again according to rigorous designs.

Mytilus edulis L.

In both culture areas, the Wadden Sea and the Eastern Scheldt, typical difficulties lowered the landings during the season 1986-1987 to 25,000 tons and 35,000 tons respectively. The importation of mussels on the level of 25,000 tons could not fulfil the market supplement, which was in demand.

Examination of the possible causal factors was leading to external influences on the culture situation.

In the Eastern Scheldt several experimental closures and part-closures of the storm-surge-barrier had to be overcome. Several areas, sensitive for reduced current velocities along the bottom and consequently sedimentation of silt were taxed.

On October 4th, Her Majesty Queen Beatrix declared the storm-surge-barrier operational. The first secondary compartment dam was closed later on in October with a professional closure of the barrier to simplify this work. The second and last secondary compartment dam will be closed in the beginning of April 1987. During one week only one tidal-cycle per day will be created, while during one day the Eastern Scheldt will be full-time stagnant. The fear for oxygen depletion will be dependent on the prevalent temperature at that time. Most of the normal relaying in spring of Wadden Sea medium size mussels on Eastern Scheldt plots will be carried out after this work is completed. In future the barrier will only be closed at too high storm levels of the North Sea.

The reduction of the tidal amplitude and flows cause the need of re-arrangements of the mussel plots for using again the best places in the new situation with a high productive capacity. The research activities conducted by the ministerial commission covered all changes and environmental impact on the mussel culture sites, using experimental data and eco-system knowledge gathered during the previous years. Regular surveys remain essential in checking the base-line theory in the practice of the new "natural" circumstances.

The rather low Dutch mussel landings from the Wadden Sea were caused by ice-drift in February and harmful stormy weather in March. Especially on the shallow subtidal plots, medium size mussels growing to reach the market in 1986-1987, were damaged. There is a big need for new plots in not wave-dominated environments to stabilize the irregular production.

Furthermore all transportation of consumption mussels from the Wadden Sea to the re-watering plots nearby Yerseke has been forbidden during a three month period from September till the end of December, to safeguard the consumers against the biotoxin of the blooming dinoflagellate *Dinophysis acuminata*. Also the supply of mussels from the Lower Saxony coast of the German Wadden Sea, Norway, Sweden, U.K. and Spain has been blocked for the same reason of protection against DSP. These rigorous regulations taken for limiting the geographic progression of this specific aquatic biotoxin exemplified the demand for market mussels and cause a rise of price on a market which is still elastic. However, in this way all adverse impact of this exceptional marine plankton bloom on human health could be avoided.

The Wadden Sea ecology and resource management studies have been supported in co-operation with the Estuarine ecology Department of the Dutch Research Institute for Nature Management. The secondary production in the Wadden Sea is very substantial, but the understanding of the Wadden Sea is very substantial, well pictured. In view of the former and still running major studies concerning the Wadden Sea ecosystem, all concerned research institutes are now rounded up to the Emowad-project. An attempt is made to channel the biological knowledge for better use by a mathematical model, the Ecological Model Wadden Sea, in hand of statisticians.

Cerastoderma edule L.

The landings of raw cockles and meat could be continued on the average level of the last six years, coming to the fresh weight of a comfortable 50,000 tons. The shucked meat found a market for top prices.

The rich yearly deposits of cockle spat on the cleaned up shallows contributed to the stabilized active suction dredging or can we say cockle culture, using the forces of nature in the right way!

Part of the catch belonged to the yearclass 1985, favoured by an exceptional good growth. For reason of population management planning next year attention will be paid to the distribution and assessment of stocks of cockles and thick trough shells as alternative outside the coast line. New gears will be used for detection. Otherwise there is a need for providing more information by a more regular registration of the catches, concerning places, quantities and the composition by number per weight and age.

Suggestions for enlargement of the fishing effort established on 36 ships, cannot be supported at this time out of a biological point of view. The knowledge of the determinism of recruitment and the assumptions needed for predictions of recruitment require further work.

Environmental conditions

All direct research in commercial and experimental situations has been carried out in combination with surveys of the most important biotic and abiotic ecological parameters.

The short and long term studies to identify the causes and to quantify the detected effects of potentially harmful anthropogenic activities are in hands by the new Tidal Waters Service of the Ministry of Transport and Public Works. The current problem in so called natural areas is to discriminate between natural changes and changes which are induced by human activities.

In the context of interactions it is preferable to mention the role of human activities, extensive mariculture included, rather than to use the conflict-model word "impact" when it concerns the marine environment and its resources.

Diseases and pests

The Challenge test on the presence and activity of the oyster pathogen *Bonamia ostreae* in the Eastern Sheldt has not been repeated in 1986. As over the two former years no planting of new batches of Lake Grevelingen indicator oysters was allowed. The results in the years 1984 and 1985 showed an asymptotic decrease in the characteristic of the bonamiasis prevalence. It was supposed therefore that new plantings of the flat oyster could only increase the chances of survival of the pathogen and could only retard the moment of total disappearance of bonamiasis with appears at reach.

The prevalence of bonamiasis for 1986 was estimated with samples of oysters left after the yearly cleaning of the experimental beds of the Yerseke Bank oyster area. A total of 230 flat oysters could be sampled over the period April till November. Only one bonamiasis-infected oyster was found in May. The conclusion was that not only the nearly zero point was reached, but that after the winter 1986 - 1987 large scale tests on commercial footing could be taken into consideration. This following period of challenge in 1987 will be possible for all interested oyster growers, but under stringent stipulations, like the limitation to a one season growing period in which the oysters have to become marketable.

The oyster samples from the Lake Grevelingen showed no bonamiasis. Also based on the zero-results of former years, this area can be considered as free of bonamiasis.

Molluscan shellfish toxicity

Blooms of Dinophysis species, in particular D. acuminata, have been observed in the North Sea in the month of September. Peaks of more than 5000 cells per litre were recorded 20 km offshore.

In the western part of the Dutch Wadden Sea Dinophysis acuminata has been recorded firstly in the beginning of September at one sampling station. During the following weeks D. acuminata reached the mussel culture sites in average concentrations of 100 cells per litre. At the same time the D.S.P. level in mussels gradually increased. During October the D. acuminata concentration decreased to less than 50 cells per litre, while the D.S.P. level in mussels fluctuated. At the end of October the D.S.P. level in mussels came again on a moderate level.

The occurrence of D. acuminata quickly decreased during the first week of November. This period was marked by a sharp decrease of the water temperature from 13°C to 9°C. The average "moderate" level of mussel toxicity more or less persisted during the rest of the month of November. Not earlier than on the first of December an advanced decrease in toxicity of the mussels has been observed, continuing during the course of the month at decreasing temperatures until 6°C.

At the end of December not any D.S.P. in mussels could be detected. The period of mussel toxicity lasted much longer than the period that D. acuminata was present.

During the whole period that the biotoxin could be detected in mussels, no toxicity could be detected in the sampled cockles from the suspected areas.

In the Eastern Scheldt the maximum concentration of Dinophysis spec. has been 3 cells per litre and no D.S.P. has been detected in the sampled mussels.

The details of the monitoring of this exceptional bloom with toxic effects of D.S.P. in mussels and the protection of consumers against this phenomenon has been reported in the Working group on the Effect of Exceptional Algae Blooms on Mariculture and Fisheries.

Molluscan shellfish sanitary control

The sanitary quality of mussels, oysters and cockles from the culture and fishery sites as well as the rewatering plots and basins for stocking came up to the high observed standard.

Special attention has been paid to the surroundings of the mussel processing areas to control the results of the measures against the annoyance of sea-gulls, which earlier in some periods caused a negative effect on the rinsing-water. The professional action of a falconer and the installation of UV apparatus in several processing plants dissolved most of the undesirable situations.

Norway - Norvège

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

Chlamys islandica

Quantitative research-surveys of the distribution and biomass of the Icelandic scallop in the northern Barents Sea, and the waters surrounding Jan Mayen and Spitsbergen was carried out by the University of Tromsø and the Institute of Marine Research (Bergen, Directorate of Fisheries). Various types of dredge, grab and corer were deployed. Underwater photography was also used. Beds of varying size were found in most regions, but the largest and most abundant were registered north of Spitsbergen. preliminary estimates suggest that the catch available to the commercial fishery is about 300-350 thousand tonnes of "round" scallops. Regional growth, mortality and recruitment data are also being analysed. Studies of the genetic homogeneity of scallops from different regions were initiated by the University of Oslo in conjunction with the University of Tromsø. An active Norwegian fishery for scallops took place in 1986.

Todarodes sagitatus

The European flying squid was noted for its absence from Norwegian coastal waters in 1986. Nevertheless, the analysis of previously collected material and data was continued by the University of Tromsø. Research has been continued on growth, population structure, and feeding habits of squids arriving at the Norwegian coast and fjords. Acoustical studies involving target strength measurements and echointegration were carried out.

Ostrea edulis

Experiments with growth and mortality of oysters on the Skagerak coast were continued during 1986. Mortality has previously been negligible. Hydrographical conditions were studied in oyster polls in the same region. On the west coast experiments with commercial hatcheries of oysters have been initiated.

Mytilus edulis

Experiments involving lowering blue mussels below the pycnocline for cleansing of diarrhetic shellfish poison were performed.

Poland - Pologne

(J. Porebski)

Illex argentinus, Martialis hyadesi, Loligo spp.

Sea Fisheries Institute in Swinoujście conducted the squid research, mainly Illex argentinus, Martialis hyadesi, Loligo spp. in the southwest Atlantic.

Vertical - horizontal distribution, length frequency, sex composition, maturity, food, parasite and statoliths were collected and studied by Mr Andrzej Koronkiewicz and Dr Norbert Wolnomiejski.

Portugal

(M.J. Figueiredo and Aura Cascalho)

Spisula solida (INIP)

Two research surveys were carried out in June and October off the northern part of the Portuguese west coast (Beira Litoral) in order to determine the spatial distribution and relative abundance of this species. Selectivity of the fishing gear using a dredge fitted with a net of 40/50 mm mesh size has been preliminary determined.

Studies on the assessment of this species have been carried out on the south coast (Algarve).

Mytilus sp.

Research on iso and allo-enzymes in the populations of the Aveiro coastal lagoon (Beira Litoral) have been carried out by electrophoretic methods and a program on the study of the Kariotype variations in this species was developed.

Octopus vulgaris and Sepia officinalis

A regular program of sampling for these two species was carried out on the Portuguese south coast.

Spisula solida, Solen marginatus, Cerastoderma edule and Ruditapes decussatus (Faculty of Sciences of Lisboa Guia Laboratory)

Studies on the population dynamics of these species and on their life cycles were carried out in the coastal lagoon system of the Portuguese south coast (Ria Formosa).

Scrobicularia plana

Studies were undertaken on the population dynamics of these species in the estuaries of the rivers Mira and Tagus (Portuguese West Coast)

Octopus vulgaris

Studies on modelling the life cycle of this species in the western part of the Portuguese south coast as well as growth investigations based on anatomic structures.

Sepia officinalis

Research on the life cycle of this species was carried out in the coastal lagoon of the Portuguese south coast (Ria Formosa).

Molluscs larvae

An overall study on the environmental exchanges (lagoon/open-sea) of Mollusc populations (in particular Cephalopods) was carried out over their planktonic period.

Mollusca ecology (University of Coimbra)

Systematic and ecological studies on the molluscs of the estuary of the River Mondego.

a) Distribution of the species;

b) Biology of the population of Scrobicularia plana (Mollusca, Bivalvia).

Patella spp(University of Azores)

Preliminary studies of the exploited stock of Limpets, in the Azores: Exploitation and assessment. Responsible are Helen R. Martins and Ricardo Serrao Santos both from Department of Oceanography and Fishery, University of Azores, Horta and Stephen J. Hawkins, Department of Environmental Biology, University of Manchester. The studies will be followed up with careful work on systematics, reproductive biology, age and growth etc.

Loligo forbesi

The common squid, L. forbesi was maintained in captivity, in order to obtain eggs for rearing in the laboratory and for behaviour and survival studies. Responsible: H.R. Martin (DOP/UA, Horta) and Roger T. Hanlon Marine Biomedical Institute, University of Texas, Galveston).

Tapes decussatus

Ecological studies of the Santo Cristo Lagoon, S. Jorge Bivalves Tapes decussatus. Responsible is Richardo S. Santos and H.R. Martin (DOP/UA, Horta, Açores).

Spain - Espagne

(A. Perez and M. Torre)

Mytilus edulis

Morphological and genetics studies were conducted on mussels in Galicia. It was shown that the cultured mussel may belong to the species Mytilus galloprovincialis.

A study on the occurrence of red tides and on the presence of the toxine in mussels ment for human consumption was initiated.

Other studies were conducted on pathology of mussels (Bonamia, Martellia, etc.).

Veneridae

Comparative studies were conducted on growth and duration of reproductive cycle of Venerupis decusata and Ruditapes philippinarum on the Atlantic and Cantabric coasts.

Pecten maximus

The studies on the reproductive cycle of this specie are currently carried on and collectors for catching spat in the sea are designed and tested.

Ostrea edulis

The studies on the reproductive cycle of this species are continued in the Atlantic and Mediterranean, as well as monitoring of the abundance of larvae and testing of spat settlement on different types of collectors. Studies are also conducted on the pathology of the oyster.

The genetic characteristics of different populations of oysters of the Spanish coast are studied.

Chemical composition of the oyster in Galicia and its mortality is being studied.

An assessment of the oyster stock at the Mar Menor (An hypersaline coastal lagoon on the Mediterranean shore) has been made.

Sweden - Suede

(H. Hallback)

Mytilus edulis

The Swedish cultivations of M. edulis have still great problems with toxin from Dinophysis. The mussels have been free for the commercial market during short periods and only in some areas.

Ostrea edulis

No toxin was found in O. edulis.

United Kingdom - Royaume Uni

1) England and Wales

(C. Bannister)

Pecten maximus L.

Study area dredge surveys continued off Cornwall (VIIe). A 1,600 square meters of scallop ground were also photographed using underwater 35 mm cameras during 20 sledge deployments. Hydroid samples were collected for settlement studies. A prototype epibenthic sampler was constructed and deployed. Historic dredge survey data for Devon and Cornwall (VIIe) were worked up, and growth curves were obtained for study locations in VIIa, VIIe and VIIf.

Ostrea edulis L.

The annual grab survey of adult stock in the Solent (VIId) continued. Solent oyster larvae surveys using pump samples were intensified to study horizontal and vertical distributions at a number of stations. Fecundity and larvae lipid levels were measured. Trial spat monitoring using tiles commenced.

Disease of Ostrea edulis L.

Monitoring for the disease Bonamia ostreae continued. Infected stock were found at Poole, and in Beaulieu River in the Solent. Clearance of infected stock was undertaken in both areas. Limited short-term relaying of Solent oysters was undertaken in Essex (IVc). Oystermen were issued with a Code of Practice for good husbandry in diseased areas. Modified movement restrictions remain in force. Experiments to culture Bonamia ostreae, and to test the susceptibility of other species to Bonamia, continue.

Cerastoderma edule L.

In addition to the routine quadrat survey of cockle stocks in the Burry Inlet in Wales (VIIIf), a new survey was carried out by suction dredge on beds in the Wash (IVc) where spatfall monitoring transects were also established.

Mytilus edulis L.

The recent series of quadrat surveys of adult and seed mussels in the Wash (IVc) continued. Stocks remain low.

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 and catch per unit effort (CPUE) have fallen since 1983. However, pre-recruit dredge surveys by FRV Goldseeker in two major west coast fishing areas indicated recent improved recruitment.

Queen landings and CPUE continued to fluctuate, showing no definite trends. The study of settlement of both species (on artificial collectors) continued on the east coast. Settlement of queens was generally heavier than that of scallops. Nineteen eighty six (1986) 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 heaviest in the north west sea lochs (up to 2245 per standard collector or 7433 per standard string in L Carron), whereas maximum numbers of only 13 and 116 scallops per collector were found 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.

The first of a series of sea bed experiments on the growth, survival and dispersion of young scallops P. maximus was carried out. Scallops from 1984 and 1985 settlements experienced very high mortality over the period from May to December. The nature of damage to the scallop shells recovered indicated that crabs were responsible; this was confirmed by time lapse photography. The quantity of shell recovered from the experimental area suggests that most of the animals had not moved far before succumbing to the crab attacks.

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 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 commenced. Some 140 farms have been registered with the Department of Agriculture and Fisheries for Scotland. So far visits have been paid to 35 farms in order to take samples and establish their status as regards pests and diseases.

Anti-fouling and molluscs

Investigations are made into the effects of TBT in anti-foulant paints on the settlement and growth of oyster and mussels.

Sampling data for molluscs 1986

Area	1. Season 2. Species	No of samples		No of animals	
		Research vessel	Market	Measured	Aged
IV A	Jan-Mar				
	Scallops		1	1922	1900
	Queens		1	365	
	Apr-June				
	Scallops		2	1707	1700
	Queens		1	233	
	July-Sept				
	Scallops		3	2147	2000
	Queens		1	668	
	Oct-Dec				
VI A	Scallops		1	580	580
	Queens		1	2684	
	Jan-Mar				
	Scallops		4	6081	6000
	Apr-Jun				
	Scallops		6	5725	5500
	Queens		1	939	
	Jul-Sept				
	Scallops	2	6	6072	5742
	Oct-Dec				
VII A	Scallops	1	5	3746	3346
	Queens		1	127	
	Jan-Mar				
	Queens		1	995	
	Apr-Jun				
	Queens		1	1765	
	Jul-Sept				
	Queens		1	1561	
	Oct-Dec				
	Queens		1	2849	

United States - Les Etats Unis

(S.A. Murawski)

The Northeast Fisheries Center (NEFC) of the USA National Marine Fisheries Service (NMFS) conducted spring and autumn bottom trawl survey 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, and for offshore clams (Surf clam, Spisula solidissima, oceans quahog, Arctica 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 routine 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, and ocean quahog was initiated by NEFC researchers. The goal of these studies (to be continued through 1987) is to utilize 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.

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, 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.

Crassostrea virginica (American oyster)

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 Science.

Placopecten magellanicus (Sea scallop)

NEFC researchers developed a prototype ship-board microcomputer system for at-sea entry of sea scallop survey data (catch, location and size frequency data). Additionally, 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. An industry-sponsored program was initiated with the assistance of personnel from NMFS and the Virginia Institute of Marine Science to evaluate the effects of varying ring diameters for scallop dredges with respect to size composition and catch rates. Aspects of growth, fecundity and energy budgets of sea scallops in the Gulf of Maine were investigated by the Maine Department of Marine Resources.

Argopecten irradians (Bay scallop)

Several state agencies continued monitoring work (Rhode Island, New York, North Carolina) to evaluate trends in abundance, size composition and survival. A bioeconomic model for determining optimal timing of bay scallop harvests for this short-lived species was implemented by researchers supported by North Carolina State University.

Mercenaria mercenaria (Hard clam)

A major research initiative on hard clam recruitment and growth was undertaken in Long Island Sound by researchers at NEFC, University of Connecticut, and others. 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 continued 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.

Arctica islandica (Ocean quahog)

Aspects of the life history and population biology of ocean quahog were 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.

Spisula solidissima (Surf clam)

Stock assessment work on surf clam was continued by NEFC and several state agencies (Delaware, New York, New Jersey). Bioeconomic modelling of the fisheries continued at Virginia Institute of Marine Science and University of Delaware. A project on employment patterns of surf clam fishermen was initiated at Rutgers University. Aspects of density dependent growth and recruitment rates were investigated at NEFC.

Mya arenaria (Soft-shell clam)

Studies of survival, growth, and reproductive biology continued at the University of Connecticut. The State of Maryland finished a project on the disease prevalence, and mortality of soft-shell clams in Chesapeake Bay. State of Maine researchers continued investigations of PSP both in terms of frequency of occurrence and biological effects on the clams.

Illex illecebrosus and Loligo paelei (Short-finned and Long-finned squid)

NEFC personnel continued biological and stock assessment related research and initiated a project to examine seasonal occurrences of squids and butterfish in relation to environmental variables (temperature and depth). The latter project it intended to examine 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.

USSR - URSS

(A.A. Elizarov)

Todarodes sagittatus and Gonatus fabricii

PINRO continued investigations of arrow squid stocks in the Norwegian Sea and open parts of the North Atlantic. A total of 119 trawlings and 598 drift squid stations were made. A number of 248 squids were examined. Arrow squid were surveyed in the reproductive part of their range west of the British Isles in January to April and in the north-east of the range in feeding areas of their wintering group in August to November. In autumn 1986 no arrow squids were found in the feeding part of the range in the Norwegian Sea. Data on the squid Gonatus were collected in the Norwegian Sea in June to July.

Pecten islandicus

Murmansk marine biological institute of the Kola branch of the Academy of Sciences of the USSR and Research Institute Sevmorgeo studied distribution, stocks and biology of scallop by means of bottom sampling, drag nets and underwater photography. Commercial concentrations of this mollusc were found and mapped.

OTHER TAXA - AUTRES TAXONS

Canada

Algues:

Laminaria longicruris

Un niveau de récolte a été déterminé pour une concentration de laminaires dans la baie des Chaleurs. Une analyse du rendement pouvant être obtenu selon différentes stratégies de récolte a été effectuée en appliquant un modèle du calcul du rendement par recrue. Un suivi de l'exploitation commerciale sera effectué afin d'évaluer les changements pouvant survenir au sein de cette population.