

SHELLFISH COMMITTEE

by

J. AUDOUIN

1979

MOLLUSCA

Belgium

(Reporting on Crustacea only)

Canada

(G.P. Ennis)

Crassostrea virginica

In 1979, oyster research and enhancement programs in the province of New Brunswick and Prince Edward Island included bottom cleansing to improve spatfall, and provision of spatfall monitoring and prediction services. Population studies were carried out in the shallow and deeper water areas of Caraquet Bay, New Brunswick, to determine the standing crop and population structure. Port sampling of oyster landings during the fall fishery was carried out on the east coast of New Brunswick.

A joint federal/provincial development project was developed and initiated in the Caraquet Bay area to improve spat survival during the winter period, increase production from private leases, and to transfer oyster culture technology to the private sector.

Modernization and computerization of the shellfish leasing system was

continued. At present, the system comprises 1,963 leases covering a total of 3,379 hectares (8,350 acres) within the three Maritime provinces. An update and review of the Shellfish Leasing Policy was conducted and a new policy document was prepared.

Work continued on the study of the pathogenicity and physiology of the Labyrinthomyxa sp. isolated from diseased Malpeque oysters. The majority of the parasitic organisms were found in the digestive diverticulum, gill, mantle, and in the vicinity of vessels suggesting that the route of infection of the organism may be via the digestive tract and/or by direct contact. The tissue degeneration found in the infected area indicated that certain extracellular toxin(s) or enzyme(s) could play a role in the pathogenicity of this organism. An extracellular proteinase was detected in the culture medium of this organism. The general properties of this proteinase were partially characterized. The protein is extremely heat labile and requires a bivalent proteinases reported in the literature.

Little growth of the isolated Labyrinthomyxa sp. was observed at 3°C but it grew well at 15-25°C. It requires a concentration of 2.5-3.0% NaCl in the culture medium for maximum growth. The growth was significantly reduced when the NaCl concentration was decreased to 1.5%, and no significant growth was observed at the 1% level. This requirement for NaCl suggests that the marine environment may be a special factor in the survival and possible pathogenesis of this microorganism.

Mya arenaria

Inventories of stocks of soft-shell clams were performed on clamflats where hydraulic harvesting took place in previous years to estimate recovery rate. Juvenile recruitment occurred to a moderate extent on clam beds located along river shorelines in Cascumpeque Bay, P.E.I., while it was nearly absent in semi-enclosed tidal inlets like Little Harbour. This suggests that while river estuarine systems may sustain a certain degree of exploitation, tidal inlets of restricted flow and lagoons may tolerate light harvesting on an occasional basis only.

Studies were also carried out to determine the minimum size of the breeding stages in the soft-shell clam in the Gulf of St. Lawrence.

Mytilus edulis

Experimental culture of the blue mussel was initiated to establish the

essential variables involved. Initial emphasis was placed on the study of growth patterns.

A study using growth of this species as a comparative index of environmental quality in different coastal marine embayments was completed during 1979. Animals were held in suspension for size-groups of identified individuals. Average growth differed slightly between bays but mortality differences were markedly different and these were the principal determinants of differences in net production. Growth rates differed significantly between individuals but were very consistent within individuals. There is a genetic influence on growth which indicates that genotypes of organisms with similar growth rates need to be established before measures of growth could be standardized and used as a sensitive environmental indicator.

Placopecten magellanicus

Georges Bank

Landings decreased by 24% in 1979 to 76,422 MT round weight, owing to continued depletion of above-average year classes. Canadian landings are only from the northern part of Georges Bank ; and because of the absence of a fisheries agreement with the U.S. in this disputed area, there have been no further efforts to optimize yield per recruit to help compensate for decreasing numerical abundances. However, fleet size has not been allowed to increase and trip quotas of 13.61 MT meat remain.

Resource surveys indicate that recent recruitment has only been average, and hence landings can be expected to decline in 1980 from recent peak landings. Ongoing studies to define scallop concentration from log data are continuing.

Bay of Fundy

Landings in 1979 (4,764 MT round weight) were similar to that in 1978, with both years well above the average landing of 2,697 MT. The inshore scallop fleet did not significantly exploit Georges Bank in 1979, as scallops could be more economically fished on the Scotian Shelf.

Northumberland Strait

Landings continued to decline in this fishery, with landings during 1979 (1,913 MT round weight) 12% lower than those of 1978. Considerable regional differences in prerecruit abundance were observed, with scallops particularly scarce in the western Strait.

St. Pierre Bank

An exploratory survey of ICNAF Subarea 3Ps was conducted in 1979 and preliminary assessments are being attempted for stocks of both giant (Placopecten magellanicus) and Iceland Scallop (Chlamys islandica).

Chlamys islandica

Landings of shucked meats from the once lucrative fishery in the Northern Gulf of St. Lawrence approached 45 MT, still well below the six-year (1969-74) average of 86 MT. Assessment of scallop stocks in this area is planned for 1980.

GENERAL

Toxicology

Studies continued on the fate of Gonyaulax toxins in the food chain and consequences to finfish. Rapid uptake of Gonyaulax toxins by each of several zooplankters and toxin retention for at least six days after ingestion of the dinoflagellates was demonstrated. The significance is that a variety of planktonic herbivores are capable of transferring Gonyaulax toxins to marine fish.

Sensitivities of adult fish (herring, pollock, flounder) to the toxins were determined. Pollock and flounder were found to have similar sensitivities to oral doses of toxins as herring (i.e., $LD_{50} \approx 650 \mu\text{g/kg}$), meaning that kills of fish other than herring are possible.

Experiments on herring larvae reared for 10 weeks past yolk-sac stage showed nearly a 20% increase in mortality of larvae over just 4 days when Gonyaulax toxin-containing copepods versus toxin-free copepods were eaten. This has obvious implications for year-class strengths.

Hydrographic, meteorological, and shellfish toxicity data for the past 20 years have been obtained and logged on computer forms in order to generate a predictive device for the timing and severity of Gonyaulax blooms.

Uptake and excretion of cadmium presented as CdCl_2 and as CdEDTA by Macoma, a small marine bivalve, were compared. In addition, the effect of Zn on the uptake of Cd was investigated to complete studies on the effect of the chelating agent (EDTA) and Zn on Cd uptake by Nereis and Pandalus. Macoma exposed for 2 weeks to 50 ppb Cd as CdCl_2 , to 50 ppb Cd as CdEDTA , and to 50 ppb Cd with 500 ppb Zn as ZnCl_2 accumulated 8.2, 4.8, and 6.7 $\mu\text{gCd/g}$ dry weight, respectively. Approximately 25% of the accumulated Cd was excreted within 4 weeks. The rate of uptake of Cd by Macoma is inversely related to animal size.

The toxicities of CdCl_2 and CdEDTA and of CuCl_2 and CuEDTA in water were determined for several invertebrates. The CdEDTA complex was less toxic than CdCl_2 to Crangon and Macoma but did not affect the Cd lethality to Pandalus. The CuEDTA complex was less toxic than CuCl_2 to Crangon and Nereis but did not affect the Cu lethality to Macoma.

Nereis, Macoma and Crangon were exposed for 30 days to two contaminated sediments having different heavy metal contents and analyzed for Cu, Zn, Cd and Pb at different time intervals. The results indicated that bioavailability of the metals to the animals differed widely and was controlled by factors other than total extractable metal contents of the sediments. Interspecies differences, possibly influenced by feeding habits and habitat were also observed. Only Macoma is of any practical use in short-term testing for bioavailability of Cu, Zn, Cd and Pb, Nereis virens may be useful for testing for Cd and Pb bioavailability.

Lobsters have been analyzed for polycyclic aromatic hydrocarbons (PAH's). Levels of PAH's in digestive gland are about 10 times higher than those in tail muscle. Animals from areas contaminated by crude oil, from impoundments utilizing creosote timbers or from downstream of industrialized areas have higher levels of PAH's than control or offshore animals. PAH's in lobsters appear to have a pattern characteristic of the source (background, creosote, crude oil).

Analyses of hepatopancreas of "aquacultured" lobsters consistently indicate relatively high levels of PAH's. PCB's and the usual organochlorine pesticides are present as well. Identification of additional contaminants is underway.

To investigate the potential for food chain transport or accumulation of chlorinated hydrocarbons, lobsters were fed mussel tissue spiked with endrin. Over a 2-week period each lobster was fed a total of 14 g of food spiked with endrin at 4.7 ppm wet weight. Endrin concentration in the hepatopancreas reached an average of 1.95 $\mu\text{g/g}$ wet weight, and was approaching an equilibrium value. With clean food the endrin concentration declined by about 65% during 4 weeks. The maximum concentration factors (concentration in lobster tissue/concentration in diet) were 0.41 for hepatopancreas and 0.0001 for lobster tail muscle.

Ecology

Surveys of benthic invertebrate (macrofauna and meiofauna) were carried out on three cruises in the Bay of Fundy during 1979. Grab samples (0.5 m^2 Van Veen) will be analyzed to compare biomass and species composition during March/April, August and October. Additional information on the nature and concentration of suspended matter, phytoplankton production and distribution of dissolved nutrients was collected simultaneously with benthic sampling as part of a general study of ecological conditions within the Bay over an annual period.

Observations of abundance, biomass and growth of macrofauna and meiofauna in sediments at Pecks Cove were carried out from April to December. This mudflat in the upper reaches of the Bay of Fundy is the site of an intensive study to monitor rates of organic carbon supply and loss from an intertidal area in this macrotidal estuary. Organic carbon present in all components of the benthic community and in the sediments as non-living debris has been measured. The data will be analyzed to determine if the benthos represents an open or closed system in terms of organic carbon flux.

MARINE PLANTS

Chondrus crispus

Approximately 25,000 MT were landed in eastern Canada ; the value to the harvesters was 4.5 million. The landings in the most productive district (District 1) in the southern Gulf of St. Lawrence increased by 60% over 1978 ; landings in contiguous districts either equalled that of 1978 or decreased. The reasons for the increase in District 1 only are unclear ; however, it should be noted that resource management efforts have been most extensive in this district ; licences were frozen, an ecologically deleterious harvesting implement was banned, and harvesting season shortened. A study was continued in the Gulf to develop a dragrake that was less ecologically damaging to the Chondrus beds than the traditional dragrake. It was shown that minor changes in the dragrake design can have significant ($P < 0.05$) effects. Another study showed that Chondrus harvesting in District 6 has little adverse effects on lobster (Homarus americanus).

Chondrus is handraked in District 12 (southwestern Nova Scotia). Here the catch per unit effort was down 30% over 1978. It has been postulated that the extreme winter of 1978 which resulted in extensive ice cover may have been responsible. A long-term study is underway on an experimental bed to determine what handrake design and harvesting strategy that will give optimum sustained yield.

Furcellaria lumbricalis

Furcellaria is harvested as "storm toss" along the northeastern shores of Prince Edward Island (District 4) ; Chondrus is mixed in with the harvest. The approximate mean annual landings since 1967 are 6,000 MT but during the recent past, landings have been below this level. The reasons for this are unclear. Dragraking has been banned in this district until studies can be carried out to evaluate impact on optimum sustained yield of commercially important benthic macroalgae.

Laminaria spp.

In southwestern Nova Scotia, the Laminaria spp. resource is estimated at 110,000 MT. A pilot scale harvest of Laminaria spp. was initiated ca. 270 MT for

dried foodstuff. A study was undertaken to assess the dragaking technique used ; it was restricted to beds with plants averaging 3 m total length. This technique removed 50% to 80% of the standing crop.

Ascophyllum nodosum

Mechanical harvesting provides 80% to 90% of the total Canadian landings of Ascophyllum. Plants are severed, on average, 35 cm above the holdfast. Incidental removal of holdfasts with this technique is less than 2% by weight, in contrast to 16% for manual cutter-rake technique. Yearly yield may be increased by more frequent harvest of this resource.

Denmark

(Reporting on Crustacea only)

France

(J. AUDOUIN)

Ostrea edulis

Un nouveau secteur a été touché par l'épizootie due au parasite Marteilia refringens (Rivière de Pénerf) et une recrudescence de la maladie s'est manifestée dans le Golfe du Morbihan, en Rivière d'Auray et dans le bassin d'Arcachon. En revanche, elle est en nette régression dans les autres secteurs, notamment : Paimpol, Morlaix, Penzé et Crach.

Un protiste parasite présentant des formes intracellulaires et des formes isolées a été observé chez des huîtres plates Ostrea edulis de l'Ile Tudy en Bretagne. Ses particularités ultrastructurales permettent de noter des affinités et des différences avec les Haplosporidies et les Marteilia. Des recherches sur l'amélioration des claires à huîtres notamment par des apports phospho-calciques ont été entrepris (I.S.T.P.M. La Rochelle). Une augmentation de la croissance des huîtres plates a été notée sans perturbation de la flore par les amendements utilisés. Une étude des échanges sol-eau sur des parcs ostréicoles a été faite.

La récolte de naissain paraît meilleure que celle de l'année 1978 (350 à 400 T). Des recherches tendant à évaluer avec précision la production de naissain, ont été entreprises (I.S.T.P.M.).

Les essais de captage en surélévation en eau profonde (Baie de Quiberon) en utilisant des coquilles de moules comme collecteurs ont donné de bons résultats.

Une étude approfondie de l'ADN des huîtres a permis d'obtenir sur des échantillons lyophilisés des résultats reproductibles et d'aborder la connaissance de la structure du patrimoine génétique - (I.S.T.P.M. La Tremblade). Des essais sont menés en vue d'aboutir à une relance de l'huître plate "en claires" dans la région de Marennes à partir d'huîtres bretonnes (2 ans) et de naissain d'écloserie.

Crassostrea gigas

L'étude du copépode Mytilicola orientalis, parasite de l'huître creuse s'est poursuivie (I.S.T.P.M.). On a noté une recrudescence de l'infestation dans le bassin d'Arcachon. Dans les autres secteurs, quelques rares spécimens ont été décelés (Golfe du Morbihan, Rivières d'Etel, Belon et Pénérf).

Dans le bassin de la Seudre les émissions de larves ont été tardives dans l'ensemble des secteurs prospectés et le captage a été médiocre. Dans le bassin d'Arcachon, outre les fluctuations de température, le blocage précoce de l'évolution larvaire met en cause l'existence d'un facteur de perturbation dans le milieu (Zinc).

Crassostrea rhizophorae

Les essais d'acclimatation de l'huître des palétuviers se sont poursuivis (I.S.T.P.M. La Tremblade).

Mytilus edulis

L'étude de la croissance des moules du Pertuis Breton a été poursuivie et l'envasement d'une zone de bouchots a été contrôlés (à la Pointe de l'Aiguillon I.S.T.P.M. La Rochelle).

Pecten maximus

L'étude des stocks de coquilles Saint Jacques des principaux gisements du littoral français (Manche orientale, Baie de St Brieuc, Belle-Ile, etc...) s'est poursuivie. Elle s'est orientée principalement vers l'étude du recrutement et du prérecrutement (I.S.T.P.M.).

Les essais de captage réalisés en Baie de St Brieuc (50 000 collecteurs) (Comité d'Expansion Economique) se sont soldés par des résultats très médiocres (5 à 60 par collecteurs). Les meilleurs résultats de captage ont été obtenus dans les courreaux de Belle-Ile (Bretagne Sud) au cours du mois de Septembre (I.S.T.P.M.).

Les travaux réalisés pour estimer le prérecrutement et les essais de captage, montrent que les variations du recrutement sont très importants pour cette espèce.

Chlamys varia

Des collecteurs ont été immergés en Baie de Quiberon (4 500) et en Rade de Brest (5 000). Par suite de mauvaises conditions hydrologiques les résultats sont médiocres. Cependant le naissain produit a permis la réalisation de semis expérimentaux en Rade de Brest et sur la côte Atlantique (Pertuis Charentais et Vendéen).

Venus verrucosa

La première phase d'une étude sur l'exploitation de la praire, conjointement par un biologiste du comité local de Granville et le CNEXO/COB s'est terminée en 1979. Cette étude devrait permettre d'apporter un certain nombre d'aménagements en vue d'améliorer l'exploitation de cette espèce.

Patellus sp., Littorina littorea, Thias sp.

L'Institut Océanographique a mené en 1979, une étude qualitative du métabolisme du cuivre chez ces trois espèces.

Céphalopodes

L'étude de la biologie des céphalopodes s'est poursuivie en 1979 (Université Paris VI - Laboratoire Arago Banyuls S/Mer) : processus de détermination et de différenciation lors de la morphogénèse. Etude des phases embryonnaires et post-embryonnaires de l'ontogénèse. Etude de la nutrition et budget énergétique d'Octopus vulgaris.

Nudibranches

Les recherches effectuées en 1979 par l'Université de Poitiers (I.U.T. de La Rochelle) ont porté sur la biologie et la systématique des Nudibranches, le régime alimentaire, la ponte, la croissance, la sexualité, etc...

Algues

La cartographie des grands peuplements d'algues exploitables sur le littoral du département des Côtes du Nord entre l'Ile de Bréhat et l'archipel des Sept-Iles a été terminée en 1979. Onze cartes au 1/10 000 couvrent cette région (I.S.T.P.M.). Une étude a été entreprise à l'Ouest de l'Ile d'Er, sur la pointe de Castel-Meur en vue de définir les interactions entre les différents peuplements exploitables selon l'intensité de la récolte qui affecte les uns ou les autres et les étapes du processus de repeuplement concernant Ascophyllum nodosum, Fucus serratus, Laminaria digitata, Laminaria hyperborea (I.S.T.P.M.). L'étude du suivi des conséquences de l'échouement de l'Amoco Cadiz sur les peuplements d'algues des côtes bretonnes a été poursuivie.

FEDERAL REPUBLIC OF GERMANY

(K. TIEWS)

Molluscs

Mytilus edulis

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

Cockles

Cockle beds along the coast of Niedersachsen and Schleswig-Holstein were again surveyed by the Institut für Küsten-und Binnenfischerei.

Programme 1980

Mytilus edulis

Monitoring work on the size of mussel beds along the German North Sea coasts shall be continued at the Institut für Küsten-und Binnenfischerei.

Cockles

Also the survey work on the size of cockle populations along the German North Sea coast shall be continued at the Institut für Küsten-und Binnenfischerei.

ICELAND

(Not reporting)

IRELAND

(Not reporting)

NETHERLANDS

(A.C. Drinkwaard)

Ostrea edulis L.

Like in 1978, the spatfall and survival in the Oosterschelde was again very low, due to the low summer temperatures and predominantly imported southern stock of parent oysters.

Averting the hybridization between native and imported stocks will not be possible in the first coming years.

In June the oyster plots of the Yerseke Bank were covered with mussel seed for 50 - 75%, causing a harmful effect on growth and fattening, but without an extra mortality.

A start has been made with the governmental restocking program by relaying native Zeeland oysters from the Lake Grevelingen to a plot under control of the Netherlands Institute for Fishery Investigations. This relaying will be continued in April or May 1980.

Although the sea-water temperatures were also low in the Lake Grevelingen, an early and rather late spawning occurred in a temperature range of 16 - 18° C. More experience was gained in predicting the larval settlement in this typical tide free sea-water lake with a surface of 11 000 hectares and a content of 575 million m³. The standing crop is estimated at 5 - 10 million oysters on 1 500 hectares, yearclasses 1978, 1977, 1976 and some older ones, respectively 15%, 50%, 30% and 5%.

The commercial fishery of more than one year old oysters may start in 1980 for ongrowing in the eastern part of the Oosterschelde. The exploitation of spat yielding ground now covers 150 hectares. Polyethylene spat collectors of French-Dutch manufacture were used both for commercial spat collecting and for the monitoring of the spatfall at several research stations. Every year, half of the available places are strewn with mussel shells as natural cultch. In 1979 about 1 500 m³ has been sown. On the other half the ongrowing of the spat proceeds during the second year.

Stratification problems occurred in Lake Grevelingen during the months of May, June and July, caused by the influx of colder North Sea water in May through the new floodgate in the western dam. At the same time the temperature in the surface water layer increased during a quiet and relatively warm period. Lethal oxygen depletion for benthic organisms and fishes occurred in the deep gullies below the 10 meter level in the western part and below 7 meter in the eastern part of the lake. Cold weather and strong wind in the direction of the longitudinal axis of the lake terminated this situation. Salinity differences in the vertical of 2 - 3 ‰, surface 28‰, figured a less important role in this stratification. On the sixth of June the thermocline at the 8 - 9 meter level showed a decline of temperature from 16.8 to 13.5° C, salinity 28.1 to 29.0 and oxygen 8.7 to 2.8 mg-l.

The mussel shells were sown between the 4 and 8 meter level. In the upper region the lake is invaded by eelgrass up to the 5 meter level over 3000 hectares.

The oyster spatfall inventory program will be continued. As an enclosed oyster pond, the Lake Grevelingen may become an important factor in the future spat delivering for the Zeeland oysterculture in the Oosterschelde. The potential production for the coming years is estimated at 20 million/year.

Otherwise the hope for more, reduced the commencing commercial interest for nursery activities, related to hatcheries abroad. However, both systems will be necessary for a complete revival. Stimulating these lines for oysterspat supply needs an integral attention for the quality of the aquatic environments in view. For this reason the work of the provisional field laboratory at Yerseke has to be based on applied aquatic ecology, with the principal components of culture technology in open coastal zone, pond and nursery situations.

Mytilus edulis L.

Not only in the Zeeland area, but also in the Wadden Sea a heavy seed fall of mussels occurred, which covered big parts of culture areas. This has been followed by losses of half grown and nearly ready for market mussels.

Owing to the losses of mussels on the free banks in the beginning of the year by heavy frost and ice-drift, it was necessary to dredge 6 million kg half grown mussels in June from available mussel banks in the Lake Grevelingen, to restock the culture plots. However, in addition to a standing crop of oysters, a sufficient stock of mussels is necessary in this lake, since the rest of the benthic fauna is dominated by sediment feeding invertebrates, on which eels predate. The eel fishery amounts to 125 tons per year.

After a systematic density survey at the end of the year, the standing crop of mussels in the whole lake is estimated at 15 million kg, distributed over 4 000 hectares. Only about 300 hectares were still populated with more than 2.5 kg per m².

Cerastoderma edulis L.

Cockle fishery in the Netherlands becomes more and more a regular activity in the months of August till December. Since 1976 the yield per year has been more than 20 000 tons live weight, with a topper of about 35 000 tons in 1978. It sounds very plausible that this year, from the Wadden Sea and Zeeland in the aggregate, 3 000 tons shucked meat has been landed. At this moment it looks a moderate fishery in 1979.

The cockle fishery is only managed by some practical regulations, like closed periods and closed areas without adult stocks. However, for fear of over-exploiting no new licenses are made available. The participants in this fishery have become more and more active.

The first experiments started to replant young cockles from places with a low growth rate and meat condition to areas with a better outlook, where seed settlement failed to come. This relaying by commercial vessels concerned about 300 tons live weight. Information on growth and mortality became available. The monitoring of a biotic factors, like current velocities along the bottom, closely related to the development of the cockle beds, will be continued in 1980. Moreover, the research to assess the importance of more common environmental and biological factors will be approached.

The studies on survival of the small cockles, captured and automatically returned to the sea-bed during the hydraulic fishery, are not finished yet. They will be continued, together with the initiated studies to determine the ecological impact of the present-day harvesting techniques.

Effects of bottom erosion on the other benthic organisms in the same habitat, during hydraulic and non-hydraulic harvesting of cockle populations, are investigated by the Netherlands Institute for Nature Management.

Exploratory surveys in offshore areas are planned for 1980. For loosening the bottom and cockles in rather deep water, the use of plunger-pump dredges may be expected.

Diseases and pests

Considerable attention is paid to the control of oyster importations from France, Ireland and U.K., to minimise the risks of introducing diseases and pests. After relaying for growth and fattening on the Yerseke Bank, the oysters were sampled regularly. No disease-infections are traced by the relevant investigations.

Some suspicious oyster lots from Greece effected the decision to restrict the import. Only consumption oysters ready for market were admitted for a short storage period in separate oyster pits.

In July and August a second floating invasion of the Japanese seaweed, Sargassum muticum arrived in substantial quantities on the bathing beaches from Hoek van Holland to the Wadden Sea isles. In April 1977 this alga arrived for the first time in the Netherlands on the coast of Zeeland up to the Isle of Texel.

Research is being done by the Herbarium of the State University at Leiden.

Shellfish toxicity and sanitary control

Phytoplankton studies during the summer period are continued in the Oosterschelde. No dinoflagellate blooms, abundant in species suspected for causing toxicity were observed. Investigations of sediments revealed only very low concentrations in dinoflagellate cysts.

Research on faecal coli's in molluscs was especially carried out on oysters and mussels ready for export. In consequence of some mussel plant contaminations in the third quarter of the year, corrections appeared to be necessary. Incidentally oysters originating from abroad and mussels from Denmark, Germany and the U.K. were checked. No cause was given to reject any incoming lot.

Oosterschelde storm-surge barrier in 1985

In order to protect the Oosterschelde estuary from floods, the storm-surge barrier is now under construction. Consequently the tides will be reduced by 25%. Studies related to the future ecological effects are commenced under the umbrella of a technical scientific consultative body, empaneled from the Environmental Research Division of the Delta Service, Rijkswaterstaat and the Netherlands Institute for Fishery Investigations.

This year a joint study is initiated to provide erosion and sedimentation data, related to current velocity and wind turbulence, concerning the natural mussel rewatering places near Yerseke. This is necessary for the future management of (re) vitalization, storage and desanding of mussels. For questions like the changing of the organic substance balance and the hydrographic (salinity) consequences of the future water managerial aspect, an insight should have to be gained into the extent of the various altering influences and their mechanisms.

Miscellaneous

At the end of 1978 the Experimental Station Texel has been transferred to the responsibility of the Estuarine Ecology Department of the Netherlands Institute for Nature Management in the same Ministry of Agriculture and Fisheries. The final mollusc research activities in this station, like the fundamental metabolism studies on mussels and the technical investigations on mussel transport etc. were concluded in the course of this year.

NORWAY

(K. R. Gundersen)

Cephalopods

Todarodes sagittatus

During January-May a few squid were taken in trawl hauls in the northern North Sea and south of the Faroes. The squid were supposed to have hatched during the preceding summer, with mantle lengths in May of 26-33 cm.

A new invasion of T. sagittatus was observed at the Faroes in July. During the autumn the squid also invaded the Norwegian coast from south of Bergen to the Varangerfjord, and some were also caught at the weatherstation M at 66°N, 02°E.

In August the mean mantle length at the Faroes was 23 cm, at the coast of Norway in September, 27-31 cm, in October 31 cm for males and 34 cm for females. In December the squid were still abundant both in the coastal areas, at st. M, and at the Faroes, with maximum mantle lengths of 40-45 cm and weights up to 1.500 g. The autumn fishery yielded about 1 500 m. tons, but much greater quantities might have been fished if required.

Gonatus fabricii

Material was collected during surveys in June - September for postlarval and 0 group fish in the Norwegian Sea and adjacent areas. Only juveniles were taken, west of the continental slope off northern Norway in numbers up to 4000 per half hour's hauls with Harstad trawl, 18 x 18 m opening.

The species has been recorded as an important food item for Atlantic salmon in the open sea.

POLAND

(Not reporting)

PORTUGAL

(A. Casealho)

Mollusca

- "Studies on Cephalopods from Algarve coast". C.S. Reis, Fac. Ciências, Lisboa.
- "Inventariation of Moluscs from central and south coast of Portugal" C.S.Reis, Fac. Ciências, Lisboa.
- "Bathymetrical distribution of Cephalopod stock from portuguese coast". C.S.Reis, Fac. Ciências, Lisboa.
- "Growth and reproductive cycle studies on Mytilus galloprovincialis populations from portuguese coast". A.M. Costa and M.M. Machado. Fac. Ciências, Lisboa.
- "Depuration experiments on Mytilus spp in open flow of chlorinated water". A. Dias et al.

- "Preliminar works on the installation of a ozone depuration plant, for grooved carpet shell, in Algarve". Rui Cachola e Antunes Dias.
- "Settlement of a molluscs experimental park in Tavira (Algarve)". Rui Cachola.

SPAIN

(Not reporting)

SWEDEN

(H. Hallbäck)

Mytilus edulis

During the last 3-5 years there has been an increasing interest for farming Mytilus edulis along the northern part of the Swedish west coast. About 1 000 tons of mussels were produced during 1979. Until now very little of biological studies have been carried out but will increase.

UNITED KINGDOM

(J. MASON - E. EDWARDS)

Pecten maximus and Chlamys opercularis

(England and Wales)

Fisheries information was obtained from all ports. The landed value was still high in 1979 (just under £2 million), but CPUE was falling and a future decline is expected.

Research was continued on visual surveying of stocks by under water television and divers. A dredge survey was carried ou in a number of offshore English Channel areas.

Artificial spat collectors were laid at various sites along the Channel and in North Wales. Settlement was better than in 1978, but still could not be described as good. Spat obtained (and some young scallops caught by divers) were relaid for growth/mortality studies.

Studies have continued on the variations in shell growth found in scallops from various areas. Seasonal variations in meat yield/gonad condition have been followed ; a detailed study is being carried out on one population off Plymouth.

(Scotland)

Monitoring of the fisheries and assessment of the state of, and effects of

fishing on, the principal stocks were maintained. Studies of the settlement and early life history continued.

The development of a sledge for carrying underwater TV and still cameras for direct observation of scallops and queens was continued. The method was compared with dredging and diving as a sampling tool.

Chlamys opercularis spat settled on artificial collectors were grown on in cages on the sea bed and hanging from rafts. A series of these cages were left undisturbed and removed singly at intervals to study gonad and growth ring development.

Oysters (O. edulis and C. gigas)

(England and Wales)

Resource surveys have been carried out in all the major fisheries and advice given on their management, including the possible use of Regulating Orders.

Batches of C. gigas and O. edulis have been placed in some east coast rivers to test their potential for growth and fattening. Some further experimental work was carried out on abnormal growth in C. gigas populations.

Research on dredge performance improvements has been carried out.

(Scotland)

Survival, growth and condition of hatchery-reared Crassostrea gigas were studied under a variety of condition.

Collection of statistics of landings of Ostrea edulis in the Loch Ryan fishery was maintained and a further survey of the beds was made.

Mercenaria mercenaria

(England and Wales)

A grab survey has been carried out on clam stocks in Southampton Water. Initial restocking experiments with hatchery produced seed clams have been set up.

Shellfish pests

The distribution of introduced pests such as Sargassum and Urosalpinx has been monitored. Possible control measures for Ocenebra off the south coast of England have been studied. Considerable attention has been given to certification governing the importation and transfer of molluscs in the UK to minimise the risks of spreading pests and diseases.

Cardium edule

Surveys have been carried out in the Burry Inlet, South Wales, to follow the recovery of the fishery following its decline in the early 1970s, and

in the Thames Estuary to advise on conservation measures to protect young stock from undirect mortalities due to dredging.

Loligo forbesi

(Scotland)

The composition of landings from Scottish inshore grounds was studied, together with the squid's biology and distribution.

U.S.A.

(Stephen H. Clark¹ and Michael Castagna²)

General

This report summarizes research activities on commercially important mollusk and crustacean species during 1979 by U.S. agencies, including Federal and state research agencies and academic institutions.

The Northeast Fisheries Center (NEFC) of the National Marine Fisheries Service (NMFS) participated in 6 inshore-offshore bottom trawl surveys totaling 163 vessel-days at sea which provided data for shellfish species as well as in sea scallop (Placopecten magellanicus), surf clam (Spisula solidissima) and ocean quahog (Arctica islandica) surveys totalling 55 vessel days at sea. Additional data were obtained during 8 sea sampling trips aboard commercial vessels in directed shellfish fisheries. A total of 399 commercial samples were also taken at dockside and 510 age determinations made for surf clams. Inshore bottom-trawl surveys were also initiated or continued by several state agencies in cooperation with NEFC. Detailed inventories of existing shellfish resources in coastal waters were also conducted or are being planned by several state agencies including those of Rhode Island, New York, New Jersey, and North and South Carolina. Several state agencies are also actively engaged in collection of statistical data for shellfish species or are developing and expanding statistical reporting programs (e.g., those of New Hampshire, Massachusetts, Rhode Island, Connecticut, North and South Carolina, Georgia).

NEFC and Southeast Fisheries Center (SEFC) personnel prepared stock assessment reports for principal shellfish resources of the USA Atlantic coast; the SEFC also prepared annotated bibliographies for various shellfish resources and fisheries. The Shellfish Technical Assistance Program of the Massachusetts Division of Marine Fisheries (DMF) continued with aid being provided to munic-

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²Virginia Institute of Marine Science, Eastern Shore Laboratory, Wachapreague, VA

pal officers and industry. The North Carolina Department of Natural Resources and Community Development (DNRCD) continued an environmental assessment of the effects of agricultural freshwater release in estuarine areas.

American oyster (Crassostrea virginica)

Researchers at Rutgers University have continued surveys to determine prevalence and intensity of Minchinia nelsoni (MSX) disease in Delaware Bay and research on environmental and biological factors contributing to incidence of MSX. Studies are also continuing to determine the feasibility of oyster drill (Urosalpinx cinerea) control by dredging operations. Agencies within the states of New Jersey, Delaware, Maryland, and Virginia continued surveys to determine the extent of available resources and prevalence and intensity of oyster disease. A Sea Grant report indicating success of the State of Maryland's repletion program has been produced. Maryland is also testing the efficiency of off-bottom oyster spat collecting devices. In Virginia a project to develop strains of oysters resistant to disease continues. The North Carolina DNRCD completed surveys of seed oyster resources and gear evaluation studies. The South Carolina Wildlife and Marine Resources Department (WMRD) continued biological studies to determine spawning season, condition, and factors affecting mortality. Texas Parks and Wildlife Department (PWD) personnel continued oyster population monitoring to provide a basis for evaluating trends in abundance and ecological factors affecting these trends.

Sea scallop (Placopecten magellanicus)

NEFC personnel completed research vessel surveys (including participation in Canadian surveys) of major scallop grounds and completed stock assessments and related analyses (e.g., growth and yield per recruit studies). The Maine Department of Marine Resources (DMR) completed tagging, aging, and growth studies; the New Hampshire Fish and Game Department (FGD) completed resource monitoring and collection of biological data for assessment purposes. The College of William and Mary completed a survey of scallop resources off the Virginia coast and published a study of the economic impact of the Virginia scallop fishery.

Bay scallop (Argopecten irradians)

Several townships in Massachusetts conducted baseline surveys for development of a management program. The Rhode Island Department of Environmental Management (DEM) and the North Carolina DNRCD studied the biology and ecology of the bay scallop and continued collection of data for assessment purposes.

Calico scallop (Argopecten gibbus)

The SEFC continued biological studies, evaluated trophic relationships and seasonal distribution, and obtained maximum sustainable yield (MSY) estimates.

Soft clam (Mya arenaria)

University of Maine and University of New Hampshire researchers are continuing studies on biology and ecology of this species.

Hard clam (Mercenaria mercenaria)

The State University of New York (SUNY) studied the reproductive biology and ecology of hard clams and evaluated the effectiveness of management and enforcement in New York waters. SUNY personnel also described hard clam fisheries in the Middle Atlantic area. An annotated bibliography of hard clam literature is nearing completion.

The New York Department of Environmental Conservation (DEC) initiated development of a population index program for use in measuring the relative condition of the hard clam resources in New York waters and continued studies of Great South Bay to assess optimum sustainable yield. South Carolina is studying potential economic impacts of hard clam aquaculture on the fishery. Genetic studies are in progress in Virginia and Georgia and research on methods of clam culture continues at the College of William and Mary.

Ocean quahog (Arctica islandica)

The Rhode Island DEM assessed the status of the ocean quahog resource in Rhode Island waters. NEFC personnel conducted stock assessment studies, developed new techniques for aging, and continued growth and age validation work and related biological studies. An improved dredging system for use in annual NEFC quahog surveys was also developed and successfully tested. Aging studies continued at the University of Maryland - Eastern Shore.

Surf clam (Spisula solidissima)

The State University of New York (SUNNY) assessed the effectiveness of surf clam management ; NEFC personnel assessed the status of offshore surf clam populations in the Middle Atlantic area, continued studies on aging techniques, and made improvements to gear used in annual surveys.

Short-finned squid (Illex illecebrosus)

Long-finned squid (Loligo pealei)

NEFC personnel completed assessments and related analyses (e.g., growth, yield per recruit studies) for both species and conducted in situ studies of spawning behavior, mortality, and predation for Loligo.

U.S.S.R.

(P.A. Moiseev)

Squid

In January through June 1979 the Soviet-Canadian investigations of the larval and young short-finned squid distribution were carried out in their feeding grounds. These are newly found grounds in the NAFO Subareas 3 and 4 between the Continental slope and the left edge of the Gulf Stream.

As a result of the survey on abundance 396 hauls were analysed and 602 plankton samples taken to check the cephalopod availability. 535 samples were analysed in the cruise. A total of 13 000 squids was measured, 6 864 specimens were examined aboard ship and 3 000 specimens in the laboratory ashore. 300 stomachs were preserved. To describe the oogenesis 70 gonads were examined. Trawl surveys on abundance were conducted in the NAFO Subarea 4 as follows : February 19 - March 3, 12-20 May, and May 26 - June 2. For the first time the distribution of short-finned squids in this area was studied in winter. The maximum density of the short-finned squid aggregations in the near-bottom shelf waters was reported from the depths of 200 m and 100-150 m in February and May respectively, and was associated with the gradient zones with temperatures ranging between 7 and 11° C. The size of the short-finned squid catches from the near-bottom waters was represented by one daylight (12.00 - 16.00) and two dusk maximums (4.00 - 8.00 and 16.00 - 20.00) in February and May respectively. In February the maturing squids of one length group (19-22 cm) prevail on the shelf and in May the immature squids with modes of 14-15 cm are predominant.

Short-finned squid stock assessment

The trawl and plankton surveys on abundance were conducted in the open ocean between the shelf of NAFO Subareas 3 and 4 and the Gulf Stream in the period from March 10 to April 13 and from April 24 to May 4, 1979.

The method of the trawl and plankton survey conduction was improved. The feeding ground of young short-finned squid was first determined and the minimum abundance of 78-86 billion sp..estimated. Maximum aggregations of the youngs were found within the depth range of 50-200 m at the temperatures of 14-20° C.

The stock size at the peak of fishing in 1979 was estimated at 2.7-3.0 mill. tons.

CRUSTACEA

Belgium

(F. Hedant)

Crangon crangon

In 1979 a study was started on the occurrence of the black-spot disease in brown shrimp off the Belgian coast. Different aspects are being considered, e.g. a quantitative analysis of the part of the population affected by this disease, the factors influencing the extent of its occurrence, the presence of different types of bacteria on the spots, the artificial propagation of the disease under controlled conditions, the impact on the shrimp population and its relative importance on the natural mortality of the population.

The study on predation-mortality of post-larval brown shrimp was focused on the importance of flatfishes (plaice, flounder and dab) as consumers of shrimps. The results of these investigations will be incorporated into the quantitative consumption-production-model of the shrimp-population in the Belgian coastal waters.

The monthly analyses of the shrimp stock and of the by-catch of experimental shrimp fishing were continued in 1979 in order to evaluate long-term interactions between the shrimp population and its predators (demersal fishes, demersal invertebrates and fisheries). Bi-monthly samplings of the shrimp larvae on an extended sampling-grid were started in January 1979.

Nephrops norvegicus

The commercial catches of Norway lobster were sampled in order to obtain data on the catch and population composition. A study on the influence of demersal predators (cod and whiting) on the population dynamics of Norway lobsters in the Central North Sea was started.

Canada

(G.P. Ennis)

Homarus americanus

Commercial catches were sampled in all Maritimes lobster areas to provide data on size frequency, egg condition, molt stage, catch/unit effort, and bycatch. A Maritimes-wide, voluntary license buy-back scheme is continuing. In the Gulf of St. Lawrence and eastern Nova Scotia, growth, size at maturity, fecundity, and mortality studies were conducted utilizing short-term sequential sampling and tag recapture methods. The 1978 assessments have been utilized in a variety of propo-

sals for several management initiatives ; the most promising one is the initiative for increasing the minimum legal size in the northern half of Northumberland Strait.

In southwestern Nova Scotia and the Bay of Fundy, routine sampling of commercial catches was increased and continued on a regular basis. Analyses of historical data of sampling since the early 1940's are continuing. An extensive tagging program in the Bay of Fundy was initiated, summer 1979, to monitor lobster movements, growth, and exploitation rates. The evidence to date indicates that during summer (June to September) many large, mature lobsters over 1.5 lbs move from deeper, colder water to shallower, warmer water for molting and reproduction. Much of the New Brunswick coastline of the Bay of Fundy may be an important area for large, mature females hatching ripe eggs into free swimming larvae, and extruding new eggs during summer. Many of the females with newly-extruded eggs move back into the deeper water during the winter months.

Lobsters were sampled for size at maturity, fecundity, morphometrics, and egg parasites to determine differences in geographic areas throughout the Maritimes. A lobster larval survey was conducted in the Bay of Fundy, summer 1979 ; analysis of this and other surveys are continuing. A study on chela mechanics of lobsters in relation to feeding was completed. A study of the diet (by examination of stomach contents of lobsters and crabs around the coastline of southwestern Nova Scotia was initiated.

A size-maturity study is being conducted on lobsters from the Gulf of St. Lawrence and the Bay of Fundy to compare size at maturity of both male and female lobsters from these different areas. In conjunction with this study, new methods have been developed for estimating both male and female maturity from external characteristics, and these have been correlated with internal physiological changes.

Long-term monitoring of the lobster fishery and studies of various aspects of lobster population biology and dynamics were continued in five localities around the coast of Newfoundland. This included commercial catch sampling, obtaining logs from individual fishermen, collecting tags from previous year's tagging operations, carrying out additional tagging and shell condition sampling. Studies of larval distribution and ecology in a near-shore area were continued. A tag-recapture study of an unfished lobster population around a small island continued for the fourth consecutive year.

Work on gaffkemia, a bacterial disease of lobsters, continued over the past year. The disease, caused by Aerococcus viridans var. homari, continues to be a problem for the lobster industry and again caused serious losses among lobsters held live. Studies have been concentrated on defence mechanisms and attempts to induce resistance in the uninfected animals . It was shown that the polysaccharide capsular material from virulent strains of the pathogen does not enhance the infection, nor does it promote infection by avirulent strains of A. viridans var. homari.

Vaccines have been and still are being produced and tested. The results are highly variable ; certain vaccines give protection on one trial, but not on another. Most vaccines have given a degree of protection, but not high enough to be considered generally applicable in providing the resistance required.

A second feeding trial using purified fatty acid ethyl esters suggested that lobsters have an essential fatty acid requirement for both $\omega 3$ (linolenic) and $\omega 6$ (linoleic) fatty acid families. The requirement for $\omega 6$ being considerably less than for $\omega 3$. Dietary supplementation with soy lecithin resulted in improved survival and growth of juvenile lobsters. The optimal dietary level of lecithin was between 6 and 8% of the dry weight of the diet. In an attempt to replace casein as reference protein in purified lobster diets, several purified proteins were prepared from various marine organisms. Protein from the rock crab (Cancer irroratus) proved to be superior to all others tested with sea urchin and mussel also being superior to casein.

Digestability studies with lobsters (200-300 g) revealed that although most proteins are well digested (92-96% for casein, soy protein, egg protein), fish protein concentrate prepared from cod fillets was only about 68-75% digested. This poor digestion may be at least part of the explanation for the very poor growth and survival of lobsters fed diets in which fish protein concentrate was the major protein.

Pandalus borealis

In the Maritimes region during 1979, biological sampling of commercial shrimp catches was continued. The fleet fished equally in the Gulf of St. Lawrence (N and NE of Anticosti Island) and SE of Cape Breton Island.

Catch/effort statistics from these areas have been collected and analyzed. A shrimp survey was completed off SE Cape Breton. For this area, the best estimated biomass was 20,000 metric tons, and the natural mortality was estimated between 0.6 and 0.7 for females. Values of M ranging from 0.5 to 0.8 were estimated for shrimp in the Gulf of St. Lawrence. Growth of P. borealis was calculated for the Gulf and Cape Breton. Another survey showed that P. borealis was absent off south Nova Scotia during the summer, 1979.

Sampling of the commercial shrimp fishery in the northern Gulf of St. Lawrence was continued. Two research surveys were conducted in this area, one in the northern commercial zone, the other covering the whole Gulf. These surveys were designed to determine biomass, distribution, vertical migration and diel variability in catches.

An intensified observer program in the Labrador shrimp fisheries provided details of catch and catch per unit effort on a monthly basis. Research surveys were carried out in the areas during July-August and November, the latter being significantly restricted due to bad weather.

A research survey in the Davis Strait (August-September) provided information on distribution, biomass and vertical migration of shrimp in the area of the commercial fishery.

Chionoecetes opilio

Sampling of commercial snow crab catches, at sea and at landing sites, is continuing in northern New Brunswick and Cape Breton, Nova Scotia. Catch per effort statistics from these two areas were analyzed. Tagging studies around Cape Breton allowed estimation of stock size, exploitation, and recruitment to the fishery. Exploitation rates ranged from 39% to 65% in different areas around Cape Breton.

A program was begun to identify and sort crab larvae from the 1977/78 larval samples taken on the Scotian Shelf. Most of the samples have been sorted and an identification key for species and all stages of crab larvae has been developed. To date, 28 Brachyura crab species have been identified.

Catch and CPUE data were obtained for various segments of the Newfoundland fishery on this species. Sampling of catches at sea and of landings at the plants was carried out. Attempts to develop a tag which will be retained through a molt and extensive field tagging studies were initiated.

Denmark

(Home waters : S. Munch - Petersen

Greenland waters : E. Smidt)

Nephrops norvegicus :

Investigations on the by-catch problems in the Danish Nephrops fishery.

Carcinus maenas :

The shore crab (Carcinus maenas) investigations in Kattegat carried out 1977, 1978 were concluded in 1979.

Pandalus borealis

Research on density of shrimp stocks was made in the offshore West Greenland area by bottom photography. Catch-effort data were obtained from commercial offshore trawlers and from inshore cutter landings. Monthly samples were taken from offshore commercial trawlers in order to get informations on diurnal variation in the composition of the catches.

Investigations will be continued in 1980 along the same lines.

Chionoecetes opilio

Inshore fishing experiments with crab traps were continued.

France

(J. Audouin et G. Conan)

Langoustine (Nephrops norvegicus)

Travaux du CNEOX - COB Echantillonnages de routine

Les débarquements de langoustine provenant du Golfe de Gascogne sont échantillonnés mensuellement dans les port du quartier du Guilvinec. Des chalutages expérimentaux sont effectués mensuellement à l'aide d'un chalut à petites mailles en une station fixe du Golfe de Gascogne. Dans les deux cas les langoustines sont sexées, classées suivant l'état de mue, pour les femelles suivant l'état des gonades ou des oeufs incubés. Les distributions de fréquence de taille sont archivées.

Des traits de filet à plancton sont effectués mensuellement à 5m, 15m et 30m de Janvier à Juillet. Les larves de langoustine sont comptées et répertoriées suivant leurs stades.

Traitement de données

Un modèle de rendement et de fécondité par recrue spécialement adapté au cycle biologique de la langoustine a été mis au point et est progressivement amélioré. Ce programme tient compte de l'accessibilité saisonnière des femelles, de l'influence du cycle des mues sur la croissance et de la survie des langoustines hors taille rejetées à la mer.

Travaux de l'I.S.T.P.M.

L'étude de la langoustine a été essentiellement dirigée vers les stocks de la région VII g (Plateau Celtique).

Recueil des données statistiques

En 1979, il a été possible de rapporter la totalité des débarquements en provenance du Plateau Celtique aux zones effectives de pêche et de calculer les efforts correspondants.

Etude de la sélectivité

Ce travail a permis de confirmer l'influence prépondérante du volume de la pêche accessoire sur le facteur de sélectivité qui peut varier de 0.4 à 0.6 pour des poids de poissons allant de 0 à 120 kg. Il a été possible de montrer également que le facteur de sélectivité variait avec l'angle d'ouverture des mailles.

Etude de la pêche accessoire de la langoustine

Un programme d'étude a été mis en place à la fin de l'année, il a permis de commencer un échantillonnage systématique des rejets d'espèces protégées dans la zone VII g.

Echantillonnages

<u>Zone</u>	<u>Navire scientif.</u>	<u>Navires commerciaux</u>	<u>Nb individus échantillonnés</u>
VII g	1	2	1 500
VIII a	1	1	5 500

Homard (Homarus gammarus)

Les opérations de repeuplement des zones côtières par l'immersion de post larvés produites en éclosérie ont été poursuivies (138 000 provenant de l'Eclosérie de l'Ile d'Yeu et 55 000 de celle de Houat).

Des échantillonnages ont été réalisés lors des prospections faites à bord d'un bateau de pêche dans le secteur de l'Ile d'Yeu en Mai et Juin 1979. Le contrôle des apports a été poursuivi dans différents secteurs. 3 907 homards en provenance du Conquet ont été mesurés et 1769 en provenance de l'Ile d'Yeu (I.S.T.P.M.).

La petite pêcherie de Houat est suivie depuis 1973 (CNEXO-COB). La ventilation des captures en catégories commerciales permet de saisir la variabilité naturelle du recrutement, l'une des principales composantes de la dynamique des populations.

Crabes

Carcinus maenas

Dans le cadre de l'écophysiologie de la respiration des Crustacés décapodes, l'action de facteurs externes (concentration d'oxygène et de gaz carbonique dissous) sur la ventilation branchiale de Carcinus maenas a été étudiée (Institut Océanographique).

Cancer pagurus

Des tourteaux du groupe O provenant de collecteurs à pectinidés ont été élevés dans des installations placées sous radeau dans le but de suivre la croissance des juvéniles dans le milieu naturel (I.S.T.P.M.).

Araignée (Maia squinado)

Les expériences de marquage dans le Golfe Normano-Breton se sont terminées en 1979. Elles ont permis de préciser les migrations saisonnières de cette espèce et d'évaluer l'intensité de l'effort de pêche dans cette région (I.S.T.P.M.).

Crevette grise (Crangon crangon)

Des échantillonnages ont été réalisés lors des 8 sorties effectuées sur des crevettiers de Honfleur et du Havre. L'exploitation des données recueillies est en cours (I.S.T.P.M.).

Crevette Penaeus japonicus

Les besoins nutritionnels de cette espèce dans des conditions intensives d'élevage ont été étudiés par le CNEXO - COB. Les paramètres physiologiques permettant de caractériser un bon état de santé des crevettes, ont été précisés.

Federal Republic of Germany

(K. Tiews)

Crangon crangon

Investigations of the Institut für Küsten - und Binnenfischerei to assess the shares of undersized protected fish in the catch of the German shrimp fishery and the fluctuations in the abundance of fish species found on the shrimp fishing grounds were continued. A total of 272 samples (= 1 711 kg) of unsorted catch of the shrimps fishery were collected in Husum, Büsum, Cuxhaven and Norddeich, and analysed as to their species and length composition. The prey-predator relationship in the Crangon fishery has been studied and assessment work on the dynamics of shrimp populations along the German coasts continued.

Programme for Shellfish Research in 1980

Crangon crangon

Catch assessment work to determine the composition of shrimp catches by species and length shall be continued at the Institut für Küsten- und Binnenfischerei.

Iceland

(Not reporting)

Ireland

(Not reporting)

Netherlands

(R. Boddeke)

Crangon crangon

Biological cycle

The investigations on the copulation process of Crangon crangon were finished during this year. Some still open questions concerning the reproduction cycle were solved. Especially noteworthy is the insight obtained in the structure of the so-called spermatophore, produced by the male during the copulation. This "spermatophore" is nothing else than the active tissue of the male gonad, surrounded by a transparent membrane and after that transported into the vas deferens. During copulation this transparent sac is emptied into one of the oviducts of the female, by contraction of the muscular vas deferens. In this transport of sperma from male to female the sperma cells mainly lose their pin-like protuberances, which stay behind in the spermatophoric sac. This copulation process explains very well the rather abrupt way in which sex change takes place in the males. The undifferentiated cells staying behind in the gonad after the removal of the active male tissue, can develop quickly into oocytes.

Because both, vasa deferentia and uteri, are present in shrimps of both sexes, a male of 35 - 60 mm develops into a female from a stage of sexual indifference, comparable to that of a very small (<25 mm) primary female.

Stock assessment

As usual, extensive surveys were carried out in April and October to estimate the abundance of brown shrimps along the coast of the Netherlands and adjacent regions, in cooperation with fisheries research stations in Belgium and Fed. Rep. of Germany. Smaller surveys covered the Waddensea and the Zealand estuaries in other months of the year.

For the period 1973-1979, the correlation was calculated between the catch per fishing day of the commercial fleet in the five different fishing areas and the catches of these surveys in April and October. For consumption shrimps the catches per fishing day were used of the commercial fleet in the same months, while the catches of undersized shrimps during the surveys were correlated with commercial catches of consumption shrimps two months later. The correlations between the catches of consumption shrimps by commercial fleet and surveys were highly significant (r varying from 0.93 to 0.76). The correlation between the survey catches of undersized shrimps and the commercial catches two months later, were not significant for the off shore areas in spring, while in the inshore areas and off shore areas in autumn the correlation (r) varied from 0.36 to 0.98.

Penaeidae

Research on the differences in food preference in relation to biological characteristics and taxonomy of several species of Penaeids continued. In cooperation with the Louisiana State University (Baton Rouge) special attention will be paid in 1980 to Penaeus vannamei and P. setiferus.

Norway

(K.R. Gundersen)

Homarus gammarus

Lobster investigations were carried out in 1979 mainly on the same scale as previous years.

Fishing experiments were carried out in the tagging areas in the skerries north and south of Bergen.

The work in order to get data of increasing in length during moult of untagged lobsters in aquaria were continued.

Also the experiment with growing lobsters from hatched larvae in aquaria to marked size were continued.

Cancer pagurus

To obtain information of the variation in the crab stock a small area in the Bergen harbour were fished continuously from January to May, and from the middle of August to the end of December.

Nephrops norvegicus

Fishing experiments with different types of pots were continued on the west coast.

POLAND

(Not reporting)

PORTUGAL

(A. Casealho)

Nephrops norvegicus

- Regular sampling have been done in Cascais including sex determination and cephalothorax length measurements. A.R. Cascalho, INIP, Lisboa.

- An exploratory fishing survey has been made on the Portuguese coast spanish research vessel in order to obtain information on Nephrops norvegicus biology.

- Decapod Crustaceans Systematics. A.M.Neves, Fac. Ciências, Lisboa.

SPAIN

(Not reporting)

SWEDEN

(B.I. Dybern and H. Hallbäck)

Norway lobster (Nephrops norvegicus)

Continued compilation of data from commercial fishery

Homarus vulgaris : Intensified investigations have started during 1979 involving :

- 1 - Tagging experiments
- 2 - Collection of data from private fishermen
- 3 - Calculating of catch per effort in different parts of the fishing area
- 4 - Trials with escape holes in traps
- 5 - Efforts to relate catches of summer guests and other occasional fishermen to the catches taken by professionals.

Cancer pagurus

Continuation of research from previous years, involving tagging experiments, diving observations and collection of statistics and information on catch/effort. Tank studies have started on crab creels with escape openings keeping crabs and

making it possible for most lobsters to escape.

Pandalus borealis

One survey at sea was performed for the collection of daily reports from a number of fishermen. The catches (and the number of boats) have been fairly constant over a number of years, indicating that the fishery is just the right in size compared with the available stocks.

UNITED KINGDOM

(J. Mason - E. Edwards)

Homarus gammarus

(England and Wales)

Following an extensive lobster tagging study to estimate growth rates and migrations, yield assessments were carried out. A recommendation was made to increase the minimum landing size from 80 mm to 85 mm carapace length. This would increase the yield per recruit and the size of the breeding stock. Sampling for lobster larvae showed a concentration at the surface but considerable sampling variation and low abundance. Time lapse underwater photography confirmed the theory that lobsters are mainly active at slack water periods when foraging is possible.

(Scotland)

Commercial landings of lobsters were sampled in all the main fishing areas and catch and effort data were obtained from selected fishermen. Preliminary yield per recruit assessments were undertaken on all the main Scottish lobster stocks and estimates made of the effect of changes in size at first capture and fishing effort.

Aquarium experiments suggested that competitive interaction between lobsters outside creels might bias catches in favour of larger animals.

A scanning electron microscope study, in cooperation with the MAFF Conwy laboratory, showed that eye development cannot be used as a guide to age or moult staging.

Nephrops norvegicus

(England and Wales)

The aim of the Nephrops programme has been to improve the input parameters for yield assessment. Length composition sampling, mesh selection, discard survival, cod predation, claw tagging for movements, and stock surveys have all been carried out.

(Scotland)

Sampling of commercial catches in the Firths of Forth and Clyde were continued. Observations were made on the quantities of undersized Nephrops discarded

and on the quantities of fish bycatch and the proportion discarded. Further tagging experiments were undertaken. The survival of trawl and creel caught Nephrops discarded was studied in cages on the sea bed.

Cancer pagurus

(Scotland)

Descriptive material on the main Scottish stocks were collated. A study of the diet showed that the edible crab has access to a much larger food supply than the lobster, thus accounting for the crab's greater biomass.

Geryon affinis

(Scotland)

Exploratory fishing for the red crab took place west of the Hebrides.

Pandalus borealis

(Scotland)

Sampling of the commercial fishery continued. Experiments were conducted on the selectivity of shrimp trawls of 25 and 35 mm mesh sizes and further studies were made of the fish by-catch. Direct observations of the behaviour and distribution of shrimps at Fladen were made using underwater television and a still camera mounted on a sledge.

Crangon crangon

(Scotland)

Monitoring of the Solway Firth fishery continued.

Maia squinado

(England and Wales)

The study of the expanding spider crab fishery in south-west England has included collection of catch-effort data, observations on size and sex of catches, breeding, growth and tagging for migrations. Spider crabs mature at a fairly small size when growth ceases (terminal moult). Movements of up to 90 nm have been recorded from large males. The fishery is dependant upon a migration inshore in the summer months. Conservation needs are being considered.

Other crustaceans

(England and Wales)

The crab (Cancer pagurus), crawfish (Palinurus elephas), and shrimp (Crangon crangon, Pandalus montagui, P. borealis) fisheries have been monitored but little specific research was undertaken.

U.S.A.

(S.H. Clark)

Northern shrimp (Pandalus borealis)

The Northern Shrimp Scientific Committee¹ completed assessments and other analyses to determine the importance of environmental influences upon trends in abundance and to evaluate the effectiveness and applicability of various management measures. The Maine DMR continued studies to determine population structure, growth, and mortality rates and to determine mechanisms by which temperature influences trends in abundance.

Brown, white, or pink shrimp (Penaeus sp.)

The State of Louisiana Department of Wildlife and Fisheries (DWF) conducted mark-recapture studies of penaeid shrimp in south-central Louisiana. The SEFC studied the abundance and distribution of post larval and juvenile shrimp. SEFC personnel also completed analyses to define the nature of the transboundary shrimp stocks between the United States and Mexico and to determine rates of growth and mortality and migration patterns of white and brown shrimp in the northern Gulf of Mexico. The SEFC also conducted gear evaluation studies to develop selective shrimp trawling gear which could prevent or reduce incidental capture and mortality of sea turtles. Texas PWD personnel studied the size distribution, availability, and movements of penaeid shrimp in inshore and offshore areas and continued monitoring of population levels to assess factors affecting trends in abundance.

Spiny lobster (Panulirus argus)

SEFC personnel of NMFS assisted in development of a fishery management plan.

American lobster (Homarus americanus)

The Maine DMR continued surveys of the commercial fishery, stock assessment, and other biological parameters in Maine waters. Studies continue at Woods Hole Oceanographic Institution on the nutritional requirements of various life history stages of lobsters. Connecticut Department of Environmental Protection (DEP) personnel continued collection of statistical catch-effort data for lobsters in Long Island Sound. The Rhode Island DEM completed studies on trawl induced damage to lobsters and continued collection of statistical data using a recently developed logbook reporting system. The New York DEC continued studies on movements, growth, and mortality rates in western Long Island Sound. NEFC personnel completed an assessment for offshore areas. The Lobster Plan development Team² initiated collection of data and analyses for inclusion in a new Fishery Management Plan. Surveys con-

¹The Northern Shrimp Scientific Committee is a joint organization of state and federal scientists which is responsible for research and assessment work.

²The Lobster Plan Development Team consists of state and federal scientists working jointly under the coordination of the New England Regional Fishery Management Council.

tinue on the offshore pot fishery of this species by the College of William and Mary.

Blue crab (Callinectes sapidus)

Studies continue in Maryland and Virginia on the larval behavior and distribution of this species and its relationship to the commercial catch. The North Carolina DNRCD and the South Carolina WMRD conducted stock assessment work.

Jonah crab (Cancer borealis)

Studies continue on the potential of this fishery in the Norfolk Canyon region.

Stone crab (Menippe mercenaria)

SEFC personnel assisted with development of a fishery management plan.

Red crab (Geryon quinquedens)

NEFC personnel initiated studies of the biology and distribution of red crabs and examination of catch -effort trends in commercial data.

U.S.S.R.

(Reporting on mollusca only)

Iceland

(H. Eiriksson - U. Skuladottir)



MOLLUSCA

Chlamys islandica

Five research vessel surveys were carried out in 1979. Four of them were concentrated on exploited beds in the various existing fisheries off the west and northwest coasts, whereas the fifth was a search for new fishing grounds at southwest Iceland. No exploitable concentrations of scallops were obtained in the last survey and it is thought that the distribution of scallops off the southern part of the country may be limited by too high sea temperatures.

The fisheries were managed as before by catch quotas and area closures. Sampling of the catch in the main fishing areas was continued along with the collection of catch/effort data. In general catch rates continued to be high or up to approx. 900 kg per one hour of fishing in the major fishery at Breiðafjörður, West Iceland.

In 1980 exploratory surveys are planned off the north and north-east coasts.

Ireland

(C.B. Duggan)

Oysters, Ostrea edulis

Low sea temperatures resulted in a poor spatfall on the natural oyster beds in Tralee Bay, Galway Bay, Clew Bay and Blacksod Bay. Oyster landings, which peaked in 1977, continued to decline.

Scallops, Pecten maximus

A very heavy settlement of scallop spat occurred in the North Water, Mulroy Bay, Co Donegal. (See Mariculture Committee report for details). Spat settlement was generally poor in other areas, except in Dunmanus and Bantry Bays, Co Cork, where it was moderate.

Mussels, Mytilus edulis

Landings of mussels from the natural stocks in Wexford Harbour, Co Wexford, and from Castlemaine Harbour Co Kerry declined. A heavy spatfall occurred in

mid-June in both areas. Spat settled offshore in the Irish Sea, and was transplanted into Wexford Harbour. Spat settlement was inter-tidal in Castlemaine Harbour and limited transplantation took place.

Spain

(H. Quiroga - M. Torre)

Banc "Canario-Sahariano"

Octopus vulgaris : 11 échantillons - 721 exemplaires (Mars-Avril 1979)

Sepia P.P. : 3 échantillons - 151 exemplaires (Mars-Avril 1979)

Loligo vulgaris : 3 échantillons (Mars-Avril 1979)

Iceland

(H. Eiriksson - U. Skuladottir)

CRUSTACEA

Pandalus borealis

Research was similar as in previous years. Since 1978 the bycatch has been checked regularly by research vessels or fishery inspectors aboard shrimp vessels. If the number of juvenile cod, haddock, herring and/or Norway lobster exceeds a certain amount, based on value of the shrimp catch, the area is closed till the bycatch has decreased again. During the year sorting machines were prohibited as sorting of the catch was often carried out on dead shrimp when delayed or carried out from 2 to 5 times instead of once. In 1980 management of the fishery will be by quotas and closed seasons as before. Research will be carried out along similar lines.

Nephrops norvegicus

Two research vessel surveys were carried out during the fishing season (May-August).

Routine sampling of the catch was continued along with work on catch effort data. As predicted, the catch rates increased at Southwest Iceland, whereas catches on the other hand dropped drastically off the southwest - probably due to the unusually low bottom temperatures recorded in that area.

In 1980 work will continue along similar lines. Moreover studies of the effect of various environmental and biological factors on the catch rates of Nephrops will be increased, using data from catch reports.

Ireland

(C.B. Duggan)

Nephrops

Investigations were carried out at Skerries, Division VIIa during summer

on length-frequency of Nephrops caught, landed and discarded in the commercial fishery. In all, five samples were taken and length-frequency determined from the following numbers Nephrops

Undivided catch	:	1833
Landings	:	1388
Discards	:	<u>1595</u>
TOTAL	:	<u>4816</u>

In September, an experimental cruise was undertaken with two chartered trawlers performing parallel hauls to examine differences in the size and length composition in catch (and Whiting by-catch) obtained using Nephrops trawls of differing mesh.

Spain

(H. Quiroga - M. Torre)

Echantillons réalisés par l'Institut espagnol d'océanographie en 1979 :

En criée

Sur les navires

Zone	Trimestre	Nombre d'échantillons	Exemplaires mesurés	Nombre d'échantillons	Exemplaires mesurés
VII	1	12	1826		
	2	3	556		
	3	4	1089		
	4	3	773		
VIII	1	4	993		
	2	2	1209		
	3	2	1137		
	4	2	684		
IX	1	4	337		
	2	4	874	27	826
	3	4	674	74	17443
	4	4	337		