International Council for the Exploration of the Sea

C.M. 1983/E:1
Administrative Report

MARINE ENVIRONMENTAL QUALITY COMMITTEE

by

J. B. Pearce

1982

Belgium
(W. Vyncke)

1. The effects of dumping industrial wastes off the Belgian coast on the fish and shrimp stocks and invertebrates were studied further.

   A monitoring programme was carried out every three months at two dumping areas for industrial wastes derived from titanium dioxide production; one area for wastes form the production of thiocarbamates; an area for wastes from the production of proteolytic enzymes and an area for an industrial waste containing 1.5% phenol.

   A biological and physico-chemical survey was carried out.

2. The monitoring programmes on heavy metals and organochlorines in fish and shellfish were continued. Samples of cod, flounder, brown shrimps and mussels from the Southern North Sea were analyzed. The study on the evolution of mercury in Solea solea in the North Sea and the Irish Sea was continued.

3. The biological and physico-chemical monitoring of the Kwinte Bank, Buiten Ratel, Oostdyckbank and Gootebank where sand extractions are taking place was continued.

4. Petroleum hydrocarbons were analysed in sea water, sediments and biota samples from off the Belgian coast.

5. The radioactivity of sediments and in samples of fish and shellfish from Belgian coastal waters was measured.

6. Studies on fish pathology were started in Belgian coastal waters, especially in dumping areas.

7. The regular monthly survey to assess the general state of the marine environment was carried out further. Samples were taken in a 23 station grid. Automatic profiling of general oceanography parameters were included in the routine.

   Heavy metals (Zn, Cd, Pb, Cu, Hg) and PCB were also determined in dissolved and suspended matter.

8. Other surveys or specific campaigns:

8.1 The survey of the benthic fauna (36 stations) was continued. There is a link with other activities (COST 47) and programmes (influence of sand and gravel extraction, see item 3).

8.2 Twice a month (January to May), ichthyoplankton were surveyed on a 8 station profile using an undulating high-speed sampler. Zooplankton biomass, chlorophyll and hydrographical parameters were simultaneously surveyed.

8.3 Eight special cruises were organized to improve the knowledge of the distribution, speciation, and transformation rates of organic matter present in the marine environments (stocks of small organic substrates; uptake by bacteria; exoenzymatic processes; phytoplankton production; and excretion, grazing, etc.). The interaction between metals and organic matter in the marine environment has also been investigated.

8.4 Air-Sea interface exchanges of metals were investigated during two of the above mentioned cruises.

8.5 Geomorphological surveys (bathymetry, sedimentology, seismic cartography) of two areas in front of the Belgian coast were performed, in relation to sand banks investigations.

8.6 The monitoring program for the pollutants discharged from channels and sewage outfalls was continued. Samples were taken simultaneously from the points of input and offshore. Four campaigns were devoted to this exercise. The data are presently processed in a computer data base.

8.7 A special campaign was devoted to the study of the physical characteristics of slib from the Belgian shelf compared to the Dutch coastal area and the Western Scheldt. A sub-bottom sampler (ORE) and a Reineck box corer were used.

9. Survey of Western Scheldt:

9.1 The monitoring programme on the Scheldt was continued. Regular monthly surveys were made at 36 stations to provide longitudinal profiles of physico-chemical parameters (salinity, temperature, dissolved oxygen, redox potential, pH, turbidity), to study sedimentation processes and heavy metal transport mechanisms, as well as nutrient interactions and bacterial activity.

9.2 Regular surveys of heavy metals (Cd and Hg) and PCB have been done, in the frame of the Joint Monitoring Program of the Oslo and Paris Conventions.

9.3 Heavy metals transport processes and accumulation in the sediments have been studied (1 campaign and 9 sampling stations). Localization of sedimentation and erosion sites was made using a "sub bottom" sample.

Canada
(J. Uthe)

High levels of polynuclear aromatic hydrocarbons in lobster (Homarus americanus) captured in a harbour receiving effluent from a coke plant were high enough to warrant banning the harvesting of lobster from the arm of the harbour nearest the coke plant. (Halifax)

Salmon (Salmo salar) entering acidic (pH 5.0) rivers to spawn demonstrated impaired sex hormone blood profiles. Androgen levels in such fish were significantly lower than those in fish captured in less acidic rivers. (Halifax)

The uptake of copper, zinc, cadmuim and lead by shrimp (Crangon septemspinosa) and polychaete worms (Nereis virens) from sediment doped with zinc ore concentrates was studied and compared to harbour sediments from the harbour where such concentrates are shipped. Copper and cadmuim levels in both Crangon and Nereis did not differ significantly from controls. Lead and zinc levels was significantly higher compared to controls. It was suggested that zinc levels were high enough to suppress cadmuim uptake. (St. Andrews)

The uptake and excretion (bioconcentration factors) of five non-alkylated polycyclic aromatic hydrocarbon by soft-shelled clams, mussels, polychaete worms, lobsters and shrimp from water or contaminated natural sediment was studied. Bioconcentration factors varied with species and exposure conditions. (St. Andrews)

Anoxia alone did not affect the metabolic energy state (adenylate energy charge (AEC)) of Nereis virens compared to normoxic animals in the laboratory. A sublethal level of endosulfan decreased AEC in Nereis virens and the decrease was below that indicative of optimal physiological states for microorganisms (0.8) in the endosulfan-treated groups (St. Andrews).

Nereis virens took up greater amounts of ^{14}C-DDT under anoxic conditions compared to normoxic conditions. After 96 hr depuration, levels in both groups were similar although no elimination had occurred in the normoxic group. (St. Andrews)

Adenylate energy charge (AEC), creatine phosphate (fish) and arginine phosphate (invertebrates) are being studied in sea raven, flounder, clams and mussels to determine variations in levels over time. Freshly caught animals were sampled monthly and the biochemical parameters were measured in extracts of gills, muscle and liver of fish and whole body homogenates of invertebrates.

AEC levels in sea raven remained stabled between October 1981 and June 1982. Creatine phosphate levels varied inconsistently. Both AEC and creatine phosphate varied seasonally in all the flounder tissues. Although ANOVA indicated significant time differences for AEC and creatine phosphate there did not seem to be a distinct pattern and AEC values appeared to be stable. AEC and arginine phosphate levels varied inconsistently in clams from three different areas and seasonal effects were found for both parameters, AEC being lowest in August and highest in February. No pattern was apparant in creative phosphate levels. Mussel AEC levels were lowest in May and also highest in February but there was no discernable pattern in AEC or arginine phosphate levels in mussels. (St. Andrews)

Salmon eggs held at pH 4.5 had lower chorinase activity than eggs held at pH 6.5. Cumulative mortalities of eggs and alevins were higher among those raised at pH 4.5 than at 6.5. A number of biochemical parameters in parr were different in fish held at pH 4.5 during smoltification than at pH 6.5. (St. Andrews)

A two-compartment model has been developed for the evaluation of contaminant accumulation. The need for this expansion becomes obvious when the excretion data cannot be described satisfactorily by a single exponential term. (St. Andrews)

A brown plastic capsule (4.5 x 10.5 x 3.0 cm) filled with liquid and solid matter was found in the stomach of a cod. The capsule floated in water and contained benzene sulfonamide and ethanol among other things. This suggests that floating, anthropogenic material is ingested by fish such as cod. (St. Andrews)

In reference to C. Res. 1982/4.7 we have completed an assessment of the discharges of trace metals from the St. Lawrence River through a two-year programme of measurements of the inorganic composition of river water at Quebec City. This work has now been published in the Canadian Journal of Earth Sciences. Currently we are conducting measurements of the discharge or organic matter by this river as part of the international SCOPE programme dealing with the discharge of organic material from major world rivers. The fluxes of total and particulate carbon and the major characteristics of total organic material, i.e. C, N, P, C_{13} are currently being measured. (A.O.L.)

Various environmental studies are also being undertaken that are directed towards the assessment of the effects of discharges of various industries on coastal areas. Examples of these are joint Canadian-Danish studies of the receiving waters of a lead-zinc mine in western Greenland, the effects of the discharges of radionuclides and heat from the coastal nuclear power station at Pt. Lepreau, New Brunswick, and the history of metal contamination in the Saguenay Fjord. Other related investigations include studies of cadmium exchange between water, biota and sediments in the intertidal zone being conducted jointly with the University of Heidelburg and the Institute of Marine Reseach, Bremerhaven, using experimental caissons deployed in the Wadden Sea near the Jade. A further experiment on the rates and products of petroleum hydrocarbon degradation is also being carried out in intertidal beach sediments of Nova Scotia. As a culmination of our aggregate studies of the chemistry of the Gulf of St. Lawrence, we have commenced a review of chemical oceanography and environmental chemistry of this area. (A.O.L.)

Increased effort on studies of the components of the lipid fraction in seawater have taken place during 1982. Investigations of the seasonal variations in such components in a semi-enclosed coastal area have been started. Attention to the partition and exchange of metals between dissolved and particulate phases in estuaries has been conducted with primary emphasis upon the St. Lawrence Estuary. Baseline coverage for the distribution of petroleum hydrocarbon residues, trace metals and nutrients has now been achieved for all areas of the Canadian East Coast from the U.S. border to northern Baffin Island, excepting the Labrador Shelf region. It is hoped to complete all such baseline coverage by the end of 1985. A major investigation of chemical conditions in the Hudson Strait/Northern Hudson Bay/Foxe Basin area was carried out during 1982. (A.O.L.)

Studies of chemical oceanography in the deep ocean have concentrated on the behavior of trace metals in the North Atlantic, the processes of nutrient regeneration in Baffin Bay, the mechanisms of major ion partition in sea ice/water mixtures, the distribution of sea ice meltwater and studies of the chemical oceanography of the Arctic Ocean. In the latter case, work carried out within the FRAM-III Program are being extended through participation in the CESAR ice camp expedition 1983. Of particular interest in the Arctic Ocean are nutrients, major ions, alkalinity, fission products (Cs-137 and Sr-90) and trace metals. A deep sea in situ pumping system for the collection of suspended particulate material was tested during 1982. It is hoped to employ this device during 1983 for the collection suspended particulate material from different depths in the Sargasso Sea. Material collected in this way will be analyzed for the composition of deep ocean suspended matter in relation to investigations of particulate/dissolved metal partition and exchange. (A.O.L.)

Gall bladder bile acid changes were studied in codfish and flounder chronically exp osed to petroleum. The levels of cholic acid decreased, and the levels of chenodeoxycholic acid increased, in cod; whereas levels of both acids decreased in flounder. It is of particular interest that both cholanic acid and dihydrocholic acid were only detected in experimental animals, indicating that these particular bile acids may have a useful role in biological-monitoring studies. (Nfld.)

Experiments to determine the chronic effects of petroleum, as well as the interaction between petroleum and blood parasites, were carried out with codfish in 1982. Results are presently being analyzed and data should be ready for publication in 1983. (Nfld.)

Cadmium and zinc have been shown to induce the synthesis of metallothionein in liver, intestine and kidney of winter flounder. The protein has been purified, and we are presently using it to develop a radioimmunossay. This assay will serve as a sensitive tool with which to detect metallothioneins in fish exposed to low levels of heavy metal contaminants. (Nfld. - MSRL)

Recent studies with salmon have indicated that in animals exposed to petroleum during spawning, hepatic MFO are somewhat refractory to induction (2 fold), while kidney MFO can be elevated 10-20 fold. This indicates that extra hepatic tissue analysis would provide an important adjunct for use in future biological monitoring studies. (Nfld.)

Work in 1982 corroborated results obtained in 1981, and it is indicated that petroleum-contaminated sediment will not pose a significant larval-toxicity problem, except under exceptional cases, such as heavy contamination of intertidal areas with hydrocarbon concentration greater than 100 ppm. (Nfld.)

A series of experiments to determine the effect of acute exposure to crude petroleum on some reproductive hormones in salmon and flounder have been carried out over the last three years. Androgenic steroids, 11-KT, 11B-OHT and testosterone, as well as 17-B-estradiol, were quantitated by radioimmunoassay, and it has been demonstrated that the concentrations of total (free + conjugated) androgens are reduced in the plasma of fish exposed to petroleum. Such subtle effects on hormone endocrinology could influence various biological endpoints including spawning success, behavior and secondary sexual characteristics. Of particular interest might be major oil spill situations in which migrating salmon would be exposed to relatively high levels of petroleum hydrocarbons in estuarine waters. (Nfld. - MSRL)

It was established in 1980-81 that various bivalves including mussels, freshwater clams, and soft clams have components of the MFO detoxification system, but activity was generally quite low and often non-detectable. We have now demonstrated a modest level of induction (1-2 fold) of benzo(a)pyrene hydroxylase activity in mussels injected with relatively high concentrations of polychlorinated biphenyls (PCBs), but attempts to induce MFO with environmentally relevant concentrations of the chemical were unsuccessful. Negative results were also obtained with freshwater mussels injected with polybrominated biphenyls. Assays included diphenyloxazole hydroxylase and ethoxyresorufin dealkylase, as well as fluorimetric and radiometric procedures for benzo(a)pyrene metabolism. The results obtained supported our earlier studies with petroleum hydrocarbons, which also demonstrated that bivalve MFO would not be particularly sensitive for use in biological monitoring. (Nfld.)

Recent studies in the U.S. have indicated that even in invertebrates such as crustaceans and annelid worms, which are "non-inducible" or quite refractory to induction, there may be selection for strains with high MFO activity levels in populations exposed to inducing pollutants for several generations. We were not able to obtain evidence for selection for elevated MFO activity levels in bivalves collected near a refinery outfall in Newfoundland, an area which has been receiving low levels of petroleum hydrocarbons for over 20 years. (Nfld.)

Les travaux sur la distribution et le comportement du mercure dans le fjord du Saguenay, l'estuaraire et le golfe du Saint-Laurent se sont poursuivis. Les résultats ont montré que les teneurs en mercure des eaux de l'Estuaire et du Golfe sont parmi les plus faibles mesurées dans l'Océan mondial et que seules celles du Fjord y sont plus élevées. Quant aux concentrations de mercure dans la chair consommable des crevettes du Saguenay, elles ont atteint la limite acceptable pour la consommation, soit cinq ans après la coupure de la principale source de contamination.

Les études sur les hydrocarbures polycycliques aromatiques ont démontré que les couches sédimentaires récentes du fjord du Saguenay sont enrichies en benzathracène, benzophénanthrène, benzo(e)pyrène, binaphtalène et benzopérylène. Ces résultats confirment qu'une source anthropique d'hydrocarbures polyaromatiques existe en amont du Fjord.

Dans le cadre de SCOPE-UNEP, la Région a participé à un programme international de measure des flux de matière organique et minérale arrivant à l'océan par les grande fleuves du monde. Le monitorage effectué dans le fleuve Saint-Laurent depuis 1981 se poursuit, en collaboration avec l'Institut océanographique de Bedford.

Le programme portant sur l'amélioration de la moule bleue (Mytilus edulis L.) comme espèce indicatrice de la pollution s'est poursuivi par l'étude des variations saisonnières des teneurs en métaux chez une population de moules de l'estuaire du St-Laurent. (Quebec)

Organochlorine (DDT and PCB) residues in seals vary with the animals' age and sex, increasing with age in males and staying approximately constant in females. Lactating female seals "turn over" up to about 30% of their blubber and its associated residue burden in one lactation, which they replace during the subsequent year's feeding. Thus, lactating females may be good samplers of current levels of environmental contamination.

Mother-pup pairs of grey seal (Halichoerus grypus) from Sable Island, N.S., sampled in 1982 had lower DDT-group levels than those taken in 1974 or 1976, but similar PCB levels. p,p'-DDE (a metabolite of p,p'-DDT) represented a higher fraction of total DDT in 1982 than in 1976 or 1974, suggesting that the 1982 residues were "older". Taken together, the results suggest that there has been a reduction in the extent of DDT contamination during the interval 1976-1982, but not of PCB contamination. (MEL)

The AMOCO CADIZ spill in Brittany has been studied at regular intervals during the past few years. The distribution of stranded oil in "low energy" systems such as salt marshes has been shown to depend on physical and geological factors, such as sediment particle size. Oil deposited on the sediment surface may be distributed "chromatographically" throughout the sediment column, perhaps by tidal pumping. The availability of oil fractions to benthic infauna and epifauna continues to be studied. (MEL)

The environmental threat posed by a chemical depends on its properties, which may include scale of production, use pattern, physical properties which may affect environmental distribution, degradability, acute and sub-acute toxicity. These features of various PCB replacements have been reviewed. Briefly, "heavy" chemicals with wide applications (some of which uses may be as a PCB substitute), may in many cases, already be environmental contaminants (examples are the silicones and di-(2-ethylhexyl) phthalate), others such as polyalphaolefins may be almost indistinguishable from existing contaminants from various sources. Many specialised chemicals produced on a small scale are likely to enter the environment as a result of specialised use as solvents for pressure sensitive copy papers (examples are the di-isopropylnaphthalenes, used for this purpose in Japan); in general, however, such chemicals are more degradable and less toxic than were the PCB which they replace. (MEL)

Denmark
(A. Nielsen)

This report provides information on the relevant activities at the Marine Pollution Laboratory and RISØ National Laboratory, Health Physics Department.

MARINE POLLUTION LABORATORY

1. The Marine Pollution Laboratory continued its monitoring activities in 1982. Bimonthly collections of samples for determination of concentrations of nutrients in sea water, phytoplankton primary production, and composition and abundance of phytoplankton and zooplankton have been accomplished at eleven locations in the Belt Sea, the Sound and the Kattegat.

   Samples for determinations of the content of trace metals, PCB, and DDT in flounder and sediments were collected at one location in the Sound, one in the Great Belt and from five locations in the North Sea.

   Samples for determination of concentrations of trace metals in sea water have been conducted at several locations in the Belt Sea, the Kattegat, and the North Sea.

2. In September 1982 a survey was carried out in the Skagerrak-North Sea area to monitor the development of oxygen depletion in the bottom water along the west coast of Jutland. Samples for determination of composition and abundance of phytoplankton were also collected. Rather high levels of Gyrodinium aureolum were found in the Skagerrak area. (see Figure on page 9).

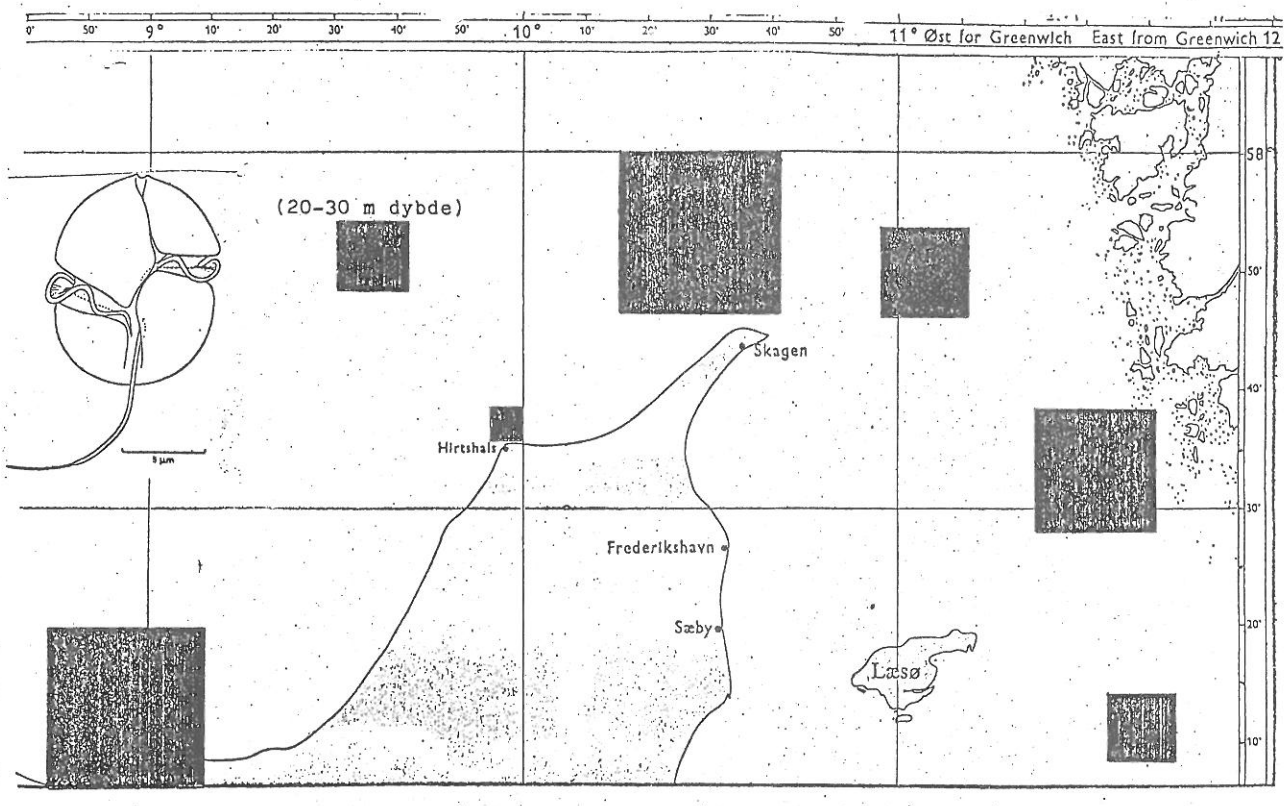
3. The Laboratory participated in the ICES Fifth Round Intercalibration on Trace Metals in Sea Water (C.Res. 1980/4:2 and C.Res. 1979/4:18).

4. During 1982 the laboratory carried out studies and tests on burrowing and avoidance behaviour in marine organisms exposed to sediment contaminated with a pesticide. The experiments were carried out in a simple laboratory set-up, but the validity of the tests was supported by in situ observations and investigations on the distribution of the test-species in nature. It is concluded that such tests are useful tools in the assessment of the impact of contaminated sediments.

5. Studies on possible effects caused by chronic oil-pollution have been carried out in a fjord. A town, a coal burning power station and an oil refinery are located at the head of the fjord. The studies also include investigations of the distribution of PAH in the environment.

RISØ NATIONAL LABORATORY

6. The Health Physics Department has carried out radioecological studies in temperate and arctic waters of the North Atlantic region with emphasis on transuranic elements. The studies included:



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Gennemsnitlig koncentration af den giftige planktonalge Gyrodinium aureolum i overfladelaget (0-15 m) 31/8 - 1/9 1982.

Average concentration of Gyrodinium aureolum in the surface layer (0-15 m) during 31. August - 1. September 1982.

6.1 Uptake and loss of certain transuranic-, fission- and activation nuclides by Mytilus and Fucus, with special emphasis on physiochemical form and the effect of low temperatures;

6.2 Studies on transuranic elements, radiocaessium, tritium and cobalt in seawater, sediments, sea-plants, and mussels; and

6.3 Environmental studies of plutonium and americium at Thule, Greenland.

As a whole, the fallout nuclides from nuclear weapons testing are still the main sources of man-made radio activity in the North Atlantic region. However, in the North Sea most of the radiocesium comes from reprocessing plants for nuclear fuel in Western Europe.

In recent years the discharges from the U.K. reprocessing plant at Sellafield have not only been detectable in the North Sea, but also in the Danish Straits, the Baltic Sea, along the west coast of Norway, at Spitzbergen, in 1982 even in East Greenland, and probably also in West Greenland waters.

Denmark (Greenland)
(P. Johansen)

1. Monitoring studies continued in a fiord system in NW Greenland affected by heavy metal pollution from tailings discharged into the sea from a lead-zinc mine and mill. Lead, zinc, cadmium, and copper are monitored in sea water, sediments, and marine organisms, including brown algae, mussels, shrimp, fish, and seals.

2. A study of the natural variation of levels of trace elements in indicator organisms (seaweed and the blue mussel) terminated in 1982. The same species now have been studied for 3 years in the same localities unaffected by local inputs of pollutants. Some results have been presented to WGMPNA of ICES.

3. A baseline study on the level of heavy metal in sea water, seaweed, and the blue mussel was carried out at a cryolite mine which has operated for more than 100 years. Significant pollution by lead was demonstrated in the study.

Finland
(T. Melvasalo and P. Tulkii)

Finland conducts marine research in the Baltic Sea, especially in the areas of the Gulf of Bothnia, Åland Sea, Archipelago Sea, northern Baltic Proper, and the Gulf of Finland. State research institutes, universities and their field stations, and water protection associations, as well as laboratories of some communities, participate in the work at sea and in the laboratories. Examples of studies relevant to the recommendations of the ICES and to the work of the ICES/SCOR Working Group of the Study of Pollution of the Baltic follow, as well as activities in connection with the Helsinki Commission.

Finland has taken part in the sixth intercalibration exercise on the analyses of PCBs in biological tissues (C.Res. 1981/4:2), second intercomparison exercise on petroleum hydrocarbons in marine samples (C.Res. 1981/4:3), and fifth round intercalibration of MCWG for trace metals in seawater. Finland also has participated in the intercalibration of biological methods of theBaltic Sea states, conducted in Rønne, Denmark.

Together with all other Baltic Sea States and ICES, Finland has prepared the second stage of the Baltic Monitoring Programme, which starts in 1984. Within the ICES/SCOR WG for the Study of Pollution of the Baltic Sea a pilot study on sediments in the Baltic Sea has been planned.

Studies of water and sediment quality in regard to mariculture (C.Res. 1982/5:1) have been conducted in the Archipelago Sea, where considerable cultures of salmonids have been established.

Fish pathological studies have been made, especially in the Bothnian Sea and in the Archipelago Sea, where discharges from the pigment, pulp and paper industries, and heavy metals from various sources, possibly have caused fish diseases(C.Res. 1981/4:6). For the same reasons comprehensive field observations were made in the Bothnian Sea by several research institutions. The study included hydrographical, sedimentological, biological and chemical observations from all compartments of the ecosystem (sediment, water, plankton; fish and benthos). The occurrence of heavy metals and possible anomalies in Baltic herring stocks were studied especially.

A research project was begun to study effects on the coastal water environment of sand and gravel extraction in the Finnish part of the Baltic Sea. The goal is to obtain an ecological basis for regulations of sand and gravel extraction.

Recovery and recovery potential of formerly polluted or damaged coastal water ecosystems were studied along the whole Finnish coast and in the Archipelago. Publications on this long-term research are now available.

Disappearance of the bladder wrack (Fucus vesiculosus) from large areas off the south coast of Finland and in the Archipelago Sea was studied in relation to eutrophication. Complicated phenomena in the environment have created disturbances, which now are recovering.

Studies on the effects of boat traffic on the littoral ecosystems in the southwestern Archipelago continue. The problems include effects of waves on littoral ecosystem, fishing, and reproduction of Baltic herring. Also, fouling and "speed reduction" by sessile organisms adhering to the bottoms of vessels was studied under Baltic Sea conditions.

Properties of the Baltic Sea sediments were studied in regard to following long-term alterations of the heavy metal contents and organohalogen compounds. Also origin of organic substances in

sediment was studied. Studies of accumulation of halogenated hydrocarbons in different parts of the marine ecosystem continues, both on a routine basis according to international agreements and for national purposes. A case of illegal dumping of wastes containing PCB is an object of local monitoring.

An investigation of stress from some heavy metals and pentachlorophenolate on heterotrophic activity and primary productivity using a factorial experiment was conducted under conditions simulating environment of the Gulf of Finland.

Monitoring of pollution of the Baltic Sea was continued in the open Baltic within the framework of the Helsinki Commission and on a bilateral basis with Sweden and the USSR. In the coastal waters, the water authorities had 82 localities observed regularly. They also measured levels of nutrients, heavy metals, and solids in 22 river mouths discharging into the Baltic Sea.

A seminar on modelling of movements of oil at sea was held 23-25 November in Finland. Participants from Baltic Sea states were present. Alsothe 13th Conference of the Baltic Oceanographers was organized 24-27 August in Finland. Many of the lectures dealt with pollution in the Baltic Sea and related questions. The proceedings were published in two volumes and has been distributed.

France
(C. Alzieu)

No Administrative Report given in 1982.

Federal Republic of Germany
(V. Dethlefsen and G. Weichart)

No Administrative Report given in 1982.

Iceland
(J. Oalfsson)

No Administrative Report given in 1982.

Ireland
(M. Parker and M. O'Sullivan)

1. Biological Effects Monitoring

1.1 Fish Pathology (C.Res. 1981/4:6)

Work on the east coast of Ireland by the Department of Fisheries in 1981 was follwed up by a further cruise in 1982 to some of the apparently more seriously affected areas. The results will be reported to the Working Group on Pathology and Diseases of Marine Organisms and they suggest that a seasonal variability plays an important part.

1.2 Benthos and Dumping Grounds (C.Res. 1979/G:14)

The programme for monitoring of marine waste dumping sites includes a survey of the benthos in and around the dumping area. Such a survey was carried out at the Cork disposal site in 1982, together with physical and chemical analysis of the sediments.

1.3 Other methods reviewed at the Beaufort Workshop.

The Working Group on Marine Pollution Baseline and Monitoring Studies in the North Atlantic has sought information on experience gained using these techniques. A study in the Environmental Sciences Unit at Trinity College, Dublin is applying and comparing certain physiological and bioassay techniques. At University College, Cork, the Zoology Department is studying the use of cryptofauna and artificial substrates in monitoring pollution.

2. Contaminant Monitoring

Maintained participation in ICES coordinated monitoring programme and cooperative studies programmes.

2.1 Intercalibrations

Participated in:

2.1.1 ICES Fifth Round intercalibration for trace metals in seawater.

2.1.2 ICES intercomparative organochlorine exercise.

3. The organic carbon content of thirty sediment samples from the marine waste dumping site off Cork was determined.

Netherlands
(S. J. deGroot)

1. On behalf of the European Commission DG XII, and in the framework of a plan by objective of research carried out in the Member States, the part "fisheries research" was provided through a contract with the institute.

2. Biodegradation experiments, using a chemostate, were continued. A further study into the persistence of 4-nitrophenol was initiated.

3. The occurence of principal phytoplankton blooms in Dutch coastal areas has been described for the period 1973-1981. Blooms of D. acuminata (>20,000 cells/liter) could be related to diarrhetic mussel poisoning.

4. For the parasitological and pathological research the main topics were pointed to the registration of fish diseases at sea, the continuation of a special effect-study on possible environmental influences on the condition of fish (eel), and the study of the activities of the oyster disease agent Bonami ostreae in the infected oyster area Yerseke Bank. For the latter, the results of 1982 pointed to a decreasing activity of the disease agent, probably as result of the control measures by cleaning the infected area and ceasing further oyster culture.

5. PCB contents in eel caught in the river systems of Rhine and Meuse as well as their estuaries still exceeded the tolerance level of 5 mg/kg (total PCB). In the river Roer, a tributary of the Meuse, an extremely high contamination by tetra- and pentachloro-biphenyls was detected, at a total PCB level of 36 mg/kg.

6. In the marine and the freshwater environment studies have been performed into the occurrence of tri- to hexachlorobenzenes, pentachlorothioanisol, tetrabromodiphenylether and chloridane compounds in fisheries products.

7. High mercury residues have been found in fishes -- pike, pike-perch, perch -- from various inland waters (e.g. Lake IJssel, pike-perch: 0.23-1.52 mg/kg).

8. Total-bromine contents in fishes vary from 1.8 mg/kg in pike-perch to 70 mg/kg inshrimps. A considerable percentage consists of organo-bromine compounds: 35% in marine fishes, 40% in freshwater fishes, 60% in sprat, 75% in shrimps.

9. Within the Ministery of Transport and Public Works the Governmental Institute for Sewage and Waste Water Treatment (RIZA) is involved in the following investigations in the marine environment:

   9.1 A regular two-weekly survey to assess the general state of the marine environment, has been continued in 1982. In their survey general oceanographic parameters, chemical composition, nutrients, pigments and some pollutants are measured.

9.2 In the framework of the Oslo and Paris Conventions monitoring and input studies have been continued. Attention has been paid to the water, organisms and sediment compartments for the parameters trace-metals, pesticides and PCB's.

9.3 The effects of dumping industrial wastes and harbour dredging material were studied further.

9.4 A study of the possible eutrophication of the coastal waters has been started.

9.5 RIZA takes part in a long term research programme in the North Sea, with main attention to physical aspects (e.g. waves, tides, sediment-transport) and pays, within this framework, special attention to the environmental properties of suspended solids and sediments.

Norway

(P. T. Hognestad and K. Palmork)

1. Field Programmes

1.1 Investigations on environmental quality in the Skagerrak area in a section (Torungen-Hirtshals) between Norway and Denmark were carried out with 11 surveys throughout the year. Measurements were made of temperature, salinity, oxygen, nutrients and phytoplankton (Flødevigen Biological Station).

1.2 Experiments were conducted in plastic enclosures in Lindåspollene, western Norway, to measure the effect of oil on biological processes and the species composition of pelagic communities (Institute of Marine Biology, University of Bergen).

1.3 Surveys have been made of hydrography, hydrochemistry, chemistry of sedimenting particles and macrobenthic fauna of various fjord areas in the area of Bergen subject to actual and potential sewage pollution (Institute of Marine Biology, University of Bergen).

1.4 Studies on effect of Ekofisk and Statfjord crude oil on the growth rate and photosynthetic capacity of marine diatoms in outdoor dialysis cultures have been carried out (Trondheim Biological Station and Institute of Marine Biochemistry, University of Trondheim).

1.5 During an artificial oil spill at Haltenbanken the effect of Stratfjord crude oil on growth of marine diatoms in dialysis cultures was studied (Trondheim Biological Station and Institute of Marine Biochemistry, University of Trondheim).

1.6 Organic carbon, nitrogen, and phosphorus in natural phytoplankton populations from the Haltenbanken oil spill were analysed (Trondheim Biological Station).

1.7 Within the framework of the Station pollution monitoring programme, sponsored by the Ministry of Environment, baseline and monitoring studies have been carried out in 15 polluted coastal areas. The investigations have focused on surface water quality (phytoplankton biomass measured as chlorophyll a), structure of shallow water and soft bottom communities, and the occurrence of metals, polycyclic aromatic hydrocarbons and other pollutants in biota and sediments. Other field studies included the evaluation of existing or planned effluents from industry and municipalities. Most of the studies included standard hydrography and measurements of plant nutrients (Norwegian Institute of Water Research).

1.8 As a part of the Joint Monitoring Programme (JMP) required by the Oslo- and Paris Conventions, mercury, cadmium and PCB's are being monitored in fish, mussels and seawater from the outer part of Oslofjord (Norwegian Institute of Water Research).

1.9 Experiments have been made on drilling muds and cuttings mixtures from offshore oil well drilling which are moved to a nearshore sea bottom at Bergen, Western Norway, to measure the rates of "leakage" of contaminants from the cuttings to the water, and to investigate the suitability of the cuttings as substrate for a benthic community (Norwegian Institute for Water Research).

1.10 The occurence and concentrations of polar oil degradation products and dissolved oil components in seawater under an oil slick was studied during the Haltenbanken controlled oil spill (Chemical Department, University of Bergen).

1.11 An experimental oil spill was performed at Haltenbanken by FOH*, July-August 1982. Horizontal and vertical distributions of petroleum hydrocarbons in the water column were determined using gas chromatographic mass spectrometric methods and in situ fluorescense. The programme also included biological observations on fish eggs and larvae, zooplankton, phytoplankton and bacterioplankton (Institute of Marine Research).

* The Norwegian Marine Pollution Research and Monitoring Programme (FOH), in cooperation with:

- SINTEF, Trondheim
- Continental Shelf Institute, Trondheim
- Institute of Marine Research, Bergen
- Institute of Marine Biochemistry, Trondheim
- Dept. of Marine Botany, University of Oslo
- Chemistry Department, Institute of Microbiology, Institute of Marine Biology, University of Bergen

1.12 Monitoring of environmental qualities of selected Norwegian fjords from Stavanger to Varangerfjord were carried out. The fjords were selected to represent different types of environmental stress conditions, i.e. industrial and domestic loads. Measurements were made of salinity, temperature, nutrients, oxygen and turbidity (Institute of Marine Research).

1.13 Environmental quality of coastal sea water. This programme continued for the eighth season. The organic load of the Baltic current is being investigated from the Øresund through Kattegat, Skagerrak and along the western Norwegian coast. Recordings are made of particulate matter, nutrients, and temperature, whereas primary production indices are measured at intervals (Institute of Marine Research).

1.14 Bacterial degradation of oil in the marine environment was investigated and measurements involved: influence of oil on microbial interactions between phytoplankton, bacteria and micro-flaggellates, specifically as to inorganic nutrient regeneration; effect of photooxidization on bacterial degradation; field research and laboratory based research; and continuous cultures as a major laboratory method (Dept. of Microbiology and Plant Physiology, University of Bergen).

1.15 Investigations of bacterial populations and spawning activity included: effects of spawning activity (mainly effect of released milt material) on natural bacterial populations, their composition and activities; and natural conditions during cod-spawning off Lofoten and conditions in an aquaculture facility for cod spawning were studied (Dept. of Microbiol. and Plant Physiology, University of Bergen).

1.16 Seasonal variations in growth rate of the natural bacterial populations, as influenced by temperature and other factors. Effects of temperature adaptation and growth influencing substance on the growth rate of natural heterogeneous bacterial populations in the fjord system south of Bergen.

2. Laboratory Assays

2.1 Behaviour of cod in water with gradients of the soluable fractions of Ekofisk crude oil was studied in special constructed aquariums (Flødevigen Biological Station).

2.2 Study of effects of water with soluable fractions of crude oil was carried out on diluted natural populations of phytoplankton and in cultures of single species (Flødevigen Biological Station).

2.3 The chemical degradation of oil in water is being studied, especially the photochemistry of oil. Analytical methods for group separations, quantification, and toxicity testing of polar water soluable products are being developed (Chemistry Department, University of Bergen).

2.4 The fates of ^{14}C-labelled napthalene, phenanthrene BaP and 2, 4, 5, 2', 4', 5'-hexachlorobiphenyl (PCB) were studied in eggs and larvae of cod. Autoradiographic studies of the disposition of PCB, phenanthrene and octachlorostyrene were carried out using various marine fish (cod, flounder, and rainbow trout). The uptake and elimination of aromatic hydrocarbons and octachlorostyrene in all Bermudian hard corals were investigated (Institute of Marine Research).

2.5 Effects of the water soluable fraction of Ekofisk crude oil and a heavy fraction of Ekofisk crude oil (b.p. >No °C) have been studied using eggs and the early larval stages of cod. The work has been concentrated on sublethal effects of low levels of dissolved hydrocarbons (50-300 ug/L) by recording weight and growth rates, morphological aberration, feeding buoyancy, yolk osmolarity, ionic regulation and oxygen consumption. Also the LC_{50} (24 h) of photooxidation products from Ekofisk crude oil was tested on cod larvae (Institute of Marine Research).

2.6 There were studies conducted on effects of oil on the growth rate of marine diatoms in outdoors dialysis cultures and we continued development of algal bioassays for testing the toxicity of hydrocarbons (Institute of Marine Biochemistry, University of Trondheim).

2.7 An exo- (B-1, 3)-D-glucanase has been detected in species of marine diatoms, for example Skeletonema costatum. The enzyme showed a specificity for B-1, 3 linked d-glucans as no reactions occurred with a-1, 4 or a-1, 6 linked polysaccharides. The activity was produced under nutrient limiting conditions (Institute of Marine Biochemistry, University of Trondheim).

2.8 Embryological material from sea urchins and marine fishes is being used to study the effect of Ekofisk oil, aromatic hydrocarbons and oil dispersants (Institute of Biology and Geology, University of Tromsø).

Poland

No Administrative Report submitted for 1982.

Portugal
(M. J. Bebianno, A. Ferreira, and C. Lima)

No Administrative Report submitted for 1982.

Spain
(A. Alvarez)

No Administrative Report submitted for 1982.

Sweden
(L. Thorell)

1. Eutrophication in marine environment I

Summarization of previous investigations.

1.1 Eutrophication in marine environment II

A four year investigation will be carried out concerning eutrophication in the Baltic Sea, Kattegat, and Skagerrak. The project will concentrate on the need for and possibility of reducing emissions of nitrogen and phosphorus, the cause of plankton blooms, and the effects on fish and fishery.

1.2 Dynamics of a Nodularia bloom:

Ecological model of the eutrophication in receiving coastal waters. Long-term changes on macrobenthos in the Baltic Sea; Eutrophication or a change in the predation pressure? Production-stimulating substances in southern Kattegat.

2. Research in Kattegat-Skagerrak

2.1 The dynamics of biological nitrogen transformation in Kattegat and the Bay of Laholm -- study on water and sediment.

2.2 Radionuclide concentrations in marine algae and invertebrates in the Sound and southern Kattegat.

3. Marine Mammals

3.1 Reproduction disturbances among seal.

3.2 An "ecological" seal project.

4. Fish Diseases

4.1 Investigations on occurrence of fish diseases and fish parasites in Swedish marine areas, mainly in connection with pollution.

4.2 Organic arsenic compounds in fish.

4.3 Fish/metal project (injurious effects by different metals on fish):

Vertebral injuries;
metal-analyses of fish;
sublethal physiological effects;
cadmium-absorbation in fish-gill, its dependence on the form of metals occurring in the water;
spawn/fry tests;
population structure of Perca fluviatilis and

Cottus quadricornis and population dynamics in pollution-receiving waters; and
metal effects on and biological availability for fish.

5. Pisciculture

5.1 Environmental consequences of aquaculture -- pollution from fish farms.

5.2 Identification and biological resources (hereditary aspects) in different Salmon species.

5.3 Sublethal physiological effects on fish caused by environmental pollution.

United Kingdom
Scotland
(A. D. McIntyre)

In accordance with the decision to focus Administrative Reports to MEQC on ICES Council Resolutions, the relevant Resolutions are listed below and appropriate comments provided:

C.Res. 1982/4:1

Intercalibrations. Arrangements are being made for participation from appropriate Scottish laboratories inthe intercomparison of non-alkylated polycyclic aromatic hydrocarbons in shellfish tissue.

C.Res. 1982/4:2; C.Res. 1982/4:6; C.Res. 1982/4:8

Baseline survey. The Marine Laboratory is active in the various aspects of preparation for the proposed 1985 geographical baseline in the North Atlantic.

C.Res. 1982/4:7

Gross riverine inputs. Under a U.K. harmonised monitoring scheme, data continues to be produced in Scotland on gross riverine inputs to the sea of a range of contaminants.

C.Res. 1982/4:10

Regional assessments. During 1982 observations were made and samples collected on the east coast of Scotland relevant to the production of a regional assessment. It is hoped that a draft of this assessment will be available for discussion in the first half of 1983.

C.Res. 1981/4:6

Monitoring biological effects. During a cruise on FRV Explorer from 28 May to 10 June 1982 pathobiological conditions were studied in several fish species in the area between 56°N and 59.5°N in the western part of the North Sea. A toal of 24 stations were sampled, some of which were in the vicinity

of oil platforms. It is intended that this cruise should be repeated next year and that this will provide input to the ICES study of biological effects.

C.Res. 1981/5:1

Toxic blooms. Salmon mortalities in sea cages in Loch Striven on the west coast of Scotland in May 1982 are thought to have been caused by "flagellate X", a small species of less than 20 um. A similar bloom was reported further north near Ullapool in July 1982.

C.Res. 1979/4:14

Sewage sludge dumping. Studies both at sea on dumping grounds and at the experimental level on the effects of sewage sludge have been continued. In particular the effects of selected components of sewage sludge, such as metals, are being examined in simulated ecosystems.

C.Res. 1976/4:13

Drilling muds. Samples have been collected around oil platforms in the North Sea which use drilling muds of different formulations. In particular, the effects of disposal of oil-based muds have been compared with those of water-based muds. Observations were made on the water and the sediments, on bacterial activity, and on populations of macrobenthos. This work was extended to include experiments on underwater enclosures to determine the cause and rate of effects.

United States of America
(C. Oviatt and J. Pearce)

The following information has been arranged according to ICES resolutions which pertain to MEQC during 1982-1978. For some categories, no information was received.

C.Res. 1982/1:6

Working within the Ocean Pulse Program of the Northeast Fisheries Center (NEFC), personnel of the University of Rhode Island (URI) and Old Dominion University (ODU) are identifying phytoplankton species associated with contaminated and uncontaminated coastal waters. Personnel at URI are developing an illustrated plankton key which may complement the ICES phytoplankton identification sets.

C.Res. 1982/2:1

Personnel of the NEFC are developing papers and making plans to participate in the special meeting on causes, dynamics and effects of exceptional plankton blooms.

C. Res. 1982/4:1

Northeast Fisheries Center personnel and contractors to NEFC are making plans to participate in the intercomparison study on PAH's, Dr. J. Uthe, Coordinator.

C. Res. 1982/4:2

The Environmental Protection Agency's Environmental Research Laboratory at Narragansett (EPA-ERLN) has participatedin the ASTM's task group on Mysids Shrimp. They have completed draft 3 of "Standard Practice for Conducting Life-Cycle Toxicity Tests with Saltwater Mysids Shrimp". This is a current U.S.A. standard method. They have completed a round robin validation of the acute and chronic Mysidopsis bahia assay using endosulfan and silver. They have also completed acute and whole life-cycle flow through toxicity tests with the same mysid shrimp for 10 metals and two pesticides. Results were used for EPA water quality criteria. These are studies in which population statistics were applied to laboratory-derived toxicological data for the purpose of assessing the population consequences of pollutant and environmentally-induced stress. Life-tables were used to calculate the critical value (r=0) for the intrinsic rate of population increases for populations of Mysidopsis bahia exposed, in separate life-cycle tests, to several heavy metals. Population statistics corresponded very well when compared with traditional toxicological measures of acute and chronic toxicity. The use of population statistics provide a direct link to making ecological and population interpretations of laboratory data.

EPA-ERLN has prepared, chemically characterized, and distributed marine organism homogenates to be used as U.S. national standard reference material by the Mussel Watch program. Chemical analytical base lines for all investigated contaminants were established, including petroleum hydrocarbons, hydrocarbons, chlorinated hydrocarbons, toxic trace metals, and radionuclides.

C.Res. 1982/4:5

Northeast Fisheries Center personnel have been involved in making pathological measurements on fish collected during standard resource assessment cruises. Data are being compiled via ADP systems and will be reported upon during forthcoming statutory meetings.

IPN Virus. Infectious pancreatic necrosis (IPN) virus, is the subject of a recent study conducted by Professor Bruce L. Nicholson at the University of Maine at Orono. Nicholson and his associates have been investigating the antigenic relationships between a number of different IPN isolates from all over the world. By determining the differences and similarities among these, he hopes to establish three or four serogroups which would facilitate identification of IPN virus. If such major groups could be established, then development of vaccines against them could proceed.

The technique used in this study, virus neutralization kinetics, is very sensitive and can distinguish subtle differences between the isolates. It has demonstrated differences between many of the virus isolates; and investigators believe that by combining results for this test with other studies in progress it may be possible to group all isolates into three or four serogroups as proposed.

This method looks at the rate of neutralization of several isolates by various antibodies, not at the ultimate amount of neutralization. It has provided a much more sensitive system than the standard procedure for discriminating between closely related but distinct isolates. The technique

is too complex for routine identification, but it will be very useful in epidemiological studies such as mapping genetic drift and the worldwide antigenic variation strains of the virus. Nicholson strongly believes additional research of this type is required to fully understand the antigenic relationships of the IPN viruses.

Often in scientific research, the problem under investigation challenges the investigators to devise new methods to meet the needs of the study. The objectives here necessitated the use of large quantities of cells and virus, and the standard procedures for growing fish cell cultures and viruses are quite expensive. Studies to alleviate the problem of additional expense were initiated, and a technique was successfully modified for growing the anchorage-dependent fish cells on microcarrier beads.

This method, which uses conventional polyacrylamide or dextran beads to increase surface areas, has allowed a larger volume of cells to be grown than in previous anchorage-dependent methods. The system thereby provides significant savings in growth medium and culture vessels (20-90%) and is currently being employed by other researchers in the United States, Europe, and Japan. It will also have future application by industry when virus vaccine development proceeds.

Additionally, studies were begun to adapt fish cell cultures to growth on media supplemented with animal sera other than fetal bovine serum, which is expensive and in short supply. Several cultures have been adapted to media with regular bovine serum, but the cell growth rate and virus yield is low. The studies will continue in an attempt to improve virus yields in these cells.

To better understand the genetic diversity of the virus, Nicholson plans to continue his studies of infectious pancreatic necrosis virus with an emphasis on epidemiological studies. Interest in IPN by Sea Grant researchers continues as a similar virus has been implicated as the cause of mortalities in menhaden, and similar viruses have been isolated from a variety of marine molluscs and crustacea.

Development of Gaffkemia Vaccination System. In 1980, testing of the gaffkemia vaccine, developed by University of Maine graduate student, Jim Rittenbury, continued. Gaffkemia, commonly known as red tail, is a fatal bacterial disease of the American lobster (Homarus americanus). The disease is often responsible for mortality among lobsters held in pounds and cars, resulting in serious economic losses to the industry which is Maine's top dollar fishery.

This year, special attention was focused on the method of vaccination which would cause the least amount of trauma to the lobster. The use of pneumatic injection was tested, but met with little success. The shell was impermeable to the high pressure spray, while the soft areas beneath the tail were extensively damaged by this method of inoculation. A method was devised incorporating a shelf-filling syringe attached to a vaccine reservoir, which could be hung by a metal loop from the vaccinator's belt. This provided a rapid method with minimal trauma to the animal.

From the various trials conducted, it was determined that large numbers of lobsters could effectively be vaccinated within the lobster pound. Mortalities during one season in a pound where 22,073 lobsters were vaccinated were less than half that of the previous ten year average.

In related research, Associate Professor Robert Bayer is working to control gaffkemia in pounds and live cars. Levels of gaffkemia in lobsters placed in the cars can now be monitored by mixing a sterile blood sample drawn from the animal with a specially developed medium. If the medium turns yellow, red tail disease is present.

Histopathological Studies on Gulf Coast Oysters. William E. Hawkins at the University of South Alabama has undertaken histopathological examination of oysters. These oysters were taken from various sites in Mississippi Sound during 1979. The examination indicates a potential disease condition occurring in oysters from waters near Point Cadel in Biloxi Bay. Tentatively diagnosed as leucocytosis, this condition is characterized by increased numbers of white blood cells in and around blood vessels and connective tissues.

Publications:

Hawkins, William E., Harold D. Howse, and Carolyn A. Foster. 1980. Prismatic Critae and Paracrystalline Inclusions in Mitochondria of Myocardial Cells of the Oyster Crassostrea virginica Gmelin. Cell and Tissue Research 209:87-94. MASGP-79-021.

C.Res. 1982/4:6

Northeast Fisheries Center personnel are making plans to participate in the baseline study of contaminant concentrations in fish and shellfish which is proposed for the North Atlantic in 1985.

C.Res. 1981/2:1

Pollutant Fluxes Through the Coastal Zone.

1. Sedimentary Record of Heavy Metal Pollution. An evaluation conducted in 1980 by Professors Henri Gaudette and Berry Lyons of the University of New Hampshire focused on determining the natural and anthropogenic fluxes of six trace metals (chromium, copper, iron, lead, manganese, zinc) in five northern New England estuaries. During the spring of 1980, box cores were taken in these five estuaries: Machias Bay, Penobscot River (Cape Rosier), Kennebec River (Bath), and Saco River (all in Maine); and the Seabrook River in New Hampshire. These areas were chosen because they differ in the type of and extent of man's activities while being composed of similar bedrock.

From this information on past and present environmental results due to heavy metal pollution, better management strategies (e.g., land use, dumping, and outfall siting) can be determined. It is obvious that the greatest fraction of trace metals introduced into the New England estuaries are from man-induced activities.

2. Pollutant Transport in Mississippi Sound. Thomas F. Lytle and Julia S. Lytle at the Gulf Coast Research Laboratory will characterize the pollutants of Mississippi Sound, clarify those processes responsible for pollutant movement and develop criteria that will be required for more responsible coastal management than that used in the past. Study in the first year of this four-year project focused on the region in the eastern Mississippi Sound influenced by the Pascagoula River.

Publications:

Lytle, Thomas, F., and Julia S. Lytle. 1981. Interim Technical Report 1: Pollutant Transport in Mississippi Sound. Mississippi-Alabama Sea Grant Consortium, Ocean Spring, Mississippi. MASGP-79-032.

The Southeast Fisheries Center's Beaufort Laboratory is conducting field work in the Mississippi River outflow in the Northern Gulf of Mexico to determine the relationship between "patches" of larval fish and their primary food items. The Southeast Fisheries Center's Beaufort Laboratory is conducting experiments to determine if morphometric measurements and otolith aging can be used as indicators of larval fish "health". This research is being conducted in the laboratory, off the North Carolina coast, and in the Northern Gulf of Mexico.

C.Res. 1981/2:19

Genetics - Fish and Shellfish. EPA-ERLN has developed a sister chromatid exchange technique to study the effects of genetic toxicants using a marine polychaete, Neanthes arenaceodentata. Positive SCE responses to mitomycin C in vitro are in the same concentration range for the test animal as found in vivo mammalian systems. Other known, direct acting mutagens and certain compounds that need metabolic activation also produce positive SCE responses in the marine test system. Results suggest that N. arenaceodentata can metabolize promutagens and may be sensitive to a broad spectrum of genetic toxicants.

Benthos - Standard Methods. No information.

C.Res. 1981/2:15

Marine Pollution and Baseline Monitoring Models. At EPA-ERLN a research manuscript has been prepared that illustrates how a hazard assessment research strategy can be applied to disposal of wastes at deepwater dumpsites, using disposal of sewage sludge at Deepwater Dumpsite 106 as an example. The manuscript illustrates how to generate waste contaminant concentration (exposure) fields using simple probabilistic models. These models use statistical information obtained from long-term current meter moorings. The manuscript also shows how to synthesize exposure and biological effects information to provide a causal link between mass inputs of waste contaminants and the potential biological impacts.

Reference:

Application of a Hazard Assessment Research Strategy for Waste Disposal at Deepwater Dumpsite 106. John F. Paul, Victor J. Bierman, Jr., Henry A. Walker, and John H. Gentile. Presented at the Fourth International Ocean Disposal Symposium, 11-15 April 1983, Plymouth, England. Submitted for publication in Wastes in the Ocean, Wiley-Interscience.

Bioassays. At EPA-ERLN a toxicity test method has been developed for the marine red alga Champia parvula to assess the effects of pollutants to marine macroalgae. The procedure has been tested with silver, copper, cadmium, lead, cyanide, arsenate, and arsenite. Sexual reproduction is the most sensitive end point tested. The results to date indicate that this procedure is comparable to the most sensitive marine animal chronic tests.

EPA-ERLN has been developing toxicity assays for benthic fauna:

1. Exposure methods have been developed and preliminary testing has begun on two species indigenous to Long Island Sound, the bivalves Mulinia lateralis and Yoldia limatula. Mulinia was tolerant to a complex waste (dredge material) in both the solid and suspended phase, showing no lethal or behavioral effects. Yoldia, when exposed to various mixtures of the waste in the solid phase, showed significant mortality (35%) at the highest concentration and impaired feeding and burrowing at all waste exposure concentrations.

2. Holding and culture techniques for the benthic amphipod Ampelisca abdita have been developed. The most favorable diet includes suspended particulates and a diatom mixture, with the diatom being the most important nutritive ingredient. A diet of the diatom Phaeodactylum tricornutum produces a sexually mature population in 28 days and a growth rate comparable to those reported in the field (Mills, 1966).

3. The infaunal amphipod Ampelisca abdita has been exposed to three metals (copper, cadmium and arsenic) in a series of short-term acute tests. A dose response was found for each exposure indicating that this animal has the appropriate sensitivity and response for testing a wide range of environmental pollutants. Further tests with a complex waste (dredge material) also show a dose response when the waste is mixed, in various proportions, with a clean sediment. Appropriate LC50's for this waste have been calculated.

Ecosystem Studies. EPA-EPLN has provided some short statements of their findings over the past two years:

1. The sea surface microlayer is the major breakdown site for a phthalate ester, DEHP, in marine microcosms.

2. Specific biological and chemical processes as well as partitioning dynamics of a phthalate ester in marine microcosms and a portion of Narragansett Bay, the subsystem being simulated, were shown to be statistically identical ($\alpha = 0.05$).

3. A detailed cost comparison of environmental assessments of a phthalate ester in microcosms simulating real environments and the standard suite of bioassays has shown that the latter is more expensive than the former. The cost analysis did not consider the quality and degree of uncertainty associated with the data derived from each test systems.

4. An environmental assessment of a phthalate ester, DEHP, in a marine microcosm was shown to be qualitatively and quantitatively dependent upon the complexity of simulation and temporal heterogeneity.

5. A marine microcosm test protocol and support document is now available to industry and others for purpose of developing data bases for environmental assessments of toxic chemicals as defined under TSCA.

6. A marine microcosm and field study have shown that marine ecological systems are not mathematically linear systems. As a result, the validity of data associated with and conclusions derived from previous and future mathematical and simulation models which assume linearity are subject to question.

Since April 1979, the Southeast Fisheries Center's Beaufort Laboratory has been funded by NOAA's Office of Marine PollutionAssessment to conduct two separate but complementary research investigations on the effects of trace metals on marine biological processes. This research is being conducted cooperatively with NOAA's Atlantic Oceanographic and Meteorological Laboratories. This cooperative research effort is conducted in the Gulf of Mexico and is designed to obtain information on the structure of larval fish food webs and the response of various components of that food web to trace metal additions. This joint project also has determined the importance of humic and fuvic acids in controlling trace metal speciation and therefore, biological effects in neritic and oceanic systems.

The second project is designed to investigate the mechanisms controlling the interaction of trace metals with marine food webs. In contrast to the field-oriented project identified above, this effort has focused on laboratory experiments to determine the importance of chemical speciation and metal ionic ratios on the accumulation and effects of trace metals on marine organisms.

Field Studies. EPA-ERLN has conducted caged mussel transplant studies in the New York Bight apex. The primary purpose of this study was to evaluate, in an open coastal environment, the effectiveness of using caged Mytilus edulis, the edible blue mussel, for monitoring fate and effects associated

with ocean dumping municipal sewage sludge through examination of selected biological parameters.* The New York Bight Apex was selected as the study site.

Caged mussels were transplanted to the New York Bight from a reference population located near the mouth of Narragansett Bay, Rhode Island. They were deployed within one meter of the bottom at a Control site seaward from Jones Beach, Long Island, at Ambrose Light, and at the sludge dumpsite for one month intervals during the period May through August, 1982. Station locations were selected to test whether sufficient between-station differences could be observed to demonstrate effects on caged mussels due to input from sludge dumping activities, specifically the sludge dumpsite station versus the Hudson River inputs (Ambrose Light Station) and the control station.

The caged mussel studies demonstrated that Zinc (Zn), Lead (Pb), and Cadmium (Cd) were significantly increased in tissues of mussels at the sludge dumpsite and Ambrose Light when compared to levels at the Control Station in the Narragansett Bay Reference population. Polychlorinated biphenyls (PCBs) were higher (however, statistical significance was not established) at the sludge dumpsite and at Ambrose Light when compared to the controls and the reference population. The qualitative composition for PCBs was distinct at the sludge dumpsite. PAHs were also highest at the sludge dumpsite. Bioaccumulation of both organic and inorganic chemicals at the sludge dumpsite and Ambrose Light fell approximately midway in the range of values reported for the Northeast by the U.S. Mussel Program.

Biological effects studies indicated that there were no negative biological effects that correlated with increased concentrations of metals, PCBs, and PAHs. Differences between stations were clearly observed in spite of known variability due to varying stages of gametogenesis between individual mussels at each station as well as suspected contamination due to sediments in mussel guts in some instances.

High concentrations of some microbiota in mussel tissues at the sludge dumpsite indicated that caged animals at that site were being directly affected by sludge dumping activities. The need for existing bans against harvesting shellfish in areas influenced by sludge dumping activity in the New York Bight Apex has been reinforced by the caged mussel study.

The effectiveness of the transplant approach for biomonitoring in open coastal systems has been demonstrated by this study. Important initial observations of the fate and effect of sludge dumping activities in the New York Bight, on Mytilus edulis, has been demonstrated as well.

Research activities at the Milford Laboratory, that are related to the activities of the MEQC, include research on pollutant effects on marine

*Parameters include: Scope for growth, O:N ratio, Gill respirometry, Histopathology, Metallothionein induction and Microbiological Characterization.

animals and biological monitoring as part of the Northeast Monitoring Program (NEMP). This monitoring effort includes physiological and biochemical studies as well as bacteriological monitoring.

We have continued to add large amounts of hematology data to our baseline collection of flounder blood measurements from Cape Hatteras to the Gulf of Maine and have located several areas where these data indicate that flounder populations are under stress. One area we have recently focused on is Long Island Sound, where we have made a variety of flounder blood measurements on a monthly schedule along a pollutant gradient. We have recently completed two years of this study and have been able to determine both seasonal and pollutant-related trends. We have also been using a variety of metabolic tests to evaluate the condition of blue mussels held at dumpsites in the New York Bight. We are now planning a major study at a dredge disposal site in Long Island Sound where caged mussels and lobsters will be held near the heavily contaminated spoils site. Flounder living in the area will also be studied.

Most offshore NEMP stations from which sea scallops were collected appear to be environmentally sound, as measured by biochemical stress parameters for scallop tissues. Exceptions are the Block Island Midshelf area, near the Mud Patch, and the outer Hudson Valley, where scallops frequently have low cellular energy in the muscle, low biosynthetic activity in the kidney, and low glycogen reserves. Sporadic collections of scallops with similarly suspect biochemistry, although to a lesser extent, have been made at a site in southcentral Georges Bank and one off upper mid-Cape Cod.

Collections of deepwater (130-190 m) scallops made throughout the year on both NEMP and Resource Assessment cruises show consistently low muscle glycogen, indicating a lack of the necessary energy reserves for gamete maturation. Moreover, the highest muscle glycogen levels observed in deepwater scallops have been in late October, suggesting resorption of gametes, a phenomenon described in Argopecten during times of food storage. Bottom temperatures at the deepwater sites rarely rise to 10°C, the temperature at which spawning is generally initiated in this animal. These three considerations suggest that deepwater spawning would be the exception rather than the rule because of inadequate nutrition, and that recruitment must come from nearby ledge populations.

Bacteriological aspects of ocean dumping research include determination of the presence of specific bacterial types in the marine environment and the potential impacts these bacteria might have on fisheries resources therein.

The measurement of fecal coliform bacteria from sediment samples from the New York Bight sewage sludge disposal area shows no significant change in counts over a 10-year period. Determination of fecal coliforms in sediments at a dumpsite in Long Island Sound, Connecticut, over a 15-month period during a dredging operation of the Thames River did not reveal high counts. High fecal coliform densities decreased in river sediments during the dredging operation because of dilution. The river outflow contributed to the counts observed in sediments at the control site and the dumpsite offshore.

Clostridium perfringens, present in fecal material, is being evaluated as an indicator organism and its presence in bottom sediments in the western Atlantic Ocean is being determined. Highest counts of C. perfringens, approximately 10^5 per gram of sediment, were observed at the sewage disposal site in the New York Bight. High counts were also observed at the mouths of the Chesapeake, Delaware, and Narragansett Bays and the Thames River, with offshore areas usually below detectable limits.

A variety of field and laboratory studies conducted by the Experimental Studies Task of the Larval Fish Dynamics Investigation of the Northeast Fisheries Center (NEFC) are related to several ICES resolutions, particularly in the area of biological effects monitoring. Continuing studies involve monitoring the growth and condition of larval fish at sea using macromolecular composition principally the ratio of ribonucleic acid to deoxyribonucleic acid (RNA-DNA ratio) and associated laboratory studies.

As a complement to this ongoing work with larval nucleic acids, we have begun to look at the nucleotide levels in larval and juvenile fish, using high performance liquid chromatography (HPLC). Mononucleotides, in addition to serving as building blocks of the nucleic acids, play a number of other vital roles in an organism, particularly in intermediary metabolism and in energy-transferring reactions.

Major findings in 1982 include: (1) monitoring of larval sand lance RNA-DNA ratio indicated that 15% of the fish analyzed were in poor condition, (2) development of a general model for the relationship between temperature, RNA-DNA ratio indicated that 15% of the fish analyzed were in poor condition, (3) development of a general model for the relationship between temperature, RNA-DNA ratio and growth rate in larval fish, (4) determination of the relations among temperature, plankton density, RNA-DNA ratio and growth rate of larval sand lance, (5) observation of a relation between the concentration of a variety of organic contaminants in the adult female striped bass from several east coast river systems and mortality of larval striped bass reared in the laboratory, and (6) observation of low hepatic DNA and muscle protein levels, heavy infestation of muscle and other tissues by worms, necrosis of the liver and poor swimming performance of juvenile striped bass from one of three river systems studied.

Pollutant Concentrations. At EPA-ERLN the organics analytical group has:

(1) Applied capillary column gas chromatographic and mass spectrometric techniques to an examination of the distributions of polycyclic aromatic hydrocarbons (PAH's) in samples of estuarine sediment and in potential sources (i.e. petroleum oils and combustion products). Results suggest that the dominant source of PAH's in the estuary studies was combustion processes. In combination with results from other studies these findings may be used to assess the contribution of various sources to the environmental concentrations of PAH's.

(2) Examined the occurrence of chlorinated compounds in the flesh of organisms taken from Narragansett Bay. In addition to PCB's and chlorinated pesticides, results showed presence of a trichloro-dibenzofuran and chlorinated diphenyl ethers in numerous samples. An examination of the potential sources of

that discharged into a tributary of Narragansett Bay was the origin of these compounds.

(3) Devised a modification to the Kovats Relative Retention Index System for identification of gas chromatographic peaks. This modification allows us to trace unknown contaminants in any marine sample matrix (e.g. flesh, mud, water, etc.) using standard GC equipment. It decreases the need for numerous GC/Mass Spectrophotometric analyses, thereby decreasing the overall analytical cost of a pollution detection program.

C.Res. 1981/4:3

With funding from the National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Dr. J.Farrington (Woods Hole Oceanographic Institution) is developing standard samples for distribution to laboratories participating in the second intercalibration exercises on petroleum hydrocarbons. The samples will be distributed during the summer of 1983.

C.Res. 1981/4:4

Marine Sediments in Relation to Pollution. At EPA-ERLN we have found that a transmissometer coupled with a microprocessor and controlled dosing valves can be used to maintain accurate concentration of suspended particles in laboratory exposure systems. In our experiments, the transmissometer was immersed in the exposure tank, and particles were added from a well-mixed slurry as needed through solenoid-actuated valves.

C.Res. 1981/4:5

Members of the NEFC and university personnel working under contract are continuing biological effects monitoring using biochemistry, physiology, and pathology as indicators of the effects of contaminants. Research has been and will continue to be reported to the General Secretary.

C.Res. 1980/4:7

Investigators within the NEFC, as well as persons working under contract with NMFS, continue to use the mussel, Mytilus edulis, as a histopathological indicator species of pollution. Others are conducting biochemical and physiological experiments using M. edulis.

C.Res. 1980/4:8

Personnel working with the NEFC Ocean Pulse and Marine Resources Monitoring, Assessment, and Prediction (MARMAP) Programs have been conducting analyses of nutrients and relating these to standing stocks of chlorophyll and primary production. Intercomparisons of nutrient analyses are being done with other investigators working within the area of interest.

C.Res. 1979/4:14

Research within the NEFC has continued on the biological effects of marine dumping of dredged material, sewage sludge and other wastes. The NEFC has been involved with ongoing studies of the efficacy of capping of contaminated dredged materials with clean sediments. Baseline studies are being done prior to dumping of the contaminated dredged materials.

C.Res. 1979/4:21

Personnel of the NEFC continue to investigate patent disease in marine finfish and shellfish to develop an understanding between causative organisms and the expression of disease, and the effects of disease on populations.

C.Res. 1978/4:2

Northeast Fisheries Center personnel have monitored phytoplankton productivity, standing stocks of chlorophyll and nutrients in areas of interest to ICES. Monitoring, up to 18 times per year, has been done throughout the area extending from the Canadian border to Cape Hatteras.

C.Res. 1978/4:14

The Cooperative Research Report No. 107 continues to be requested through the Northeast Fisheries Center. During the past 24 months, over 40 copies have been distributed to persons interested in responding to oil pollution and toxic waste disposal incidents.

USSR
(N. P. Morozov)

1. Biogeochemical studies in 1982 included studies of the microelement composition of Antarctic krill and its habitat. Along side these studies the analysis and the generalization of the data on the distribution and migrations of microelements in marine ecosystems allowed us to broaden our knowledge of the biogeochemical circulation as a system of separate but coordinated and related cycles and currents occurring in definite parts of the biosphere under the influence of physic-chemical, geological, biological processes and anthropogenic factors. Every defined ecosystem has its own definite spacial and structural organization of biogeochemical cycles of chemical element "migrations".

   To reveal specific features of biogeochemical cycles (extent, intensity, directions of biogenic migrations, as well as quantitative relationships of elements participating in these processes) involves opening the way to dividing seas and oceans into biochemical districts.

   In the long run, anthropogenic factors change natural processes and the organization of biochemical cycles. That is why studies of biogenic migrations of elements in sea and ocean ecosystems are not only of scientific interest, but also of great practical value for the development and the formulation of such criteria as maximum allowable pollution pressure and maximum allowable outflows of sewage into the sea.

2. Studies in toxicology were oriented towards biotesting of sewage waters and certain pollutants discharged at sea, and the assessment of the quality of natural waters in the areas of industrial sewage. Methodological recommendations on biotesting of natural, sewage waters and several pollutants were developed. These include methods of rapid bioassays for the control of natural waters in the areas of aquatic farms based on a determination of the speed and rate of the aggregation of young mussels.

MARINE ENVIRONMENTAL QUALITY COMMITTEE

REPORT ON MARINE AGGREGATE PRODUCTION FOR YEAR 19 8 2

COUNTRY ...Belgium.....

ISSUING AUTHORITY Ministry of Economic Affairs.....

REPORTING PERIOD (IF DIFFERENT FROM ABOVE) .....

TYPE OF MATERIAL	SIZE RANGE*	TOTAL PRODUCTION million m^3	TOTAL PRODUCTION million tonnes	LOCALITIES (See overleaf)
SANDS	0.063-2.0 mm	0,6	0,9	Kwinte Bank
GRAVELS	2.0 mm-6.4 cm			
PEBBLES/COBBLES	> 6.4 cm			
CALCAREOUS SHELL LITHOTHAMNION OTHER (SPECIFY)	ALL SIZES			

*The size ranges shown here are idealized, and are intended merely as a guide to the type of categorization required.

IMPACT ON FISHERIES

A CURRENT PRODUCTION Briefly specify the types of problem encountered as a result of aggregate production during the reporting period (if any)

B FUTURE PRODUCTION Detail the quantity, type and location of any proposed marine mining activity likely to be of international fisheries interest or concern

MARINE ENVIRONMENTAL QUALITY COMMITTEE

REPORT ON MARINE AGGREGATE PRODUCTION FOR YEAR 19 8 2

COUNTRY ...Belgium.....

ISSUING AUTHORITY ...Ministry of Economic Affairs.....

REPORTING PERIOD (IF DIFFERENT FROM ABOVE) .....

TYPE OF MATERIAL	SIZE RANGE*	TOTAL PRODUCTION million m^3	TOTAL PRODUCTION million tonnes	LOCALITIES (See overleaf)
SANDS	0.063-2.0 mm	0,6	0,9	Kwinte Bank
GRAVELS	2.0 mm-6.4 cm			
PEBBLES COBBLES	> 6.4 cm			
CALCAREOUS SHELL LITHOTHAMNION OTHER (SPECIFY)	ALL SIZES			

*The size ranges shown here are idealized, and are intended merely as a guide to the type of categorization required.

IMPACT ON FISHERIES

A CURRENT PRODUCTION Briefly specify the types of problem encountered as a result of aggregate production during the reporting period (if any)

B FUTURE PRODUCTION Detail the quantity, type and location of any proposed marine mining activity likely to be of international fisheries interest or concern

MARINE ENVIRONMENTAL QUALITY COMMITTEE

REPORT ON MARINE AGGREGATE PRODUCTION FOR YEAR 1983.

COUNTRY Finland

ISSUING AUTHORITY National Board of Waters

REPORTING PERIOD [IF DIFFERENT FROM ABOVE] .....

TYPE OF MATERIAL	SIZE RANGE*	TOTAL PRODUCTION million m^3	TOTAL PRODUCTION million tonnes	LOCALITIES (See overleaf)
SANDS	0.063-2.0 mm	ca. 0.5		mainly Gulf of Finland
GRAVELS	2.0 mm-6.4 cm			
PEBBLES/COBBLES	> 6.4 cm			
CALCAREOUS SHELL, LITHOTHAMNION, OTHER [SPECIFY]	ALL SIZES			

*The size ranges shown here are idealized, and are intended merely as a guide to the type of categorization required.

IMPACT ON FISHERIES

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Marine Sand and Gravel Extration in Swedish waters during 1966-1982

Area	1966-1977	1978	1979	1980	1981	1982	Total m^3
Bredgrund	286 478	-	-	-	-	-	286 478
Disken	2 552 021	-	-	-	525 499	104 415	3 181 935
Gislövsläge	4 276	-	-	-	-	16 320	20 596
Sandflyttan	910 175	34 735	43 400	111 798	18 645	-	1 118 753
Svibådan-Grollegrund	6 033	-	-	-	-	-	6 033
Trelleborg harbour	4 868	-	-	-	-	-	4 868
Trindeln	3 952	-	-	-	-	-	3 952
Vitfågelskär	8 872 205	-	-	-	-	-	8 872 205
Västra Haken	237 935	18 954	20 220	22 556	3 190	6 020	308 875
Ystad	450	5 200	-	-	-	-	5 650
Total m^3	12 878 393	58 889	63 620	134 354	547 334	126 755	13 809 345