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Report of Activities

SHELLFISH COMMITTEE

COMITÉ DES MOLLUSQUES ET CRUSTACÉS

by/par

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FOREWORD

All member countries but one, participating in the Shellfish Committee Activities provided input on research and assessment activities. Survey activities of both crustaceans and molluscs continue to play a very important rôle in the activities of member countries. Research and development activities have otherwise continued to emphasise the recently implemented geostatistical survey techniques. These methods are now being compared and contrasted with the classically used ones, e.g. stratified random sampling. Attention has also been aimed at bringing multivariate statistical techniques (e.g. principal components analysis, correspondence analysis) into operation to determine patterns and trends in catch and demographic data. Multivariate techniques appear particularly promising where uni- or bivariate methods have failed to provide satisfactory results. Further attention has been paid towards developing production, productivity, and energy budget models at the individual and population levels; these complement efforts aimed at understanding life history trends relative to abiotic and biotic environmental factors. Two ICES Shellfish Workshops were arranged for 1989, as a prelude to the 1990 ICES Symposium on "Shellfish Life Histories and Shellfishery Models".

CRUSTACEA

Belgium - Belgique

(F. Redant)

Crangon Crangon

The biennual Young Fish and Brown Shrimp Surveys (in spring and autumn) were continued in 1988. These investigations included faunistic and quantitative analyses of the epibenthic and demersal fauna in the Belgian coastal waters. the surveys consisted of 15 minutes' hauls with a small meshed beam trawl at about 35 fixed sampling stations in an area within 10 miles off the Belgian coast.

Nephrops norvegicus

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

A two years' study on the development of the abdominal eggs in relation to the size of the berried females was concluded in 1988. These investigations provided further evidence on the occurrence of biennial spawning amongst Nephrops in the Central North Sea.

Canada

Newfoundland Region and Scotia Fundy Region

(G.P. Ennis)

Homarus americanus

The 1987 and 1988 landings by the inshore lobster fishery on the Atlantic coast of Nova Scotia remained near 1986 levels after six years of unprecedented increases. Measured impacts of scallop dredging, clam dredging, mussel dredging, and rockweed harvest on inshore lobster stocks showed that scallop dredging killed a few lobster in locations where they occupy the same grounds. The other fishing activities had no impact on lobster.

The offshore fishery was unable to reach it's quota (720 t) for the first time in the 1980's. This could be due to decreased abundance or to a shift in stock distribution. Berried females captured from Georges Bank were released at four locations near shore. Ninety percent of recaptures were from the shelf break, an average of 144 km from the release points, showing a marked preference of offshore habitat.

Long-term monitoring of fishery characteristics including catch rates, catch, effort and exploitation rates and aspects of the population biology of lobster including annual growth, recruitement and standig stock was continued in three localized fishing areas around Newfoundland.

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

Pandalus borealis

Fishermen logbooks, observer and a research trawl survey provided data on the northern shrimp fishery and status of the stocks off coastal Labrador in 1988. TAC's were taken in most of the traditional fished stock areas and more effort was directed to some previously unfished areas, especially Div. 0B and 2G. A research survey was conducted in Hopedale (Division 2H), Cartwright and Hawke Channels (Division 2J) from July 6 to July 26 and data from both research and commercial fishing are being analyzed for resource assessment.

A small inshore fishery also took place in Fortune Bay on the south coast of Newfoundland in 1988.

Chionoecetes opilio

In the Newfoundland fishery, at sea research sampling and sampling of commercial catches continued. Catch and CPUE data for the various management areas were analyzed and biomass estimates based on 1987 data derived. Landings are increasing in the southern zone offshore areas apparently because of increased recruitment since 1986. In 1982, there was a sharp reduction in the level of molting activity in the population that had persisted and appears to be related to lower bottom temperatures

throughout the area over this period. CPUE remained constant in offshore areas but increased markedly in the deep-water bays along the coast, probably as a result of strict quotas that were fisrst imposed in 1986. Landings and CPUE in the northern zone declined dramatically as a reslut of excessive fishing pressure.

Research aimed at fully documenting behavioral. Ecological and biological aspects of a deep-to-shallow breeding migration of snow crab in Bonne Bay on the west coast of Newfoundland continued. Studies of various aspects of molting, mating and egg development continued. A second survey to investigate the feasibility of using a Remotely Operated Towed Vehicle (ROTV) as a means of determining prerecruit snow crab size, distribution and density by means of bottom photography met with failure. It appears that routine assessment of snow crab stocks using ROTV's is not currently practical. However, initial attempts to survey crab stocks using bottom trawl during spring 1988 were more successful.

The overall status of snow crab stocks along the Atlantic coast of Cape Breton Island in 1988 appears a slight improvement over 1987, maintaining the reversal of the collapsed state noted in previous years. A pulse of males first detected in 1985 continued recruiting into the commercial stocks prior to the 1988 fishing season and increased, or maintained, fishable biomass over 1987 levels in all areas. A strog marked demand for snow crab resulted in a 50% increase in fishing effort; this, coupled with slightly higher average catch rates, resulted in a large rise in landings. Eighty-nine of 106 licensed vessels were active and their recorded catch (540.6 t) was 150% of the 1987 value (64 vessels: 360 t) but still only 66% of the 1989 value (99 vessels: 822.3 t). Estimates of exploitation rate, calculated by Leslie analysis of fishermen's logbooks, ranged from 57 to 64% on the traditional inshore grounds. However, a previously unexploited concentration of snow crab was fished for the first time in the offshore of S.E. Cape Breton, resulting in high catch rates from this area. The size of this concentration is unknown and the exploitation rate exerted on it in 1988 could not be estimated.

The minimal legal size was thought to confine exploitation to males that had been mature for 1-2 years. Hence, the full reproductive potential of the resource was believed to be protected. However, between 47.1% and 10.9% of the landed males sampled during 1988 were morphometrically immature. Although the long-term biological implication of this situation remains unclear, virtually all of the mature females sampled through the 1988 fishing season were carrying eggs. Analyses of morphometric data from sea sampling also revealed that large numbers of males had attained a terminal molt below the legal minimum size. Research into reproductive physiology and definition of maturity in snow crab is continuing.

Région du Québec et Région du Golfe du Saint-Laurent

(G.Y. Conan)

Pandalus borealis

L'état de la ressource pour les cinq unités de gestion du Golfe du Saint-Laurent a été évaluée à l'aide de données obtenues de l'exploitation commerciale et d'un relevé expérimental. Les débarquements de 1988 (près de 14,000 t) sont les plus élevés depuis le début de l'exploitation en 1965. Les taux de capture sont relativement stables depuis quelques années alors que l'effort de pêche augmente graduellement. Les estimations de biomasse obtenues par chalutage de fond indiquent une augmentation de l'abondance de la ressource depuis le dernier relevé en 1987.

Divers projets sur la distribution spatiale des crevettes aux stades larvaire et adulte se sont poursuivis. Les résultats préliminaires suggèrent que l'organisation spatiale des distributions de fréquence de longueur résulte de gradients qui sont modulés par la topographie des chenaux. Les distributions de fréquence de longueur caractéristiques des différents assemblages montrent cependant des variations annuelles et régionales qui sont probablement attribuables à des fluctuations annuelles du succès et de la répartition du recrutement. Dans la région nord du golfe du Saint-Laurent, la distribution spatiale à grande échelle des stades larvaires est étendue et cela tend & soutenir l'hypothèse de l'homogénéité des groupes de crevettes.

Homarus americanus

L'abondance de la population de homards de l'Ile d'Anticosti a été déterminée par un recensement unique selon la méthode de marquage-recapture de Petersen. La biomasse commerciale de homard du côté sud d'Anticosti a été évaluée à 620 t, au début de la pêche en 1987, et le taux d'exploitation a été d'environ 20%. Le taux de croissance du homard de cette population serait faible. Une analyse du rendement par recrue est prévue.

La population de homards de taille commerciale du côté nord de la Baie de Gaspé a été étudiée au cours de la saison de pêche 1987 afin d'en évaluer la distribution, l'abondance et le taux d'exploitation. Une comparaison de la méthode de marquage-recapture de Petersen et de la méthode de Leslie, fondée sur les statistiques de pêche, suggère qu'une part importante de la baisse des PUE pourrait être due au recouvrement des aires d'attraction des casiers.

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

déterminer si ces caractéristiques biologiques vont être modifiées en fonction de la densité du stock.

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

A la demande des pêcheurs, une étude sur le cycle de vie du homard dans une des baies de l'Ile-du-Prince-Edouard a débuté afin de déterminer le déplacement, la saison de mue, les causes de perte des pinces et le recrutement. Dans le cadre de cette étude, une expérience à l'aide d'un chalut muni d'un système électrique a été effectuée. Les résultats préliminaires ont révélé le potentiel prometteur de ce type d'engin comme outil pour l'estimation de recrutement de homard.

Chionoecetes opilio

L'état de la ressource dans le Sud Ouest de Golfe a été étudié à partir des statistiques de débarquement et des journaux de bord remplis par les pêcheurs. L'échantillonnage des captures commerciales est effectué à la mer par du personnel embarqué. Une campagne de chalutage a été conduite à l'aide de chaluts à langoustine courant toute la surface de la pêcherie du sud-ouest du Golfe Saint-Laurent. Après la forte chute des captures observée en 1987, les captures de 1988 se sont maintenues au même niveau. Une cartographie et une évaluation de la biomasse totale ainsi que de la biomasse du recrutement annuel ont été réalisées par la technique géostatistique du krigeage. Il apparaît que le fait de négliger les caractéristiques de distribution spatiale de la ressource et de l'effort de pêche dans certaines méthodes traditionnelles d'évaluation de stock puisse aboutir à une surestimation de l'abondance de la ressource du crabe des neiges.

Un programme de marquage en zone hauturière est en cours, le but est d'étudier les mouvements à long terme des crabes des différentes catégories biologiques et la croissance.

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

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

Une évaluation de l'état des stocks de crabe des neiges de l'estuaire et du nord du golfe du Saint-Laurent a été effectuée à partir de l'analyse des statistiques de pêche et des journaux de bord des pêcheurs. Une deuxième expérience de marquage magnétique a eu lieu dans le secteur de la Basse Côte-Nord en vue d'estimer

la population et d'évaluer le taux actuel d'exploitation. Le projet visant à décrire l'habitat des juvéniles et à évaluer le recrutement à la pêche s'est poursuivi et une étude de la fécondité des femelles de ces stocks a été amorcée. La croissance sera étudiée en 1989.

Plusieurs dizaines de milliers de crabes des neiges ont été trouvés échoués sur une distance d'environ 10 km de plage, principalement à Rivière-Brochu, sur la Haute Côte Nord du Québec. Les crabes étaient majoritairement de taille non commerciale (< 95 mm, largeur de carapace) et allaient ou venaient de muer. Des analyses de détection de contaminants n'ayant rien révélé, une hypothèse est avancée à l'effet que les courants de marée combinés à de fortes vagues seraient responsables de cet échouage.

Orchomenella minuta, Orchomenella pinguis et Anonyx sarsi

Des expériences sur les effets des agrégations d'amphipodes sur les communautés benthiques ont été réalisées.

Denmark - Danemark

(Sten Munch-Petersen)

Pandalus borealis

Data for assessment of Pandalus stocks in Divs. IIIa and IV have been collected from the commercial landings. A trawl survey for Pandalus in Skagerrak and the North Sea was conducted in November 1988.

Mesh selection experiments with gear both for Pandalus fishing and gear for Nephrops fishing have been conducted in 1988.

Faroe Islands - Iles Féroé

(A. Nicolajsen)

Nephrops norvegicus

Monthly catches have been taken in the principal commercial Nephrops area Tangafjordur (southern sound between the main islands) for biometric measurements and to determine maturity stages.

France

(Anatole Charuau)

Cancer pagurus

Le suivi des apports, des efforts et des CPUE des flottilles françaises attachées aux ports de la Manche a fait l'objet d'un suivi:

A partir des livres de bord européens (logbooks) pour les unités du large;

A partir d'évaluations pour les unités côtières.

Des échantillonnages au débarquement ont été assurés sur les captures des caseyeurs du large (8 périodes, 38 bateaux). Les données des années antérieures ont fait l'objet d'une analyse quantitative et qualitative: description spatio-temporelle de la production française de Manche, Iroise et "accores des fonds" et analyse en composantes principale de la taille moyenne et du sex-ratio. Les résultats ont été présentés au CIEM dans la communication K:33.

Les observations relatives à la croissance en Manche et Golfe de Gascogne ont été analysées et des paramètres de l'équation de von Bertalanffy applicables à ces secteurs sont proposés. Ces résultats ont ait l'objet de la communication K:34 au CIEM.

Des recherches sur l'infection du tourteau par le dinoflagellé parasite Hematodinium sp. ont été poursuivies et un bilan des observations a été dressé dans la communication CIEM K:32.

Homarus gammarus

Une cartographie des captures (tonnage et poids moyen) par rectangle statistique est entreprise à partir des données consignées sur les carnets de pêche des caseyeurs du large.

Entre 1984 et 1986, 2,500 juvéniles d'un an produits en écloserie et marqués magnétiquement ont été ré-immerges sur un site pilote en Bretagne sud. L'échantillonnage des captures de la pêche professionnelle a fourni 8 recaptures en 1988; elles font apparaître une sédentarité marquée des animaux et un taux de croissance supérieur ce qui était considéré jusqu'à présent.

Maia squinado

L'analyse des données sur la biologie et l'exploitation du stock de Manche orientale a été poursuivie. Une campagne d'estimation directe du recrutement a été assurée sur les zones de transit entre nurseries et zones d'exploitation hivernale. L'analyse des résultats de 1938 et années précédentes est entreprise par les méthodes géostatistiques. Des marquages ont été réalisés pour préciser les relations entre nurseries et pêcheries du large.

Liocarcinus puber

Le suivi de la population d'étrille du Mor-Braz (Bretagne sud) et en particulier le niveau d'infection par le dinoflagellé parasite Hematodinium sp. ont été réalisés. Ce dernier point a fait l'objet de la communication CIEM K:41.

Nephrops norvegicus

L'échantillonnage des débarquements a été poursuivi comme chaque année pour les deux pêcheries: Golfe de Gascogne et Mer Celtique.

Un début de cartographie des zones de pêche effectuée d'après enquêtes a pu être réalisé pour le nord de la pêcherie du Golfe de Gascogne.

Un suivi des stades de pré-mue des langoustines femelles de cette pêcherie a été fait en vue de revoir le pourcentage d'individus susceptibles de muer chaque année.

La reconstitution de séries historiques de l'effort de pêche, des productions par port, et de la taille moyenne dans les captures depuis le début des années 1970 a été réalisée pour la partie nord de la pêcherie du Golfe de Gascogne afin d'en dresser un bilan d'exploitation.

De nouvelles expérimentations du chalut sélectif à langoustine ont été faites & bord de bateaux professionnels dans le but de démontrer sa possibilité d'utilisation en pêche commerciale.

Une typologie des navires langoustiniers côtiers de Sud Bretagne au moyen d'analyses en composantes principales sur les données des fichiers du système statistique national a permis une première étude des stratégies d'exploitation de cette flottille.

Federal Republic of Germany - République Fédérale d'Allemagne

(K. Tiews)

Crangon crangon

By-catch research in the German brown shrimp fishery, to determine abundance indices for fish and crustaceans of commercial and non-commercial importance occurring on the shrimp fishing grounds, was continued at the Institut für Küsten-und Binnenfischerei der Bundesforschungsanstalt für Fisherei. A total of 378 samples of 2,986 kg was analysed.

Studies on the occurrence and cause of the black spot disease of Crangon which were started in 1986, were continued and brought to an end.

As part of a cooperative programme 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 populations by the Institut für Küsten- und Binnenfischerei der Bundesforschungsanstalt für Fischerei. A total of 252 samples was studied.

Iceland - Islande

(H. Eriksson and U. Skúladóttir)

Nephrops norvegicus

An annual research vessel survey was carried out in May covering all major Nephrops grounds. Most importantly, the survey included regular sampling of various biological parameters used in a yearly stock analysis. The nominal catch of Nephrops amounted to

2,250 tonnes compared to over 2,700 tonnes in 1987. CPUE which had remained high during the years 1980-1987, ranging from 46-61 kg per trawling hour, dropped from 53 kg in 1987 to only 39 kg in 1988. This is attributed to a combination of unfavourable weather conditions during the high season in late May and June as well as decreasing recruitment.

Pandalus borealis

Research vessel surveys were carried out as usual for sampling P. borealis and obtaining information on by-catch in the inshore areas. This was done both at the beginning of the fishing season and towards the end of the season. At the same time stock assessments were made, using area swept. The offshore stocks were surveyed for the first time in 1987 in order to assess the stock sizes by area swept. In 1988 a somewhat larger area was surveyed where about 60% of stations were randomly chosen. It is planned to survey again in the near future the same stations that were taken in 1988.

Landings in the offshore fishery declined from 34,772 tonnes in 1987 to about 25,000 tonnes in 1988. The CPUE declined from 78 kg in 1987 to 65 kg in 1988 for the northeast areas. CPUE is expected to decline further in the offshore areas in 1989. Most of the inshore stocks are now at a low level, either due to overfishing or an increase in the number of predators. An exception to this is the stock of Arnarfjordur which was at its peak in 1988. Moreover, in two areas the extremely strong year-class of 1987 has dominated the fishery. In order to continue fishing in these areas gear experiments had to be carried out where the ordinary cod-end was compared to that with square mesh (same mesh size, 36 mm open mesh). Not only did half of the one year-old shrimp escape but also all the 0-group cod. The use of cod-ends with square meshes seems to solve the innshore by-catch problem as well as protecting the young shrimp.

Collection of young shrimp in a small-meshed bag attached to the cod-end has been found to be very useful in providing recruitment indices.

In 1989 research will be carried out along the same lines as previously.

Ireland - Irlande

(J.P. Hillis)

Nephrops

Sampling of catch, landings and discards in the Irish Sea (ICES Division VIIa) continued as in previous years. Sampling of Porcupine Bank (Division VIIc,k) Nephrops was supplemented by sampling those from inshore Galway Bay (VIIb) as landings there were more frequent and so it formed a suitable project during periods when no Porcupine Bank Nephrops were in the process of being landed. Numbers sampled in all three areas are shown in the accompanying table.

As in 1987 a cruise to examine mean size of Nephrops in relation to sediment particle size was undertaken, this time over the entire southern end of the area indicated on the Geological Survey sediment map as being of suitable sediment for Nephrops. Results are being analysed to study the effects of sediment particle size and population density on growth and on survival. Concentrated research vessel trawling in the limited area where externally marked micro-tagged Nephrops were released in 1987 yielded eight returns, but despite a reward system considered generous, the industry (catching and processing sectors) did not return any.

A seperator trawl experiment late in the year which achieved good separation between Nephrops and whiting is more fully described in the Fish Capture Committee Report.

Table 1 Irish sampling data for Nephrops 1988.

Div.	Quarter	Number of samples	Sex	Catch	Landings	Discards	Total
VIIa	1	6	Male	1 247	706	190	2 170
			Female	671	238	164	1 073
			Unsexed	...	774	...	774
			Total	1 945	1 718	354	4 017
	2	10	Male	1 917	502	372	2 791
			Female	2 359	196	362	2 917
			Unsexed	....	1 753	...	1 753
			Total	4 276	2 451	734	7 461
	3	21	Male	1 399	363	407	2 169
			Female	2 625	487	654	3 766
			Unsexed	....	2 041	...	2 041
			Total	4 024	2 891	1 061	7 976
	4	6	Male	1 132	327	282	1 741
			Female	895	92	292	1 279
			Unsexed	....	695	...	695
			Total	2 027	1 114	574	3 715
	Total	43	Male	5 722	1 898	1 251	8 871
			Female	6 550	1 013	1 472	9 035
			Unsexed	....	5 263	...	5 263
			Total	12 272	8 174	2 723	23 169

VIIb	2	3	Male	-	336	-	336
			Female	-	121	-	121
			Unsexed	-	...	-	...
			Total	-	457	-	457
	3	9	Male	-	3 241	-	3 241
			Female	-	511	-	511
			Unsexed	-	...	-	...
			Total	-	3 752	-	3 752
	4	6	Male	236	578	134	948
			Female	29	8	28	65
			Unsexed	...	229	...	229
			Total	265	5 024	162	5 451
	Total	18	Male	236	4 155	134	4 525
			Female	29	640	28	697
			Unsexed	...	229	...	229
			Total	265	5 024	162	5 451
VIIc,k	2	10	Male	323	2 327	-	2 650
			Female	421	1 676	-	2 097
			Unsexed	-	...	-	-
			Total	744	4 003	-	4 747
	3	10	Male	323	2 327	-	2 650
			Female	-	646	-	646
			Unsexed	-	...	-	...
			Total	-	4 083	-	4 083
	Total	20	Male	323	5 764	-	6 087
			Female	421	2 322	-	2 743
			Unsexed	-	...	-	...
			Total	744	8 086	-	8 830
Overall		81	Male	6 281	11 817	1 385	19 483
			Female	7 000	3 975	1 500	12 475
			Unsexed	...	5 492	...	5 492
			Total	13 281	21 284	2 885	37 450

The Netherlands - Le Pays Bas

(R. Boddeke)

Crangon crangon

Surveys

The international young flatfish and brown shrimp survey in cooperation with Belgium, FRG and UK was carried out as in earlier years in October, covering the entire coastal zone of the Netherlands. In March, May, August and November week-long cruises were made on the Easternscheldt, to monitor environmental changes. Results of these cruises are not available yet.

Sampling.

The sampling of shrimp harbours continued. In each harbour four samples from commercial catches were taken every month and, on the basis of statistics for catches per fishing day per statistical rectangle, worked up to catches per fishing day of commercial sized shrimps, unripe eggs and ripe eggs per area. These quantitative data from a series of years will be used to obtain better insight in stock-recruitment relations and total mortality estimates of different stages of the life cycle.

Norway - Norvège

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

Pandalus borealis

CPUE, in both the Skagerrak area and the Norwegian Deeps, especially towards the end of the year, decreased due to a combination of poor recruitment and heavy exploitation. The 1988 year-class, on the basis of research vessel surveys, seemed though to be above average.

Abundance estimates (number and biomass) of deep-water prawn by age-class were continued by the Institute of Marine Research/Directorate of Fisheries (Bergen) in the Barents Sea and on the West Spitsbergen Shelf in 1988. By-catches of fish (species, year-class, and stomach content) in the demersal prawn trawls were also recorded. Annual research surveys using a prawn trawl were carried out in April and May in the Barents Sea (Div. I) and in July and August in the Spitsbergen area (Div. IIb). Biomass estimates in the Barents Sea exhibited an increase of about 21% compared with the minimum values observed in the spring of 1987. In the Spitsbergen area an increase of about 18% was observed.

In the east Greenland area, the Institute of Marine Research/Directorate of Fisheries had an inspector on a prawn trawler in April. Biological samples were taken and by-catch and discard were measured. In September the annual scientific demersal trawl survey was conducted off East Greenland, in order to measure prawn abundance and distribution.

Population density, demography, maturity stages, fecundity, and growth and mortality studies in selected north Norwegian and Spitsbergen fjords were continued by the Norwegian College of Fishery Science/University of Tromsø in 1988. Classification of populations on the basis of the above named parameters using multivariate techniques were further continued.

The programme studying latitudinal life-cycle responses and reproductive output from the southern to the northern limits of geographical sampling have been examined by the Norwegian College of Fishery Science/University of Tromsø in 1988. A version of the previously developed biomass, production and productivity model was further developed in 1988 using energy content (kilojoule) parameters. Studies of the importance of P. borealis in the food webs of north Norwegian fjords, the Svalbard area and the Barents Sea have been continued.

Studies of multi-species interactions, involving prawns as prey for cod and seals, have been continued at the Institute of Marine Research/Directorate of Fisheries, the University of Tromsø, and the University of Oslo. These investigations have included studies of multi-species modelling, predator-prey behaviour, and alimentary physiology.

Homarus gammarus

The monitoring programme for CPUE and length measurements of commercial catches at five different localities in the Skagerrak area was continued. Yearlings of lobster raised in warm water have been released at different localities along the Norwegian coast. At one of these localities it has been noticed that the released lobsters have two pincer-claws and a more elongated appearance than the native ones; the fishermen call these morphs "foreigners". Such morphs contributed about 20% to the undersized lobsters. Releases of about one lobster per metre of shoreline were made at this locality in 1985, 1986, and 1987.

A project involving releasing one year-old lobsters into the sea has been initiated at the Austevoll Aquaculture Station (Directorate of Fisheries), to examine the potential for replenishing wild stocks. The releases are being followed up by field and experimental studies.

Carcinus maenas.

Fecundity of shore crabs has been measured by the Austevoll Aquaculture Station (Directorate of Fisheries) in terms of numbers of eggs as a function of female body size, and wet and dry weights of the egg-plug. The energy content of the eggs is also being measured.

Table 2 Samples of crustaceans analysed by Norway during 1988.

Species	Area	Season	No. of Samples Research	Market	No. of individ's Measured	Aged*
Pandalus	I	Apr/May	119	15	40,200	35,700
	IIb	Jul/Aug	64	10	22,200	19,200
	IIIa	1. quart.		3	935	935
	IIIa	2. quart.		3	876	876
	IIIa	3. quart.		3	672	672
	IIIa	4. quart.	52	3	11,579	11,579
	IVa	4. quart.	3		930	930
	IVa	4. quart.	50		8,338	8,338
	XIV	2. quart.		7	500	
	XIV	3. quart.	50		8,000	
Homarus	IIIa	4. quart.		5	858	

* Pandalus aged by normality separation method.

Poland - Pologne

(NO REPORT ON CRUSTACEA)

Portugal

(M.J. de Figueiredo and C. Sousa Reis)

Nephrops norvegicus

Three research surveys directed to the study of the bathymetry and topography of the main Nephrops fishing grounds were carried out by the Instituto Nacional de Investigação das Pescas. Attempts were made to define populations living in the vicinity of the deepest rocky grounds. Most of these were primarily comprised of large animals, probably owing to the shallower grounds offering suitable shelter for the youngest individuals.

A number of 82 individuals were recaptured by the Instituto Nacional de Investigação das Pescas from a total of 6,681 Nephrops tagged in 1987/88 in an area of the eastern part of the Portuguese south coast, at depths ranging from 300 to 600m. 32 individuals had moulted, of which 18 were males and 14 females.

On the basis of carapace increments occurring over a period of 10 to 12 months, Nephrops ranging from 34.0 to 51.0 mm carapace length were estimated to have an annual growth rate of about 11.0% of the initial size for males and 4.5% for females. Nephrops smaller than 34.0 mm were frequently tagged but were not recaptured. No significant migrations have been detected (Instituto Nacional de Investigação das Pescas).

Three Nephrops populations of the Portuguese south coast have been sampled for electrophoretic analysis of population genetics (Instituto Nacional de Investigação das Pescas).

Parapenaeus longirostris and Aristeus antennatus

The sampling programme on the Portuguese south coast (Vila Real de Santo Antônio) was continued by the Instituto Nacional de Investigação das Pescas in the same manner as previously. 4,082 individuals of Parapenaeus longirostris and 4044 of Aristeus antennatus were measured.

Two research surveys on board the R/V's "Noruega" and "Mestre Costeiro" were carried by the Instituto Nacional de Investigação das Pescas out in Algarve (south coast) and Alentejo (west coast) in order to study the spatial distribution and abundance of both species, and detecting areas of concentration of juvenile Parapenaeus. After a period of extremely poor catches the Parapenaeus stock appeared to be recovering and summer and winter recruits were detected. Biological characteristics and fishing data on both species from the last five years were analysed.

Shrimps

A trial fishery of shrimps has been carried out with traps by the Department of Oceanography and Fisheries of the University of the Azores around the coasts of the islands down to 200 fathoms. Five species were found whereof four have not been recorded from the Islands before. The experiment will continue at greater depths.

Spain - Espagne

(A. Pérez Camacho)

Penaeus japonicus and P. keraturus

Studies were carried out to determine the response of these two species to sexual maturation and spawning induction techniques, egg production per female and survival to the adult stage. The use of feed in the diet was tested, and research was conducted on the resistance of both species to pathogenic agents and the use of chemotherapy products.

Sweden - Suède

(Hans Hallbäck)

Homarus vulgaris

Commercial catches are still decreasing, some catch data were collected.

Cancer pagurus

Catches are still good, collection of catch data continued.

Nephrops norvegicus

The fishery with trawls and creels for Nephrops is very intensive in the Kattegat and the Skagerrak. About 4,000 Nephrops have been tagged. Collection of catch data continued.

Pandalus borealis

Collection of data and samples for demographic and population analyses continued. Test trawling with the Norwegian "Campelen" shrimp trawl has been carried out during the spring of 1988 in the Skagerrak.

United Kingdom - Royaume Uni 1) England and Wales

(R.C.A. Bannister)

Sampling

The collection of lobster, crab and Nephrops landings, effort and market sampling information by the Sea Fisheries Inspectorate has continued to be supplemented by scientific staff and contractors using log books and a census approach, together with field studies and experimental work (see Table 3).

Cancer pagurus

The fishing industry is being consulted about a proposal to raise the crab minimum landing size in those areas presently subject to the smallest regional size limit of 115 mm carapace width. This proposal was based on an assessment for the east coast carried out using length cohort analysis.

The 12 month detailed survey of the English Channel crab fishery was completed and the analysis of landings, discards, effort, CPUE and size-composition data has commenced.

A cruise to describe the distribution and abundance of larvae in the Channel is planned for June 1989, while sampling of ovigerous crabs for fecundity estimation has continued. Sampling was begun to describe male and female maturity, and to study reproductive processes.

Attempts have been made to observe ovigerous crabs in areas subjected to gravel extraction by trying several underwater observation techniques (diver, TV, remote observation vehicle) but have so far been unsuccessful.

Crab catches on the east coast were reported to be above average in the 1988 winter, but well below average during the normal summer fishing season, a result claimed to be a warm winter effect.

Homarus gammarus

A variety of observations continued to be collected on east coast study areas. Thus collection of detailed size composition and catch per effort for the fishery at Bridlington, Yorkshire,

continued. Trials with escape gaps in pots fished in the same fishery showed that the catch of undersized lobsters (and crabs) could be reduced. Trawl caught lobsters were sampled at sea during the winter off Bridlington and differed in size compostion from samples caught in traps in the summer. Collection of new information for a small fishery off the Suffolk and Essex coast commenced. General stock assessment and stock-recruit studies continued.

At the Bridlington, Yorkshire, stock enhancement site the final release of 7,440 microtagged hatchery reared juveniles brought the total to 5,4218, to complete the 5 year release phase. A total of 3,514 lobsters, mainly undersized, were tested by tag detector, and 26 recaptures were identified, all from the early (1983/4) releases. Mark-recapture trials, to estimate local stock density and emigration, continued. Stock enhancement experiments at other sites in Orkney (conducted by Sea Fish Industry Authority) and at Aberystwyth in Wales (conducted by the North Wales and North Western Sea Fisheries Committee) continued, yielding respectively 44 and 8 microtagged recaptures. At Conwy, a laboratory experimental study of juvenile burrowing and feeding behaviour continued.

Nephrops norvegicus

Distribution, abundance and size composition were estimated by trawl survey in the Farn Deep, North Sea fishery. Trap caught animals (2,000) were tagged with a persistant tag and released. Sampling of discards continued and fecundity estimates made. The 1987 larvae survey gave a low estimate of spawning stock biomass. An hypothesis of biennial spawning was tested by two short larvae surveys in May and July 1988. Larval abundance in May was higher than in 1987, and similar to the 1976 survey estimate.

Monitoring of the eastern Irish Sea fishery continued. A study of larval development and temperature has been written-up for publication. We provided the chairman for the Nephrops Study Group which met in Coleraine, N. Ireland to study growth variations in relation to density, substrate and fishing intensity.

Table 3 Crustacean market sampling in England and Wales, 1988.

Species	Area	Nos measured
Nephrops norvegicus	IVb	10,165
	VIIa	4,096
Homarus gammarus	IVb	4,107+
	IVc	138
	VIId,e	317
	VIIa	1,054
Cancer pagurus	IVb	2,269
	IVc	1,113
	VIId,e	7,194*
Maja squinado	VIIe	512
Palinurus elephas	VIIe	92

+ excludes sampling at Bridlington during field projects.
* exludes 67 shorebases and 13 at sea samples, i.e., about 10,000 crabs, collected during special 12 months project.

2) Scotland

(J. Mason)

Nephrops norvegicus

Commercial trawl and creel landings were regularly sampled at the main fishing ports and research vessel surveys were also conducted on the main stocks. Regular monthly sampling of selected sites in the Firth of Clyde continued to provide information on the variability of growth, maturity, size and abundance data.

Further recaptures of tagged Nephrops in Loch Torridon demonstrated the effectiveness of cuticle implant tags and confirmed that eye damage has little effect on subsequent growth and survival. Studies were made on the survival rate of Nephrops discarded by commercial trawlers.

Field and laboratory experiments showed that sound detection in Nephrops was confined to the near-field of the source.

Pandalus borealis

Monitoring of commercial landings and research vessel catches was carried out for the Fladen (area IVa) and Farn Deep (area IVb) fisheries.

Homarus gammarus

Monitoring and sampling of lobsters contained in all the main fishing areas. The collection of catch per unit effort (CPUE) data continued to expand. A new CPUE form is due to be introducted which will include all creel-caught species.

Growth studies are continuing on a west coast lobster population. Information collected so far has allowed some examination of the two components of growth rate, i.e. moult increment and moult frequency, and also a consideration of overall growth rate by using the anniversary method.

Acoustic tracking studies were carried out on five lobsters simultaneously. Preliminary results indicated that the lobsters were relatively inactive.

The artifical reef of Dunbar was studied in detail. Underwater TV and photographic cameras were employed and fishing over the reef was carried out using creels, trammel and gill nets. Much of this work was carried out with the collaboration of the Gatty Marine Laboratory, University of St. Andrews. Results suggest that the reef is supporting a more abundant fish population than the surounding area.

Lobster storage facilities were routinely tested for Gaffkaemia. No incidence of this disease was reported in Scotland.

Cancer pagurus

Sampling of commercial catches and the CPUE data continued.

The use of artifical collectors to monitor the post-larval settlement of C. pagurus has shown promise.

Liocarcinus puber

Sampling of commercial catches continued at all main ports. Growth studies on an unfished population indicated that males and females (within the range 45-70 mm carapace width) cast once per year, the average increment being 9.1 mm for males and 5.3 mm for females. The technique of using artificial collectors to monitor post larval recruitment also shows promise in this species.

Table 4 Scottish sampling data for crustaceans, 1988.

Species	IVa C	IVa R	IVb C	IVb R	VIa C	VIa R	VIb R
Nephrops							
Jan-Mar	-	-	4,345	-	4,455	2,210	
Apr-June	4,051	-	3,851	-	13,724	1,956	
July-Sept	2,802	-	4,186	5,816	14,174	10,064	
Oct-Dec	3,620	44	4,288	-	15,868	2,014	
Lobster							
Jan-Mar	11		-		-		
Apr-June	-		1,189		97		
July-Sept	-		1,211		1,561		
Oct-Dec	802		1,789		662		
Crab							
Jan-Mar							
Apr-June	1,544		1,081		709		
July-Sept	1,379		441		2,876		
Oct-Dec	626		592		811		
Pandalus							
Jan-Mar	2,139						
Apr-June	1,118		581				
July-Sept		766		810			
Oct-Dec							

C = Commercial (market) samples
R = Research vessel samples

United States - Les Etats Unis

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

Northern Shrimp (Pandalus borealis)

Northern shrimp resources in the Gulf of Maine were evaluated during a trawl survey conducted in summer months. NEFC researchers applied length-based assessment techniques to time series data of length distributions to estimate growth parameters and age composition. Sea sampling of commercial fishing trips was instituted to evaluate by-catch and discard of species taken coincident to the northern shrimp trawl fishery. Maine and Massachusetts researchers continue the development of shrimp separator trawls to minimize the by-catch of finfish. Cooperative stock assessments of the resource were undertaken by scientists from Maine, New Hampshire, Massachusetts, and NEFC, under the auspices of the Atlantic States Marine Fisheries Commission.

White Shrimp (Penaoue cotiferus) and Brown Shrimp (P. aztecus)

White shrimp feeding habits are being investigated in tidal creeks of S. Carolina marshes. Those areas in the creeks from

which the shrimp are feeding and the organisms the shrimp are feeding on are being determined. Those areas found to be critical for the shrimp can then be protected from development and the by-products thereof. Plankton studies are also underway investigating recruitment, and recruitment strength of brown and white shrimp stocks in S. Carolina. Bi-weekly monitoring of brown and white shrimp stocks in marshes, recruitment strength, growth after metamorphosis are being monitored on a long-term basis.

American Lobster (Homarus americanus)

NEFC researchers completed a modeling study of length-based yield and egg production, in relation to exploitation rate and minimum landings size. State of Maine researchers continued intensive monitoring studies of commercial fishery performance and biological characteristics of the catch. Investigators at the University of Maine continued various projects, including a tagging project to evaluate rates of inshore/offshore movement. State of Massachusetts, scientists continued a study of areal variation in fecundity, and a survey of lobster shell condition. A cooperative project evaluating the historical incidence of shell diseases in lobsters and other continental shelf crustaceans was completed. This project was undertaken in response to reports of increased incidence of such disease coincident with the offshore dumping of sewage sludge material. State of Connecticut researchers studied adult population biology, reproductive anomalies, and larval/juvenile abundance. New York researchers evaluated size composition, sex ratio, cull rate, local movements of tagged lobsters, and fecundity.

Blue Crab (Callinectes sapidus)

Researchers at the University of Maryland initiated a project to estimate blue crab abundance, growth rate, recruitment, and total mortality rate of populations in Chesapeake Bay. The approach uses commercial fishery monitoring, combined with a dredge survey for over-wintering crabs, and a tag-recapture experiment. Similarly, Virginia researchers continued a tagging project to determine brood production interval, rate of reproduction, time spent on the spawning grounds, and exploitation rate. The mechanistic causes of blue crab shell dissolution in Pamlico Sound, NC are being investigated by fisheries scientist in North Carolina. This condition may be the result of industrial pollution being discharged into the Sound. Blue crab migratory patterns are being studied by researchers in Florida where some stocks of female blue crabs are migrating northward unexpectedly. Louisiana researchers are investigating molting in blue crabs.

Stone Crabs (Menippe mercenaria)

Florida fisheries scientists are investigating the population genetics of stone crabs in N.W. Florida. A newly discovered species is hybridizing with the local species of stone crab. How these hybrids affect recruitment and population dynamics of the fishery are the main concerns.

USSR - URSS

(S.A. Studenetsky)

Pandalus borealis

In 1988 the Soviet investigations of P. borealis stocks in the Barents Sea and Spitsbergen areas were continued in April-July. A total of 230 shrimp samples were collected and processed. Results of the investigation indicated a subsequent reduction in shrimp biomass from the Barents Sea and Spitsbergen area which was due to the influence of predation and an unregulated fishery. A trend of restoration in abundance was observed in the southern Barents Sea.

MOLLUSCA

Belgium - Belgique

(F. Redant)

Buccinum undatum

A study of the population composition and growth of the whelk, Buccinum undatum, was started in 1988. Its major aim is to describe and to compare growth rates of whelk in different areas, such as the North Sea, the English Channel, the Celtic Sea and the Irish Sea.

Canada

Newfoundland Region and Scotia Fundy Region

(G.P. Ennis)

Illex illecebrosus

An annual survey was conducted on the southwest slope of the Grand Bank during June. Favorable temperatures persisted throughout most of the survey and daytime catches, using bottom trawl, averaged 70 squid per set, about half the overall catch rate of the previous year.

Pre-season abundance indices overall indicated a low resource level for 1988. Low abundance of adult squid inshore at Newfoundland was subsequently realized, continuing the trend of recent years. The low level of abundance limited biological studies in the Newfoundland inshore area. However, some squid samples were acquired for detailed biological analysis. A trap was maintained at one locality to cellect squid catch/effort data, to monitor the relative abundance of potential prey species, and to capture squid specimens for aging experiments.

Placopecten magellanicus

Landings for NAFO SA 4, the Bay of Fundy and Scotian Shelf were approximately 29,800 tonnes round weight for 1988. This is an

increase of nearly three times that of the 1987 landings. In the Bay of Fundy, the Digby beds have experienced record landings in 1988. Commercial catch-rates have been over 25 kg/hm for the most productive areas if the log information available is representative. Meat yields (13-15 g) were good when sampled at the start of the season. Surveys indicate some pre-recruits and appreciable quantities of young recruits. The Scotian Shelf landings have decreased to approximately 830 tonnes round weight in 1988. No catches have been recorded from the western Shelf; catches reported came from the Western Bank - Sable Island area on the eastern side. Catch-rates improved 35% from 1987.

The Georges Bank catches (NAFO SA 5) represent on average 85% of the total annual offshore catches: 1988 was the third and last year of the experimental management plan using enterprise allocations. Under this plan, a heavy targeting of effort was seen on age 5 animals. Research surveys show poor survivorship above this age. The TAC for 1988 was set at 44,820 tonnes round weight. Landings were 36,000 tonnes, which was a 37% decrease from 1987. In addition, a roe fishery started up with 50 tonnes landed. There was a slight increase in effort; however, catch-rates decreased by almost 40% from last year. Research data confirmed this by indicating that recent year-classes have not been as strong as the 1982 year-class.

Stock surveys were carried out on the eastern Scotian Shelf scallop beds, in the Bay of Fundy and on Georges Bank. Research activities are continuing on growth rates and variability in meat yields. Studies on larval distribution are nearly completed.

A survey was conducted on St. Pierre Bank to determine spatial distribution and abundance of sea scallops. Nominal catch from NAFO Div. 3Ps amounted to a record 1,027 tonnes (meats). Residual biomass again points to an active fishery in 1988, but removals are expected to be considerably smaller. The fishery will continue to depend primarily on the 1982 year-class.

Spisula polynyma

The fishery on Banquereau Bank is getting underway. Three Canadian vessels, all converted oil tenders equipped with double dredges, started fishing in 1988, one in July and two in November. Landings for 1988 were 2,859 tonnes round weight, and it is expected that 1989 will be the first year in which the fishery will approach the 30,000 tonnes TAC. The fishery was focused on a very small area of Banquereau Bank and the extent to which the rest of the Bank is commercially viable is still unknown. After the exploratory fishing in 1987 there has been no fishery development on the rest of the Scotian Shelf outside of Banquereau Bank.

Région du Québec et Région du Golfe du Saint-Laurent

(G. Y. Conan)

Placopecten magellanicus

Un relevé expérimental et l'analyse des données de l'exploitation commerciale ont permis d'évaluer l'état des stocks de pétoncles

des Iles-de-la-Madeleine, de la Gaspésie et de la Basse Côte Nord (Golfe du Saint-Laurent). L'effort de pêche et les débarquements sont restés relativement stables en 1988.

Les expériences de photographie sous-marine visant à mesurer l'efficacité de la drague Digby se sont poursuivies pour une seconde année.

Le projet sur le recrutement du pétoncle aux Iles-de-la-Madeleine s'est poursuivi pour une quatrième année consécutive. Des collecteurs ont été immergés au printemps et relevés à l'automne afin d'évaluer la fixation du naissain. En 1988, le nombre moyen de naissains, environ 600 par collecteur, était à son plus haut niveau depuis le début du projet. Au cours de la prochaine année, les travaux porteront principalement sur l'évaluation des stocks et le recrutement.

Une analyse de la structure génétique des populations de pétoncles du golfe du Saint-Laurent est en cours. Les résultats préliminaires donnent à penser que les populations de la Gaspésie et des Iles-de-la-Madeleine seraient distinctes.

L'état de la pêcherie du pétoncle géant dans le sud du golfe du Saint-Laurent a été évaluée en analysant les données provenant d'un programme d'échantillonnage en mer, de journaux de bord, de questionnaires et des statistiques de pêche. Les prises par unité d'effort et l'abondance relative de pré-recrues (pétoncles < 70 mm) calculées en 1988 ont été similaires et quelques fois supérieures aux valeurs calculées en 1987 pour la presque totalité du territoire de pêche. Les pêcheurs n'ont percu aucun problème immédiat qui pourrait suggérer une diminution des rendements pour 1989.

La région située au nord du détroit de Northumberland, entre l'Ile du Prince Edouard et le Nouveau-Brunswick semble être la seule qui pourrait connaître des problèmes & court terme. Les pêcheurs ont signalé des réductions de rendement et une diminution dans l'abondance de jeunes pétoncles. L'analyse des données disponibles pour cette région laisse entendre que l'état général de la pêcherie (prises par unité d'effort et % de pré-recrues) est en décroissance depuis 1986 et qu'aucune amélioration n'est prévue pour 1989.

Des études pilotes sur le pétoncle géant en milieu aquicole ont débuté en 1988, en collaboration avec des aquaculteurs de la côte ouest de Terre-Neuve. La croissance du pétoncle a été étudiée en utilisant deux techniques d'élevage en suspension: les lanternes japonaises et les boucles d'oreille ("ear hanging"). La déposition du naissain sur des collecteurs artificiels a aussi été étudiée. L'objectif était de déterminer la période pendant laquelle les collecteurs devaient être mis à l'eau afin d'obtenir une collecte optimale. Les résultats préliminaires de ces études ont été présentés à l'industrie (aquaculteurs) lors d'ateliers de travail et de sessions d'information.

Chlamys islandica

L'état de la pêcherie du pétoncle d'Islande dans le d'étroit de Belle Isle (Terre-Neuve) a été évalué en analysant les données

provenant d'un programme d'échantillonnage au port et des statistiques de pêche. La campagne d'échantillonnage annuelle n'a pas eu lieu en raison de problèmes techniques.

L'effort déployé vers le pétoncle d'Islande en 1988 a été considérablement plus faible qu'en 1987 en raison d'une diminution du nombre de pêcheurs actifs. Cette diminution a été le résultat d'une chute du marché du pétoncle et par conséquent, les données obtenues de l'exploitation commerciale ont permis d'évaluer l'état des stocks de la côte nord du golfe du Saint-Laurent. Une baisse importante des captures a été notée en 1988 dans le secteur de la Moyenne Côte-Nord, causée principalement par une forte diminution de l'effort de pêche.

Mytilus edulis

Les travaux sur la répartition spatiale des structures d'élevage des moules se sont poursuivis. Ces travaux visent entre autre à évaluer l'effet de la resuspension de la nourriture, de l'adaptabilité et de la selectivité alimentaire sur la croissance des moules.

Buccinum undatum

Des expériences sur l'aire d'attraction des casiers & bassins ont débuté en 1988 et seront poursuivies en 1989. Par ailleurs, des travaux sur l'âge et la taille de maturité sexuelle ont été entrepris afin de recommander une taille minimale de capture qui permet de protéger le potentiel reproducteur de la population.

Denmark - Danemark

(Sten Munch-Petersen)

Mytilus edulis

Investigations of mussels in the Danish Wadden Sea were continued by the Danish Institute for Fisheries and Marine Research. Considerable effort has been put into methods of delineating mussel beds, including aereal survey techniques for estimating their densities. Another extensive mapping of mussel beds in the Wadden Sea was conducted by the Institute of Genetics and Ecology, University of Århus.

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

Faroe Islands - Iles Féroé

(A. Nicolajsen)

Chlamys opercularis

A research survey was conducted to determine the state of the commercially exploited queen scallop stock east of the islands. Underwater video recordings were made to assess the abundance in

selected unit areas. Comparison between actual catches and abundance is hoped to reveal the magnitude of the effectivity of the commercial dredge. The selectivity of the commercial dredge was determined by covering half of the dredge by small meshed net and comparing the height distributions from the two bags.

Monthly biometric and nutritional measurements began in 1987 and after a pause continued this year. Work is being conducted to determinde growth rates.

France

(D. Latrouite)

Venus verrucosa

L'année 1988 se traduit par une nouvelle diminution de la production qui est actuellement de l'ordre de 1 400 tonnes pour l'ensemble du golfe normand-breton. En moyenne, les rendements ont chuté de 30% en deux saisons et se situent autour de 15 kg/h. L'échantillonnage biologique ne révèle aucun indice de redressement prévisible à court terme. L'agumentation du prix moyen au kilo contribue à maintenir le caractère attractif de cette activité, dont l'importance économique dans le golfe normand-breton est, en 1988, du même ordre de grandeur que celle de la coquille Saint-Jacques.

Tapes rhomboïdes, Spisula ovalis et Glycymeris glycymeris
T. rhomboïdes = palourde rose
S. ovalis = spisule
G. glycymeris = amande

Manche-Ouest

Golfe normand-breton: Des compléments d'évaluation directe ont été réalisés sur les zones prometteuses du golfe normand-breton; il apparaît une relative stabilité des populations de palourdes roses, reposant sur plusieurs classe d'âge. Les gisements de spisules sont dominés par l'importante classe d'âge née en 1985, les cohortes 1986 et 1987 étant respectivement faible et nulle.

En matière d'exploitation, on observe en baie de Saint-Brieuc un développement de l'activité avec plus de 500 tonnes de palourdes roses et 150 tonnes de spisules, en 1988, alors que les bancs de l'Ouest Cotentin sont restés inexploités.

Iroise: Dans le Nord Iroise, une prospection à la drague n'a mis en 'eidence aucune concentration de bivalves justifiant une exploitation. La zone Sud Iroise a constitué depuis deux ans le principal centre de production de spisules avec une production de l'ordre de 3,500 tonnes en 1988. Une campagne d'évaluation directe a montré que les gisements monocohortes (1979) étaient en cours d'épuisement. Aucun recrutement significatif n'a été observé sinon sur un seul gisement (cohorte 1986).

Golfe de Gascogne

Sud Bretagne (Concarneau & Houat): L'étude des bancs de spisules

de la baie de Concarneau montre, sur le banc des Moutons, que la cohorte 1981 a étE presque totalement exploitée tandis que la cohorte 1986 présente une croissance correcte et une survie faible. Le banc de Leuroiu, constituté uniquement de la classe d'âge née en 1984, a été exploité en 1987-1988. Le banc de Boulanger, qui n'était plus productif depuis plusieurs années, a connu un recrutement important en 1986. A Belle Ile, le banc d'Arzic, constitué essentiellement de la classe 1981, et à sa périphérie de la classe 1986, exploité en 1987 et 1988 a subi une mortalité massive par les étoiles de mer.

Pays de Loire (Le Croisic à Noirmoutier): Des prospections qualitatives à la drague ont mis en évidence quelques concentrations de spisules des cohortes 1984 à 1986, dans les secteurs de la Banche et de la baie de Bourgneuf.

Vendée (Yeu à Oléron): Le gisement de spisules de Jard-sur-Mer a connu, au cours de l'année 1987, une forte mortalité par les étoiles de mer; en 14 mois, le gisement a perdu plus de la moitié de l'effectif global, toutes classes d'âge confondues, et le tiers de la biomasse. Avec plus de 15,000 tonnes, ce banc reste le plus important du golfe de Gascogne, mais il est fortement sous-exploité (275 tonnes en 1988).

Une prospection a été conduite sur le banc de spisules de la Sablaire à l'Île d'Yeu. Ce gisement a bénéficié d'un fort recrutement au cours de l'année 1986. Le banc est actuellement uniquement constitué de cette classe d'âge dont l'exploitation n'est pas envisageable avant l'été 1989. Selon le taux de croissance et la survie, la biomasse se situera alors entre 4 000 et 6,000 tonnes.

Les recherches entreprises dans les Pertuis breton et d'Antioche ont montré la présence de quelques spisules ne présentant par actuellement un intérêt en matière d'exploitation.

Evolution de l'exploitation

L'exploitation poursuit son développement, en particulier pour la spisule. Les apports se situeraient en 1988 à plus de 8000 tonnes, dont 5,300 tonnes de spisules, 2,300 tonnes d'amandes et 700 tonnes de palourdes roses, pour une valeur globale supérieure à 25 MF. 40 unités de petite pêche sont concernées par cette activité, pour la plupart toute l'année.

Le taux d'exploitation est très variable selon les secteurs: important en Bretagne Sud et Iroise, faible sur le banc de Jard et en baie de Saint-Brieuc, et nul dans l'Ouest Cotentin.

L'importance des mortalités par prédation sur les gisements peu profonds de spisules conduit à suggérer une stratégie d'exploitation plus opportuniste de ces gisements qui, indépendamment de toute action de pêche, connaissent des fluctuations considerables du recrutement. Dans la mesure où le recrutement apparaît limité par la présence de cohortes préexistantes à de fortes densités, la pêche peut avoir un effet positif dans le renouvellement des générations.

Buccinum undatum

Malgré une absence de transparence, liée à la désorganisation de l'exploitation, la production en 1988, essentiellement concentrée dans le golfe normand-breton, semble d'être maintenue autour de 5,000 à 6,000 tonnes. En raison de la baisse de rentabilité de l'activité, la flottille de bulotiers a diminué mais l'effort de pêche individuel a augmenté. Ces unités, qui avaient pour activité unique la pêche du buccin au casier, tendent à se diversifier, en particulier vers les métiers du crustacés au casier mais aussi vers les lignes et les filets.

Mytilus edulis

L'etude des moulières en eau profonde de l'Est Cotentin (secteur 7D), entamé en 1981, s'est poursuivie en 1988 avec une prospection printanière par dragage sur les principaux gisements: Barfleur, Reville, Ravenoville.

Les rendements observés au cours de cette campagne ont mis en évidence un stock exploitable issu d'une fixation de naissain en 1986. En conséquence, après deux années d'interdiction totale d'exploitation liée à des défauts de recrutement, ces gisements ont été réouverts à la pêche et la production en 1988 s'est élevée à près de 3 800 tonnes.

Pecten maximus

Les principaux stocks de coquille Saint-Jacques du littoral Atlantique et de la Manche restent à un niveau d'exploitation très élevé malgré des ressources à un très faible niveau. La production nationale ne devrait pas dépasser 5,000 tonnes, ce qui marque une importante diminution par rapport à l'année précédente.

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

Baie de Saint-Brieuc

Le total de 2,100 tonnes a été enregistré pour une saison de pêche 1987-1988 limitée à 9,000 heures de pêche. La décision de restreindre la quota global d'effort (20,000 heures environ les années précédentes) avait été prise pour conserver une partie du stock existant en vue de la campagne 1988-1989 qui s'annoncait catastrophique. De plus, les jeunes coquilles (nées en 1985) n'avaient pas la taille habituelle et une campagne normale se serait traduite par de nombreux tris et rejets à l'eau provoquant une mortalité additionnelle importante.

La saison s'est donc déroulée avec une pêche prudente de deux jour par semaine avec une heure de pêche, une longue interruption en janvier et une clôture en fin mars avec le même rythme.

De plus, une zone de près de 6,000 ha est restée fermée au dragage car elle contenait un grand nombre d'animaux n'ayant pas la taille marchande.

Des mortalités importantes ont été observées au cours de la fin de l'hiver 1987-1988 sur les adultes. Ce phénomène a déjà été noté à la même époque en 1985-1986 et 1986-1987.

Manche-Est

Les captures sont en constante diminution et la saison 1987-1988 n'a permis que 2,600 tonnes de capture (- 22%). Les gisements se divisent en deux zones: la baie de Seine et le reste de la Manche-Est. La baie se caractérise par une pêcherie reposant à 50% sur une seule classe d'âge, le recrutement, et donne lieu à une exploitation intense de durée très brève. Les captures des autres zones sont plus équilibrées mais restent à des niveaux faibles en raison d'une série de mauvais recrutements.

Aquaculture extensive

Les travaux sur la production de juvéniles en aquaculture et le semis sur des zones réservées interdites à la pêche se sont poursiuvis en rade de Brest et en baie de Saint-Brieuc. Près de 3 millions d'animaux de 30 mm ont été produits en 1988.

Federal Republic of Germany - République Fédérale d'Allemagne

(K. Tiews)

Mytilus edulis

Monitoring of blue mussel beds along the German North Sea coast and in the Flensburg Fjord has been continued by the Institut für Küsten- und Binnenfischerei. Management advice has been formulated regarding the optimal utilization of the mussel resources in the Flensburg Fjord. There was no new occurrence of DSP in 1988 on the German coasts. The last DSP case was in 1986/87, when from October 1986 to January 1987 the sale of blue mussels harvested at the Niedersachsen coast had to be prohibited because of several cases of DSP.

Cerastoderma edule

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

Iceland - Islande

(H. Eriksson and U. Skúladóttir)

Chlamys islandica

An annual stock abundance dredge survey was carried out in March-April in the Breidafjordur area, W. Iceland. A slight decrease was observed in the stock abundance index based on over 100

standardized tows. A slight decrease was also observed in the CPUE, from 962 kg per hr fishing in 1987 to 945 kg in 1988. However, due to continued marketing difficulties, landings dropped very considerably from 13,500 tonnes in 1987 to about 10,000 tonnes in 1988.

A small-scale Iceland scallop culture project was initiated in Breidafjordur, W. Iceland, involving hanging cultures of 2-4 year-old scallops as well as spat collectors.

Ireland - Irlande

(J.P. Hillis)

Ostrea edulis

The occurence of Bonamiasis in free-growing stocks in Cork Harbour (Dept. of Zoology, University College, Cork).

Cerastoderma cardium

Incidence of haemic neoplasia ((Dept. of Zoology, University College, Cork).

Mytilus edulis

Spawning patterns in shore populations in Bantry Bay (Dept. of Zoology, University College, Cork).

Intertidal mollusca

The impact of predation by Crows, Corvus corone (Dept. of Zoology, University College, Cork).

The Netherlands - les Pays Bas

(R. Dijkema)

Mussel Culture

Fishery for mussel seed was successful in 1988, which in most cases prompted the mussel growers to seed mussels on their plots in high densities. A considerable part of the mussel stock in the Waddenzee, which usually yields 75% of the total mussel landings, was swept away from the plots during storms, which reduced the share of this area in total landings to 50%. Thanks to the low production, auction prices were high, resulting in an unprecedentedly high total landing value. The high losses caused record profits for a number of mussel growers, but on the other hand economic problems for others, according to the area of plots they are leasing in storm-sensitive areas.

In the Waddenzee, a research project was initiated into the extent and causes of storm mortality of mussels, in view of the possible allocation of alternative plots in the Eastern Waddenzee. The research project into the functioning of mussel cultivation plots in the Oosterschelde, carried out in cooperation with the Tidal

Waters Department of the Ministry of Transport and Public Works, was continued in 1988. The investigations were ultimately aimed at effects of the flood barrier in the Oosterschelde. Before the construction of this barrier, the maximum current velocity played a determining role for the area where mussel culture is possible. After conclusion of the barrier construction, however, current velocity ceased to be a limiting factor. During the investigations in 1988, the role of food supply in relation to growth and condition index (meat yield) of the mussels was investigated in more detail. Before construction of the barrier, growth and condition of the mussels showed a downward gradient for the mouth of the Oostenschelde in inland direction. After 1987, this gradient has almost disappeared. For 1987 this could be explained by the high primary production in that year, which was discovered to be significantly related to mussel condition. In the mouth of the oosterschelde, mussel growth did not correspond with primary production. This is ascribed to a decreased import of phytoplankton from the North Sea due to a lower tidal exchange. Decreased growth rate of mussels in the mouth of the Oosterschelde are also supposed to be caused by siltation of a number of plots after local current reductions. A preliminary conclusion is that the location of the mussel plots in the mouth of the Oosterschelde, the positioning of which was once based on current velocity, will have to be reconsidered. It is thought probable that a rearrangement of a number of cultivation plots will result in a more balanced consumption of the available food and hence in a more efficient food utilisation in the Oosterschelde by the filter feeding organisms present.

With the aim to assess new opportunities for mussel cultivation plots, 40 experimental plots with a total surface area of about 500 ha were leased on locations dispersed over the western and central part of the Oosterschelde. On a selection of these plots, growth rate and meat yield of the mussels are being investigated. A decision as to the permanent use of these plots will be taken in 1991.

An ecosystem model, aimed at predicting carbon fluxes in the macrobenthos and water phase of the Oosterschelde was completed and will be validated during the next two years. Also for the Waddenzee an ecosystem model is being developed.

Oyster culture

After the outbreak of the oyster disease Bonamiasis in the Oosterschelde in 1980 and a ban on flat oyster (Ostrea edulis) culturing until 1987, this epizooty also broke out in Lake Grevelingen, presumably as a result of the transfer of diseased oysters from the Oosterschelde. Spatfall was moderate in 1988, but an abundant stock of marketable oysters of year class 1987 is present in the lake at this moment. It will depend on the speed of spreading of Bonamia whether a good harvest can still be expected in 1989/1990.

Changing research priorities caused a decrease in the effort of oyster research. Concentrations of oyster larvae were still monitoried on a limited scale during the summer months, also incidental counts were made of oyster larvae settlement on mussel shells. Highest concentrations of oyster larvae amounted to 3,243

larvae per 100 litre water. A week after settlement, a mean density of 2-5 spat per shell wa counted.

After the recent constatation of the presence of Bonama ostratae in the lake, a stock assessment was carried out in order to dispose of baseline data of the population densities before the outbreak.

The lifting of the ban on oyster cultivation on the Bonamia-stricken cultivation plots in the Oosterschelde in 1988 did not result in intensive restocking of this water body with seed oysters from Lake Grevelingen by the industry. Only one grower stocked his plots with see oysters from the lake, the other firms seeded only leftover oysters from their storage basins. These oysters, mostly undersized and malformed individuals, are expected to have a possible negative influence on the genetic constitution of the population of O. edulis in the Oostershelde, which is at present almost anihilated due to the cultivation ban and by the mortality caused by the disease. It has been strongly recommended that this kind of oysters, which also has demonstrated an increased susceptility for Bonamia infection, be destroyed instead of re-seeded.

Culture of C. gigas has undergone some expansion during the recent years, mainly because cultivation plots became available after the outbreak of Bonamiasis in the Oosterschelde. Natural spatfall still the only source of raw material for this culture, the support of a hatchery/nursery system is deemed necessary to ensure a more stable supply of seed oysters. Meat quality has slowly improved over the last five years, as more experience is being built up by the growers with this relatively new organism. This resulted in better export possibilities, as the quality in many cases appeared competititve on the export market. The low prices on the European market, however, left little margin for profit.

Cockle Cerastoderma edule fishery and cultivation

The manual fishery for cockles intensified in 1988, the fishermen mainly delivering to the canning industries. A small amount of fresh cockles was exported to Belgium. Mechanical cockle fishery was restricted to the Waddenzee and the North Sea coast. From the latter area a record yield of 18,000 tonnes (fresh weight) was landed.

Seeding of cockles from the Westerschelde area to cultivation plots in the Oosterschelde was continued in 1988 on a small scale. Growth rate and meat yield of these cockles were investigated. Growth rate appeared to compensate mortality and was much higher than on the locations of origin. Loss of cockles occurred to a large extent during the first hour after seeding. Differences in burrowing velocity of the seeded cockles were observed, probably caused by differences in vitality due to capture and transport stress. The use of a bottom grab for sampling to assess distribution of cockles was judged to function unsatisfactorily because of the immense patchiness of cockle populations. A towed sampling gear is being developed which continuously samples a narrow furrow at the bottom and also proved to have a higher sampling efficiency on hard bottoms.

Cut through shell (Spisula subtruncata) fishery

Like in 1987, local banks of this species were fished at the North Sea coast. The product was cooked and exported deep-frozen.

Whelk (Buccinum undatum) fishery

An unknown quantity of whelks was landed, mostly as by-catch of the bottom trawl fishery for flatfish.

Production figures

Species	Yield in tons x 10^3	Value in US$ x 10^6	Number of Firms
Mytilus edulis (Cultivation)	70.5	38.5	79
Ostrea edulis (50% cultivation)	1.0	8.9	16
Crassostrea gigas (Cultivation)	0.7	1.8	14
Cerastoderma edule (Cultivation)	0.3	0.1	3
Cerastoderma edule (Fishery)	58.8	17.5	36
Cut through shell	0.5		2
Buccinum undatum (Fishery)	?		

Norway - Norvège

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

Chlamys islandica

Investigations of the populations of C. islandica near the island of Jan Mayen, and in the areas near Björnöya (Bear Island) and Spitsbergen were continued in 1988 (Norwegian College of Fishery Science/University of Tromsö with Institute of Marine Research/Directorate of Fisheries Bergen). Various population parameters, such as size and demography, density of distribution and the degree of fouling by barnacles were studied. In addition, an investigation on the effect of the scallop fishery on the scallop bed communities were conducted in conjunction with the project mapping scallop resources. Sampling and surveying were conducted by dredging and use of underwater video recording equipment. Studies of the genetic variability of scallops from different geographical regions were continued by the University of Oslo in conjunction with the University of Tromsö.

Todarodes sagittatus

There was a relatively small invasion of the European flying squid to the coast of northern Norway in the autumn of 1988. Investigations of this species thus were relatively limited. Although there were some trials carried out by the Norwegian College of Fishery Science/University of Tromsö to measure target strength, little further progress was made towards the goal of developing acoustical methods for stock assessment.

Mytilus edulis

Monitoring of algae which may contain toxins affecting mussels was performed by the Directorate of Fisheries/Flødevigen throughout 1988. DSP and other toxins were monitored by mouse bioassay. The content of DSP in mussels prohibited their sale throughout most of the year, especially in the Skagerrak and Sognefjord areas.

Ostrea edulis

Experiments concerning growth and mortality of oysters on the Skagerrak coast were continued by the Directorate of Fisheries/Flødevigen during 1988. Hydrographic conditions in potential oyster polls were studied in the same region.

Poland - Pologne

(NO REPORT ON MOLLUSCA)

Portugal

(M.J. de Figueiredo and C. Sousa Reis)

Bivalve Molluscs

Surveys on the distribution, biology and economic potential of some species of this group, particulary Spisula solida, Solen marginatus, Ensis spp., Cerastoderma edule and Venerupsis pullastra, were carried out along the Portuguese coast by the Instituto Nacional de Investigação das Pescas (INIP).

Biological studies on Solen marginatus were started by INIP in the coastal lagoon "Ria Formosa" of south Portugal.

Cephalopods

A sampling program was established by INIP to get information on the distribution as well as some biological parameters of some species of squids captured by bottom trawl in surveys directed to demersal fishes and crustaceans along the Portuguese coast.

A specific program was started by INIP on the distribution and biology of the octopus Eledone cirrosa captured off the Portuguese coast.

Loligo forbesi

This and other cephalopods are being sampled by the Department of Oceanography and Fisheries of the University of the Azores for electrophoretic analysis in order to establish possible genetic differences between our populations and those of continental Europe. Analysis of mercury content in squid muscle as well as analysis of heavy metals in squid livers has been carried out and will continue.

A trial fishery was started in the central group of Islands, followed up by biological studies by the Department of Oceanography and Fisheries of the University of the Azores.

Tapes decussatus

Comparison of growth between the original population in S. Jorge Island and the transplanted population i Pico Island has been carried out by the Department of Oceanography and Fisheries of the University of the Azores. Reproduction has also been studied in S. Jorge.

Patella spp.

Limpet studies were continued by the Department of Oceanography and Fisheries of the University of the Azores. In 1988 special emphasis was given to studies of reproduction of Patella candei in order to find out whether it has seasonal reproduction, and recommend a minimum size of exploitation.

Spain - Espagne

(A. Pérez Camacho)

Mytilus galloprovincialis

Of the molluscs, the mussel is by far the most important species in Spanish aquaculture. Production is estimated at about 220,000 tonnes annually.

There has been an increase in studies done on this species, covering genetic variability, productive characters, reproduction, energy processes (e.g. consumption, egestion, digestive efficiency), histophysiology of energy reserves, viability of eggs and larvae in relation to their biochemical composition, parasites and predators. An international symposium on this species is planned to be held in Galicia, NW Spain, in November 1989.

Ostrea edulis

Studies are still being carried out on the pathology of this species, mainly concerning infections by Marteilia and Bonamia, as well as on spat collection, the reproductive cycle, larva abundance and methods of culture. Larva and spat nutrition and energy processes are also being studied. Different types of live and inert food (microcapsules) are being tested.

Venerupis spp. and Cerastoderma edule

Current production of these species is around 2,000 and 3,000 tonnes annually respectively. Studies are being carried out on distribution areas, density, size and age of the different populations. Histo-enzymological and histochemical studies have been conducted on V. decussata.

Ruditapes philippinarum

Research has been conducted on the effect of diets of different species of phytoplankton on the growth and survival of this species, and on its culture on sea bottoms as well as hanging from ropes. Several histo-enzymological and histochemical studies have also been carried out.

Pectinids

Studies continue on their distribution, spat collection and fattening experiments, as well as on larval nutrition.

Sepia officinalis and Sepia elegans

Several aspects of the biological cycle of these species (distribution, growth, fertility, season and place of spawning) and native diet have been studied. The diet of S. officnalis using feed was analyzed; a new method of capturing prey was described, as well as the incidence of prolonged fasting on the content of total lipids, phospholipids, fatty acids, sterols, carbohydrates and proteins.

Loligo gahi

Studies have begun on its diet.

Necora puber

Studies were carried out on post-larval growth in the laboratory.

Polybius henslowii

Studies continue, concentrating on diet, reproductive cycle, maturity, fertility and growth.

Liocarcinus arcuatus and L. derator

Research has been started on their diet, with a view to determine the incidence of raft-cultured mussels and their associated epifauna.

Sweden - Suède

(H. Hallbäck)

Mytilus edulis

There are still problems during some periods with toxin from Dinophysis, specially from the northern part of the Swedish west coast. About 2,000 tons of Mytilus were landed during 1988.

United Kingdom - Royaume Uni

1) England and Wales

(R.C.A. Bannister)

Cerastoderma edule L.

Surveys of stocks in the Burry Inlet, Wales (VIIf) and in the Thames Estuary (IVc) were completed. In the Wash (IVc), survival and growth of the 1986, 1987 & 1988 year-classes was monitored in a study area subjected to intermittent suction dredging.

Mercenaria mercenaria

The biennual survey of the introduced stock in Southampton Water (VIId) was undertaken.

Mytilus edulis L.

The annual survey of intertidal stocks in the Wash (IVc) continued using quadrat surveys in conjunction with aerial photography.

Pecten maximus L.

Surveys were undertaken in the Cornish (VIIe) and Irish Sea (VIIa) fisheries, using dredges and a camera sledge to investigate abundance and patchiness. The efficiency of fine-mesh dredges and epibenthos samplers were measured using 1 & 2 year old cultivated seed relaid onto an experimental plot off Cornwall. Further hydroid and bryozoan samples were collected for settlement studies. The determination of age and growth rates, employing stable oxygen isotopes techniques, was completed for stocks in VIIa, VIIe and VIId.

A detailed study of trends in the south west channel fishery continued, using historical survey and size composition data, and a combination of fishery officer records and fishery log books. A programme of size composition sampling of the commercial fishery has recommenced after a lapse of several years. Modelling studies on scallops populations have commenced.

Ostrea edulis L.

The annual grab survey of adult stock in the Solent (VIId)

continued, and the biennual survey of the Fal stock (VIIc) was undertaken.

Disease monitoring for Bonamia continued. No new areas of infection were detected. Although production is now reduced in the hardest hit areas, individual cultivators have maintained some production in infected areas by relayed disease free stock and restricting the period of lay to one season, leading to as complete a removal as possible for sale, followed by clearance of residual stock.

Studies of fecundity and larval abundance for the Solent stock have continued.

2) Scotland

(J. Mason)

Pecten maximus and Chlamys opercularis

Monitoring of the main scallop (Pecten maximus) and queen (Chlamys opercularis) fisheries continued. Scottish landings of scallops remained around 4,000 tonnes and landings of queens rose from approximately 3,000 to 4,000 tonnes. CPUE rose slightly in the main scallop fisheries and pre-recruit dredge surveys by FRV "Goldseeker" showed evidence of recent improved recruitment. Queen CPUE from the main north Irish Sea fishery continued to fall.

The study of settlement of both species on artificial collectors continued on the west coast. Settlement of queens was again generally better than that of scallops. 1988 was a poor year for settlement, the worst collected since experiments began in 1982, although growth of the settled animals was especially good. The studies will continue in an attempt to establish a correlation between settlement and subsequent recruitment to the fisheries.

The effect of light and water currents on the movement and orientation of juvenile scallops (Pecten maximus) was studied in June 1988. The light experiments were carried out in an aquarium using a source filtered to give a transmittance curve similar to the spectral sensitivity of a scallop. At the light levels studied, 0.003-0.06 uE m2 s-1, the scallops were positively phototactic ($P < 0.001$). There was also some evidence to suggest that scallops orientate to both light and current. However, further work is required to confirm this.

Squids

Studies on the population structure and stock identity were carried out on Loligo forbesi. Samples were obtained from the major fishing areas, and some research vessel time was devoted to examining the squid stocks at Rockall. Samples of Alloteuthis subulata were also obtained for examination from area IVb.

Pests and diseases of molluscs

During 1988 samples of consignments of bivalve molluscs for deposition i Scottish waters continued. The species involved were Crassostrea gigas and Tapes philippinarum. During the summer months mussel samples for examination for PSP contamination were collected at a number of sites on the east and west coasts of Scotland. No dangerous level of toxin was detected in any of the samples from Scottish waters.

During the year the number of farming operations registered under the "Registration of Fish Farming and Shellfish Farming Business Order 1985" continued to increase. By the end of the year, 200 shellfish farms had registered with the Department of Agriculture and Fisheries for Scotland. During the year the programme of visits to farms in relation to pest and disease monitoring continued. Apart from small areas of the Clyde known to be subject to Mytilicola infestation no known pests and diseases of bivalve molluscs were found.

Anti-fouling and molluscs

Following the banning of the use of tributyl tin (TBT) based antifoulants in inshore areas the levels of TBT in cultivated molluscs declined. Effort in this area is reduced.

Table 5 Scottish sampling data for Mollusca, 1988.

Species	IVa C	IVa R	IVb C	IVb R	VIa C	VIa R	VIb R
Queen							
Jan-Mar					440		
Apr-June					1,976	634	
July-Sept					3,952		
Oct-Dec	1,418				3,170	80	
Squid							
Jan-Mar		108		1,661	289		
Apr-June							
July-Sept		165		1,379			1,550
Oct-Dec		1,704		144			

C = Commercial (market) samples
R = Research vessel samples

United States - Les Etats Unis

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

Various state and federal agencies conducted or supported surveying efforts for bivalva mollusks and squids. The Northeast Fisheries Center (NEFC) conducted spring and autumn bottom trawl surveys of the region from Cape Hatteras to the Gulf of Maine. These trawl surveys were used to index the abundance and distribution of

squids. A directed dredge survey for sea and Iceland scallops was also completed by NEFC. Trawl and dredge survey programs underway in various states (i.e. Massachusetts, Rhode Island, Connecticut, New Jersey, Maryland, Virginia, Georgia, Florida, Louisiana, Texas) provided considerable data on the populations of exploited molluscs in these regions. Recent regulations compelling the various states to "certify" the sanitary conditions of shellfish growing waters, have resulted in significant new programmes for routine testing and monitoring of shellfish and their habitats. Research into bivalve diseases and marketing of bivalve fisheries in the face of diseases is providing valuable aids to management methods in Louisiana and the Gulf States. South Carolina Sea Grant has a study geared to development of aquaculture aimed to the legal aspects and improved aquaculture legislation in the state.

American Oyster (Crassostrea virginica)

Research on American oyster stocks is primarily concentrated in three areas; (1) evaluation of the effects of fishing on the age structure and abundance of natural populations, (2) evaluation of the effects of naturally-occurring diseases, and potential methods for ameliorating disease effects, and (3) oyster culture and propagation methods. Researchers in New Hampshire, New Jersey, Delaware, Maryland, Virginia, Louisiana, and Texas have conducted extensive surveys of natural populations, and the communities associated with them (LA & TX). Projects conducted at Rutgers University, the University of Maryland, and the Vriginia Institute of Marine Science seek to develop and distribute more disease-tolerant strains of oysters, and to identify integrated strategies to manage wild stocks to reverse drastic declines seen in Delaware Bay and Chesapeake Bay. South Carolina researchers are developing and testing the feasability of using non-traditional techniques of oyster culture, and studying the relationship between oyster diseases (MSX and DERMO) and climatic conditions, specifically drought periods. In Louisiana a state project is underway to divert waters of the Mississippi river to provide fresh water to oyster areas in an attempt to return these areas to traditional salinities which have been altered by the builiding of canals, boat access channels and shipping lanes. The increased salinities in the marshes is thought to be a major contributor to the spread of these diseases (MSX and DEMO). A project designed to evaluate the effect of temperature, salinity and currents of recruitment, growth, mortality, and optimal stocking density was instituted in Maryland waters of Chesapeake Bay. Research is underway investigating factors influencing recruitment and settlement of oysters as a function of both salinity and depth in the Pamlico Sound, NC. Parts of this study are focused on a state program to plant oyster cultures in certain areas to increase the state fishery yields. Greater settlement is being found deeper in the water column (>2 m depth), and competent larvae are being found in the water column in the absence of settlement events. Virginia researchers applied DeLury-type estimators to back-calculate oyster stock abundance. Research in Georgia is aimed at improving marketing and management strategies in the face of oyster disease and parasites, while state research is focused on updating and developing new harvest and aquaculture techniques.

Sea Scallop (Placopecten magellanicus)

Stock assessments were produced, based on research vessel and commercial catch data, for the Mid-Atlantic, Georges Bank, and Gulf of Maine area. NEFC researchers evaluated the utility of minimum meat count regulations (numbers of scallop adductor muscles per pound of landed meat), and efficient volumetric methods for sampling commercial catches. Seasonal changes in scallop meat weight in relation to spawning was evaluated by researchers from the State of Maine, NEFC, and the Virginia Institute of Marine Sciences. NEFC also continued developmental work on sea scallop aging. A bioeconomic study of factors influencing the areal distribution of scallop fishing effort was also initiated. State of Maine researchers concluded submersible studies to evaluate distibution, growth, and the efforts of dredging on various types of habitat. Maine investigators also continued extensive studies of reproductive biology in various habitats.

Bay Scallop (Argopecten irradians)

Several state agencies continued monitoring work (Rhode Island, New York, North Carolina) to evaluate trends in abundance, size composition and survival. The state of Rhode Island continued a study to perform histological examinations of gonad development and gamete transports in coastal ponds to ascertain differences in spawning patterns and strategies. The effects of brown algae blooms in Long Island Sound, New York, and distribution of bay scallop were evaluated by New York state fishery researchers. University of North Carolina and National Marine Fisheries (NOAA, NMFS SE labs) researchers are investigating the influence of a recent red tide (Ptychodiscus brevis) outbreak of the recruitment of bay scallops into previously highly productive scallop areas, and the recovery of scallop stocks in those areas. UNC researchers are also looking at mechanisms to augment natural recruitment through the establishment of spawner sanctuaries (transplanting of adult scallops prior to spawning to replace "natural" recruitment and spawning). The degree to which avain predation decreases the crop of harvestable scallops is also being studied.

Calcio Scallop (Argopecten gibbus)

University of S. Florida researchers are investigation calico scallop population dynamics in regions of upwelling off the Florida coast. Long term monitoring projects are underway to determine reproductive output and population abundances of the scallops in upwelling areas to apply this information to other coastal areas.

Hard Clam (Mercenaria mercenaria)

Researchers at NEFC continued a project to evaluate factors influencing recruitment, growth, and reproduction of hard clam populations at selected sites in Long Island, New York. The intent of this series of projects is to assess hard clam recruitment success along a pollution "gradient" extending from more heavily impacted waters in the western Sound, to relatively pristine waters of eastern Long Island Sound. A project conducted by researchers at the University of Rhode Island, NEFC, and the University of Florida evaluated comparative growth, shell microstructure, and geochemical aspects of shell deposition in Narragansett Bay (Rhode Island).

Researchers at Rutgers University concluded a study of shell mocrostructure and growth rates from Southern New Jersey. Extensive estuarine surveys of New Jersey and New York waters containing hard clams were continued. South Carolina hard clam resources were evaluated in projects to locate commercial sources of subtidal brood stock, and to assess a subtidal oyster shell habitat as a refuge from predation to extend natural populations. Several states are investigating and developing new culture techniques and methods for this species. Polyculture methods are being studied in Georgia, Florida and South Carolina. This entails the culturing researchers are also investigating the use of different genetic stocks in an attempt to increase clam yields, growth, and survival. Florida researchers are looking at the response of clam populations to increased pressure from the fishery. The hybridization of the two naturally occuring Floridian species (M. mercenaria and M. campeciancensis) is being studied as a means to increase hardiness of local populations. How the hybrid species reproduces, recruits, and is affected by the physical parameters of the environment are the main questions being asked.

Surf clam (Spisula solidissima)

A simulation study of potential management strategies to decrease interannual variability in catches by "stockpiling" infrequent but very large year classes was completed by NEFC researchers. Because of the low natural mortality rate of the stock, the fraction of biomass loss to natural deaths is relatively low, and thus the problem becomes one of the economics of resource stability vs. maximization of the yield potential of particular cohorts. Bioeconomic studies of surf clam management were continued at the University of Delaware and the Mid-Atlantic Fishery Management Council.

Soft Shell Clam (Mya arenaria)

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

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

NEFC investigators completed stock assessement evaluations for the two stocks, which are managed under TAC regulations. Factors influencing the distribution and co-occurrence of Loligo squid and butterfish were evaluated in an NEFC project. Similarly, a project to develop alternative trawl survey abundance measures for fisheries such as squid, that are highly seasonal, was completed.

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(S.A. Studenetsky)

Squid and scallops

In 1988 the Soviet investigations of the squids Todarodes sagittatus and Gonatus fabricii at early stages of ontogeny and

Iceland scallop Chlamys islandica from the southeast Barents Sea were studied. Investigations of T. sagittatus were conducted in January-March, while those for C. islandica were conducted in April-June and September-October. In total 104 larvae and young squids of both T. sagitatus and G. fabricii and 66 scallop samples were collected and processed.

Studying of larval distribution and young specimens of T. sagittatus gives the grounds to suggest that the major portion of young squid drifted to the south of the Azores area in spring 1988.

Some scallop settlements in the south-eastern Barents Sea, as well as the bottom biocenoses at the sites of these settlements greatly suffered from dredging by the vessels equipped with up-to-date gears for processing molluscs.