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Symbol for the Council of Europe environmental activities

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Captions to illustrations p. 16-17:

1. Naples Museum, Mosaic of marine life at Pompei
- 2, 3 and 4. Prof. I. Nigrelli - Villa Romana de Piazzarmerina, Sicily.

Will we act?

The world's oceans and seas show unmistakable signs and warnings that they too are becoming exhausted, badly managed, polluted. Shrunken by modern communication means, the seas are no longer vast, endless, fathomless. On the contrary: fish stocks become depleted, marine mammals and turtles disappear, and pollution in all its forms creates almost insoluble problems. Are we nearing the point where our world's life-support systems are breaking down? Are the various warnings enough to indicate that a major change in our attitudes towards our environment is necessary?

There are fortunately reactions from industry, private organisations, governmental bodies that they have heard the ticking of this, yet another time bomb. May we react while there is still time.

The Council of Europe will celebrate its 40th anniversary in 1989. Naturoopa's editors believe that the most appropriate way to draw their readers' attention to this event is by dedicating Naturoopa 61 to information and education concerning man's environment.

H.H.H.



Editorial

For an Icelander, it is peculiarly distressing to see and hear in the world's media our integrity and our honour being constantly impugned over the highly charged and sensitive issue of whale conservation. We are called liars, tricksters and butchers. We are accused of wilfully flouting some "international law" by continuing to catch a small and strictly controlled number of whales each year for scientific purposes—apparently because we then utilise the whale carcasses for economic purposes rather than leaving them to rot on the beach.

What makes this sustained and emotive assault so galling is that Icelanders, of all people, are among the most careful and conservation-conscious people in the world. We of all people have cause to realise how fragile is the ecosystem which is our habitat. We of all people have led the way in protecting and conserving the natural resources by land and sea by which, and on which and through which, we survive.

All over the world, ever since the days when men were nomadic hunter-gatherers, the produce of the sea formed part of man's staple diet. Even after the great farming revolution of 4000 BC, when man began to make settlements on land and clear plots and pastures for cultivation and animal husbandry, the sea remained a ready store for those whose land resources were too meagre or too difficult to survive on; and at sea, man remained a hunter-gatherer.

For more than a thousand years, the sea has kept Iceland alive. It was fickle and often perilous, and untold numbers of brave men lost their lives in pursuit of its gleaming harvest. But there was no thought that its teeming cornucopia would ever run out.

But a hundred years ago, this automatic assumption began to change. The coming of steam power enabled fishermen to handle much larger nets than had previously been known. The mass-production technology of fishing increased man's effectiveness as a hunter-gatherer a thousand-fold. As the 20th century progressed, ominous signs began to appear that the seas were being over-fished.

One major factor in this growing over-exploitation was that the sea was traditionally every-man's-land. The resources of the sea belonged to all who wished to take them. They were common property. No-one owned them, and therefore no-one husbanded them, in the way that a farmer owned and husbanded his land. Fishing was an international free-for-all—and it was only later that the hidden price became apparent.

Iceland was one of the first nations to see that the only way to prevent catastrophic depletion of fish stocks was to establish a broader territorial fishing zone so that the coastal state might keep a close watch on marine ecology and control fishing.

Whaling, however, was not a local but an international matter. Many whales are highly migratory, and therefore they were supposed to be taken care of by the International Whaling Commission, which was established in 1946 in an attempt to secure rational management of the free-for-all whaling that was gravely threatening the existence of several species of whales. For a number of years the IWC failed miserably to agree on the necessary conservation actions, despite mounting scientific evidence of damage that was being done, and the wholesale exploitation of whales reached crisis proportions. Then in 1982 the IWC swung to the other extreme and banned all commercial whaling, regardless of the state of the stocks of individual whales and once again disregarding all scientific advice.



Iceland has been accused of "whale piracy" and of using scientific research as a mere front for continued commercial whaling. But let me put the record in perspective, as we see it in Iceland.

The whaling "industry" in Iceland is scarcely an industry at all. In the first place it is land-based, at one place only in Iceland, and not on factory ships that can hunt down whales all over the world. In the second place it is tiny, involving only two small ships. In the third place it is very strictly controlled: this year, for instance, its quota is less than 80 whales, that is: 10 seiá and 68 fin whales. This latter figure represents less than 1% of the total amount of fin whales swimming in the waters around Iceland. And in the fourth place, this catch really is dedicated to research. The whales

that are caught are studied to enable us to know more about their life-cycle and their status and their role in the ecosystem—and catching them is the only practical way of conducting research. It is not the only aspect of whale research being carried out in Iceland, of course. There is a great deal of patrolling and population-counting, all designed to build up our scientific knowledge about the whale. All the proceeds from whaling activities are directly dedicated to the research programme.

Already, even greater dangers to the world's marine resources are looming large on the horizon. Indiscriminate pollution is posing a fearful hazard to the existence of all kinds of marine life. Who knows how much this toxic pollution, from all manner of sources, can be held responsible for the present decimation of the seal stocks? How much is it affecting the basic food-chain on which whales, too, depend?

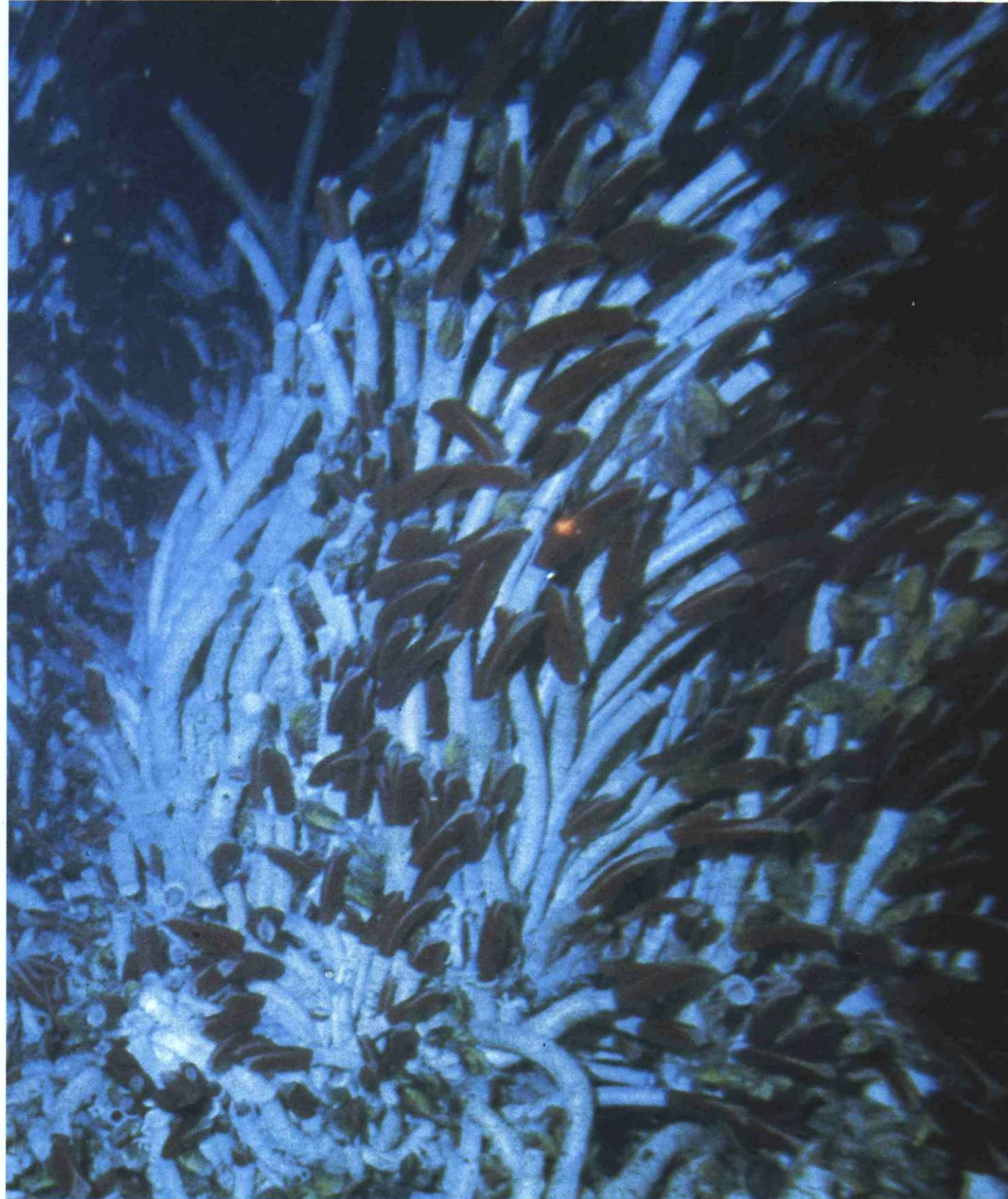
Conservation does not mean total protection of a species for its own sake alone. It also means the protection for the good of all who live in the world. The Icelanders have played their part in saving marine life from extinction by over-exploitation; and our scientists are playing their part in the battle against pollution. But like the bad old days of free-for-all fishing, pollution is primarily caused by those who do not appreciate the consequences of their actions, and have no direct economic interest in controlling them. We must all stop using the oceans as universal dumping sites, for the sea can only disperse so much and no more—and the ill-effects linger, with unpredictable and devastating results.

The sea covers about two-thirds of our globe. Yet sea products constitute only a small fraction of the world's consumption of protein, because the fertility of the land is at present far greater. But with world food shortage looming, and famine at hand in all too many areas, the sea will become more and more important as a source for feeding mankind. If you believe that the sea and all its abundance has a part to play in our future survival, as Icelanders do from long experience, it is vital to know more about the creatures we can safely harvest, and to ensure that they are properly managed and conserved in a habitat that is not wantonly polluted by heedlessness.

Vigdís Finnbogadóttir
President of Iceland

Life in the seas

Worms getting their energy from geothermal sources.



TOH

John H. Steele

The oceans have always been a major source for romantic images of our world—from the beneficence of Botticelli's *Venus* to the harsh vision of Melville's *Moby Dick*. Even science fiction conveys this sense. Jules Verne and Tom Clancy have much in common. The romance is that of an unknown and scarcely imaginable world. For example, we can see to the stars but our voices carry sound for less than a kilometre. Yet underwater, these two rules are reversed. Any animal in the sea can see only a few tens of metres but a small explosive charge set off Bermuda can be detected at New Zealand.

Thus, the role of the oceans in our culture and in our everyday lives has been set apart from the mundane reality of the terrestrial world of "telegrams and anger". The solo round-the-world sailor and the child in a row-boat share a sense of escapism. Those who make their living from the sea, such as fishermen, are certainly separate communities and when they have financial problems we treat them almost as endangered species.

But this vision of a separate and inviolable realm is changing and changing very rapidly. What are the reasons for this change? What ought we to do? What can we actually do? These questions have faced scientists for a decade. Now they are firmly in the political arena. Can we separate the romantic image from the social reality?

A little-known world

The mysteries of life in the sea are very real. In the last decade we have discovered luxuriant and diverse communities in the depths of the ocean where we previously believed that life was sparse. These communities are composed of entirely new species. But even more exciting is the fact that they are located at hydrothermal vents and derive their basic source of energy from geothermal processes emanating from under the earth's crust. This separates them from terrestrial life which derives its

energy from the sun. And yet, we have only explored a tiny fraction of this earth beneath the sea. There is much exploring still to do.

But there are more subtle mysteries near the sea surface. Terrestrial animals, including man, have evolved to escape as far as possible the rigours of their physical environment. Warm blood isolates us internally from temperature variation. We build burrows—or centrally heated houses.

The higher animals on land produce relatively few offspring and expend much of their energies in protecting and feeding them. Marine animals have evolved quite different strategies. Their body temperature is usually close to that of the water. This is not because they are unable to develop suitable mechanisms. Some fish, such as tuna, have tiny thermostated heaters to keep their brains at constant temperature. But even more relevant is the usual pattern of reproduction in the sea. Most marine organisms produce thousands, and sometimes millions, of eggs which are released to the water and move and disperse with the currents. They are at the mercy of predators and, as they develop, must find their own food.

The successful selection of spawning areas and patterns of migration must depend on the evolution and adaptation to the complex physical dynamics of the ocean from the smallest scales of turbulence to the largest ocean gyres. Marine organisms depend on and utilise their intimate interactions with the complexities of ocean physics. But this also means that they must adapt to variability in this environment as single species, or even more as communities of different species. From historical evidence we can now see that trends in the environment on a local or regional basis will cause changes in the species composition on time scales of a few decades. Particular species may disappear, to be replaced by others, so that the ecological structure maintains its integrity.

In summary, compared with our terrestrial world, individual marine species may be much more sensitive to change in their environment, but in consequence the communities are much more adaptable to such change.

To study the interrelations of marine life with the ocean environment requires diverse scientific disciplines and new technology which we are acquiring. But especially and critically, it requires a different vision of the interplay between biology and physics in the sea compared with that on land.

This is the fascination of marine research in the open sea that has intrigued scientists

since the "Challenger" expedition set off around the world just over a hundred years ago and discovered life at all depths in the ocean. But now these questions are no longer the esoteric domain of oceanographers. Our social concerns arose first in the context of overfishing in areas such as the North Sea or Georges Bank. We witnessed the virtual disappearance of species such as herring and mackerel. Yet, in both areas there were equally dramatic increases in other pelagic species such as sand eels. The economic impacts were severe but the ecological integrity survived at the community level. More recently, as herring have returned, we must consider whether natural trends, exacerbated by fishing pressure, also played a role. Thus we are learning that this mix of sensitivity and adaptability is relevant to man's intrusion as well as to natural changes. And further, we must disentangle the relative effects of natural and man-made factors if our own role is to be properly understood and controlled.

Man's influence

These questions have taken on a completely new significance and a tremendously increased public concern as we have come to realise all the other ways that we are affecting the sea. We are outraged by the sight of oiled sea birds, by tar on the beaches, by plastic litter on the sea shore, and by viral contamination of swimming areas. This outrage is justified and must be resolved. Some actions at national and international levels are being taken but much more is required. Yet these obvious impacts affect man's activities directly rather than through significant changes in marine populations. Also some of these contaminants, such as plastics, come from recent technologies and can be replaced by older or new processes.

The most obvious and significant effects on marine life, however, arises from basic human activities—the production and consumption of food. In certain areas, such as the Southern North Sea or the New York Bight, we put vast amounts of nutrients into coastal waters in liquid form—particularly nitrate and phosphate. These elements are essential for the basic productivity of the ocean by microscopic algae. But in excess—eutrophication—the nutrients not merely increase the productivity but alter the species composition in unwanted or unexpected ways. We can see this effect in satellite images, or as "weeds" on or near the shore line. Sometimes these effects are evident as generally increased production over the spring and summer growing season but often we have sporadic, very intense but brief and localised "blooms" which can poison shellfish or, now, damage the stock in fish farms. Such blooms are not new. We have historical records of their occurrence throughout the world seas.

What is new is the apparently greatly increased frequency of these events. Again we have this mix of natural and man-made causes. What combination of physical factors and nutrient inputs triggers these blooms? Can we hope to alter the basic behaviour of the continually increasing human populations living near the coast? These questions do not have easy scientific answers nor a simple technological fix.

A complementary question is the disposal of sewage sludge. Must we dispose of it on land—perhaps by exporting it to eastern Europe or other continents? Or can the oceans accept some, if not all, of this material at offshore sites? There are distinguished oceanographers who believe that ocean dumping under carefully controlled and monitored conditions is an acceptable option—even preferable to land disposal in certain regions. And we are faced with options since we can hope to reduce the quantities but cannot expect to eliminate them entirely.

European experience

The particularly critical issue is the presence of potentially toxic chemicals in these wastes and the ubiquity of traces of these compounds—especially synthetic organics—in nearly all marine organisms. The most difficult and controversial questions facing marine scientists is not the presence of these chemicals but whether there is any impact at the population level. For truly marine fish—those like herring and haddock which do not use estuaries or rivers as part of their life cycle—there is no observable evidence of any effect on overall populations. Again I stress population size, not individual fish. Is this lack of evidence because we know too little about the mix of physical and chemical factors that induce short or long-term variability? Should we treat fish as we do man where we regard excessive exposure of one individual as one too many?

These effects tend to be discovered at local “hot spots” where populations are dense and water circulation is restricted. At the other extreme we have world-wide climate change. This global greenhouse effect is intimately connected with ocean physics and biology. The ocean circulation keeps our climate equable and the sea absorbs about half the excess carbon dioxide we release to the atmosphere. But changes in the atmosphere will alter the ocean circulation and in turn the rainfall patterns over the continents. Further, such changes must affect the growth of plants in the open sea and this is one factor in the CO₂ balance. Will these changes reduce or accelerate the climate trends? We have evidence for both kinds of response but an understanding of the balance, and especially of the adaptations of marine life, requires more knowledge. We can now predict weather four to six days ahead. We believe it will be

possible to forecast climate for a year, or perhaps even a decade. What impact will that have on our social behaviour?

Such concepts take us beyond scientific criteria and possibly even beyond the purely political arena. We return to the romantic view of the oceans as an inviolable realm. But we return in an entirely new context. The sea is no longer a separate domain but is an integral part of our habitation like the land and the air. We have altered the land. The European landscape is essentially man-made. Much of it is very beautiful—

some of it is very ugly. We try to preserve the former and redress the latter. I have attempted to show that life in the ocean has a different pattern of response to its environment from the land. It is both more sensitive and more adaptable to change. Can we retain its beauty without prohibiting its use? The European “experiment” is of global significance. ■

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F. Haas-Irman

A conservation plea



Caretta caretta laying eggs.

J.L.S. Dubois/JACANA

and bigger amounts of concrete in their joint ventures in the prettiest bays of Turkey, almost as if to see how far they can go.

Another example is the exportation of snowdrops (*Galanthus elwesii*) to Holland. The Dutch import companies, in their seemingly endless thirst for more tons of this now nearly extinct plant, do not share the Dutch Government's anxiety that the Turkish stocks are becoming depleted. This, together with the many other examples which can be observed in Turkey, leads us to the conclusion that scientific limits to growth and controls must be laid down by all countries at all levels.

Safeguarding of the turtles

I have saved the most important news until the end of my article: the 620-bed hotel in Dalyan in southern Turkey—which was the reduced version of the 3,200-bed hotel originally planned—has been officially cancelled. The project, which was to be built with Turkish and German finance and co-operation, had met immense concern and opposition, because it would have destroyed one of the major remaining nesting beaches in the Mediterranean of the loggerhead sea turtle (*Caretta caretta*), and a unique spot where five very rare ecosystems can live together in unspoiled perfect harmony. Thus the conservation issue which obtained world attention and concern has been wisely resolved and conservationists can breathe one of their rare sighs of relief. The Turkish Government is to be congratulated on this wise decision. I think Turkey now deserves to be set up as an admirable example of environmental awareness as it has done something which many European countries, at this stage of development, have failed to do. According to the governmental decision announced on 6 July 1988, the areas of Gökova, Fethiye and Köyceğiz/Dalyan have been declared “Sites of Special Protection”. Exact protection and legal status for these areas will be worked out.

Let us hope that this very important and unparalleled example in Turkish history regarding the environment will pave the way for continuous environmental consideration, both within and outside Turkey. No nation should be allowed to lose any more time in saving what is left. ■

Nergis Yazgan
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Nergis Yazgan

Contemplating upon the question whether we are really ready to make economic and other sacrifices in order to help safeguard the survival of threatened species such as the monk seal and the sea turtles, the immediate answer is: “we should be, but we are not”. At least, until now we have not. This extends to all nations.

On the other hand, as the number of plant and animal species becoming extinct increases, our readiness to make these sacrifices is also increasing... but often much too late. I do not think any attempt to save the Turkish bald ibis will bring the species back, now diminished to a deplorable three individuals in the wild. We are all spectators of a process called “becoming extinct”—and it is for ever.

Economy and ecology must go hand in hand

I am rather reluctant to use the word “sacrifice”, in terms of sacrificing an investment involving economic profit in order to safeguard a species. We are constantly learning that economy and ecology must go hand in hand and that economy without regard to ecology is bound to be short-lived, resulting in more debts and bigger problems than ever before. We also now know that safeguarding biological diversity is one of the primordial tasks of today and tomorrow. Therefore I would prefer to use the

term “sustainable development” rather than speaking of sacrifices made, even though upon reflection we see that “sustainable development” is a stage at which the developed countries arrive. For the less developed, it is still considered a sacrifice—unfortunately.

Turkey has a lot of plants, birds, insects, mammals and reptiles which are endangered, and many are endemic. For many of these, Turkey is the only habitat where they can survive in Europe, due to its vast territory covering many different geographic regions. Consider the bald ibis, the pied kingfisher, the loggerhead sea turtle, the monk seal, the wild cyclamens, the snowdrops...

Very many Europeans are deeply worried about the population status and the lack of protection given to these plants and animals and their habitats—and they are right. But if the developed countries have lost theirs because of careless management, industrialisation, pollution or tourism and they do not want these mistakes to be repeated, then they must also help. They must help financially, through international organisations of which Turkey is a member, and through multilateral banks. They should also help with expertise and guidance. It is not only the governments who should help, but also the European private sector. As is known, Turkey has been expanding its tourism revenues in the recent years, for many, too quickly, too fast. We see many foreign countries who condemn this and warn against a Turkish “Costa del Concrete” trying to pour more

Towards clean(er) oceans



Einar Brun

Kittiwakes feeding on plankton and small fish.

C.P. Srivastava

The International Maritime Organisation (IMO) started its work in 1959 as the specialised agency of the United Nations dealing with maritime affairs, in particular with those related to the safety of life at sea. It subsequently became apparent that there was also an urgent need to address the threat to the oceans caused by the discharges of harmful substances into the sea by ships, be it through accidents, operational discharges related to maritime transport or by the dumping of wastes at sea. The prevention and control of marine pollution has therefore become one of the most important objectives of the Organisation.

It had indeed been recognised in the 1950s that the oceans are the earth's greatest single natural resource, covering more than 70 % of the earth's surface. They are crucial to maintaining the balance of the global ecosystem and they are important as this planet's last great economic frontier, the potential source of living and non-living resources, the final buffer against ecological catastrophe and a recreational outlet for the restoration of the body and spirit of man.

I will in the following paragraphs highlight the activities of the International Maritime Organisation in the field of marine pollution prevention.

The prevention and control of marine pollution

Since IMO started its work, a strategy for the protection of the marine environment from pollution has been developed containing the following main components:

- the adoption of the highest practicable standards in matters concerning the prevention and control of marine pollution from ships and related activities;
- the provision of assistance to enable attainment of the widest possible acceptance and effective implementation of these standards.

In order to fulfil the above aims, a comprehensive framework of binding international agreements as well as technical codes,

recommended practices and guidelines has been adopted. For the effective implementation of IMO's regulatory regimes, technical co-operation is promoted and advisory services are provided with a view to strengthening capacities for national and regional actions.

Pollution from ships

One of the main global conventions adopted by IMO is the International Convention for the Prevention of Pollution from Ships, 1973, and the Protocol of 1978 relating thereto, commonly known as MARPOL 73/78. This international treaty covers the prevention and control of marine pollution from ships by oil, noxious liquid substances carried in bulk, harmful substances carried in packages, as well as pollution from sewage and garbage.

With regard to the prevention of pollution by oil (MARPOL 73/78 Annex I), the Convention requires that discharges from machinery spaces of ships and from oil tankers' bilges are strictly limited and that the discharge of oil is prohibited in so-called "special areas" (the Baltic Sea, the Black Sea, the Red Sea, the Gulfs Area and the Gulf of Aden). This is achieved by mandatory standards concerning the installation of oil/water separating and monitoring equipment resulting in the retention of oily wastes on board, as well as by the establishment of shore-based reception facilities for the collection of such wastes. Rather strict ship inspections and surveys of ships have also been introduced. A number of construction requirements have been developed to minimise to the extent practicable the release of oil in cases of accidents.

There is no doubt that the reduction of operational discharges achieved due to the above requirements has given rise to considerable improvements in the incidence of oil pollution. Estimates show that between 1971 and 1980 the amount of oils discharged into the sea from ships has decreased from 2 million tons per year to 1.5 million tonnes per year, although the amount of oil carried by sea has increased during that period from 49 million barrels to 61 million barrels per year. The number of accidents at sea has also fallen sharply in recent years: there were on average annually 26 accidental oil spills in the 1970s, but only 8 in the 1980s.

With regard to the transport of chemicals at sea (MARPOL 73/78, Annexes II and III), it should be pointed out that although these substances are not carried in such large quantities as oil, there are frequently specific problems associated with their fire hazards, their marine toxicity and health hazards which give rise to even greater concern should an accident occur.

The hazards of many hundreds of chemicals carried by ships have been evaluated by expert groups according to the effects they would create when released into the sea, such as damage to living resources, hazards to human health, reduction of amenities, and interference with other uses of the sea.

The "hazard profiles" so drawn up are then used for establishing provisions for their carriage by chemical tankers as well as for provisions governing the discharge of chemical residues into the sea. For the

Transport of packaged chemicals, loading and stowage requirements have been adopted and a new label has recently been introduced identifying certain chemicals as "marine pollutants" in the International Maritime Dangerous Goods Code.

Besides oil and chemicals, another type of material introduced into the sea from ships is garbage and it is recognised that the persistent forms of garbage (e.g. plastics and metals) once thrown into the sea threaten marine life and are detrimental to the aesthetic quality of coastlines and beaches.

Many seabirds, fish and marine mammals have died by the ingestion of plastics, by entanglement in discarded fishing gear and by swallowing metal and glass pieces.

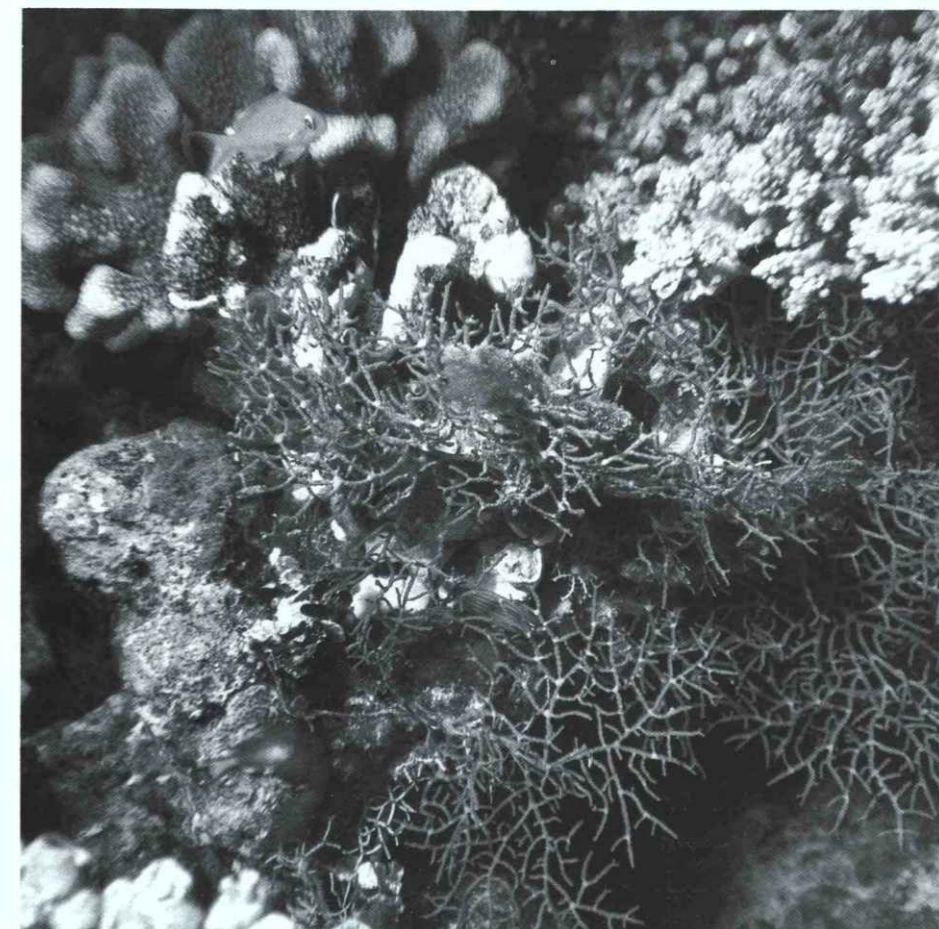
The prevention of pollution from ships' garbage is covered by MARPOL 73/78, Annex V which is due to enter into force on 31 December 1988. This will prohibit the disposal of plastics at sea, and also impose severe restrictions concerning the discharges of other non-plastic garbage from

ships into coastal waters and "special areas" (i.e. the Baltic, Black, Red and Mediterranean Seas, and the Gulfs Area).

The disposal of wastes at sea

Since the early stages of mankind the sea has been used as a receptacle for wastes; however in the early 1970s it was recognised that the capacity of the sea to assimilate wastes and render them harmless was not unlimited. Accordingly an Inter-Governmental Conference convened by the United Kingdom in 1972 adopted the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the so-called London Dumping Convention). The Contracting Parties to the London Dumping Convention, after its entry into force in 1975, designated IMO to be responsible for the carrying out of Secretariat duties in relation to the Convention. The Convention regulates the sea dumping of all wastes and other matter by requiring strict licensing, notification and monitoring procedures to be implemented by the national administrations of Contracting Parties. Substances and materials which shall not be dumped at sea include mercury, cadmium, organohalogen com-

Can the bottom of the seas absorb our wastes?



Annunziata/JACANA

pounds, oils, high-level radioactive wastes, materials produced for biological and chemical warfare, and persistent plastics. Consultative Meetings of Contracting Parties to the Convention are currently convened on an annual basis to review the application of the Convention and to consider any amendments that may be desirable.

The Convention was expanded in 1978 to cover the incineration of hazardous wastes at sea. Incineration at sea had been carried out since 1968 by a number of countries using specifically designed ships. Another sea disposal method, the burial of hazardous wastes into the seabed, including high-level radioactive materials, was proposed by a number of Contracting Parties, and in this regard a Consultative Meeting has agreed that the London Dumping Convention is the appropriate international forum to address the question of the disposal of hazardous wastes into the seabed, once this method is proved to be technically feasible and environmentally safe.

Another problem discussed by Consultative Meetings relates to the export of wastes for sea disposal. After lengthy discussions a Consultative Meeting adopted recommendations addressing that issue.

In addition to the above, the Consultative Meetings have provided advice in the form of Guidelines addressing many problems encountered by Contracting Parties in the effective implementation of the Convention, e.g. concerning the disposal of dredged material, the carrying out of environmental impact assessment studies, the selection of dumping sites, the application of appropriate dumping methods, etc.

One of the most controversial subjects considered between Contracting Parties during recent years is related to the sea disposal of low-level radioactive wastes. Such dumpings had been carried out in the North-East Atlantic for many years by several Contracting Parties and it was in 1983 that a Consultative Meeting suspended such activities due to concerns expressed by the same countries, pending the presentation of studies on scientific, technical, legal, socio-economic and political issues. An Inter-Governmental Panel of Experts on Radioactive Waste Disposal at Sea has been established to provide advice to the Contracting Parties on this matter.

Since the entry force of the London Dumping Convention increasing efforts have been made by Contracting Parties to reduce the amounts of industrial wastes dumped at sea. But in spite of waste management procedures recognised among Contracting Parties, namely that every effort should be made to reduce the production of hazardous wastes by changing industrial processes, the use of recycling methods and waste treatment techniques, for many countries the disposal at sea of certain waste types, in particular dredged material and sewage sludge, will continue to be their best practicable option. It has also been shown through previous

experience that disposal and/or treatment of wastes on land may not always be the least damaging option concerning the protection of human health and the environment as a whole. Therefore sea disposal of wastes and other matter continues; however, the various procedures adopted within the framework of the London Dumping Convention for minimising harmful effects provide guidance to Contracting Parties concerning the selection of dumping sites, dumping techniques and monitoring programmes.

Since the entry into force of the London Dumping Convention waste amounts dumped at sea or incinerated at sea have decreased considerably and awareness has been created among Contracting Parties concerning the damaging effects that might be caused by sea disposal if no proper licensing and control procedures are applied.

Effective implementation of IMO standards

An effective framework of measures for preventing and controlling marine pollution from ships has been established during the last 25 years, as I have described above. However, we have to ensure that these are implemented in the most effective way. In this regard it has been recognised that the governments of many developing countries experience difficulties in putting IMO and LDC requirements into force, particularly due to their lack of experienced and trained manpower. This Organisation therefore developed a technical assistance programme with a view to helping governments to implement and enforce conventions and recommendations thereto in an effective manner. Measures taken by IMO in this respect include:

- the appointment of advisers and consultants who assist governments in effectively implementing the Convention requirements;
- the provision of financial assistance through the United Nations Development Programme and a number of donor countries for the establishment of maritime training academies;
- the award of fellowships for the training of governmental experts; and
- the establishment of the World Maritime

University in Malmö, Sweden, which was opened in 1983. This provides high-level training for key administrators from developing countries on maritime affairs including maritime pollution protection.

Outlook

It has been demonstrated that due to measures taken by the International Maritime Organisation the pollution of the sea caused by maritime transport and the disposal of wastes at sea is decreasing. It has however also been realised that after the adoption of international legal instruments every effort should be made to implement effectively such legislation by providing assistance, education and training facilities to those who are directly involved. These are maritime administrators, masters and the crews on board ships as well as the many individuals connected with the maritime industry who should also be made aware of the importance of keeping our oceans clean for future mankind.

The introduction of pollutants into the sea from ships and sea disposal operations is rather small compared with other sources of marine pollution, e.g. through the atmosphere and land-based inputs through rivers or directly from land, or from offshore exploration and exploitation facilities. Many more efforts are necessary in order to win the final battle towards reaching a "clean sea". The International Maritime Organisation maintains its ceaseless endeavours to achieve its goals and I assure you that we will continue the battle. To reduce the inputs of pollutants into the sea from all sources, co-operation between the various organisations and agencies working in the field of marine pollution prevention has to be continued and, if possible, strengthened to attain specific objectives. IMO, for its part, has shown itself to be ready and willing to further such co-operation with other international bodies, global and regional, to protect the oceans from pollution, and this will continue to be fundamental to the Organisation's approach. ■

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IMO



Coastal wetlands - a source of life

L. Hoffmann

Europe is a small continent, representing barely 5 % of the earth's land area. Yet no other part of the world has such a jagged coastline, totalling some 80,000 kilometres in length—the equivalent of twice round the Equator. As a result, Europe as a whole is oriented towards its coasts, whose natural richness were the starting point for its cultural and economic development.

Europe's coasts are very varied: they can be flat or steeply sloped, rocky, sandy or muddy. Of all the coastal zones, the estuaries, inter-tidal zones and lagoons, that is the coastal wetlands, are the most productive. Many of Europe's urban and cultural centres were established and have developed in the vicinity of such zones. This is particularly true of the estuaries of the rivers Scheldt, Rhine, Weser, Elbe and Thames bordering on the North Sea, and of the estuaries of the major French, Portuguese and Spanish rivers. Mediterranean examples include the lagoons of Valencia, the Rhone delta, Venetia and the Macedonian coast.

Nowadays, however, large expanses of these wetlands have disappeared or are in danger of doing so. With the intensification of agriculture and rapid industrialisation, the resources of wetlands pale in comparison and 20th century man has lost interest in their potential. Many such areas have been treated with suspicion because of health hazards or the difficulty of making use of them: they needed to be drained or built up so that they could be developed economically.

The role of wetlands

Are we to understand by this that coastal wetlands no longer have a contribution to make to, and indeed positively hinder, development in Europe and that, logically, they ought to be allowed to disappear?

Many Europeans take this view, whilst others, in increasing numbers, are endeavouring to halt their destruction, preserve those that remain, and even rehabilitate some of those already damaged. What role, then, could these coastal wetlands play for man in the 21st century?

First and foremost, wetlands have a direct and obvious role to play for everyone. The richness and diversity of fauna is spectacular; out of 415 species of birds observed in Europe, 172, that is over 40 %, benefit from, or indeed, depend heavily on the resources offered by wetlands. The same is true, to varying extents, of other categories of vertebrate and invertebrate animals. In addition, a vast number of plant species are indigenous to wetlands and are morphologically and physiologically very different from terrestrial species. Our natural environment would be tragically impoverished if coastal wetlands were to disappear.

For many of our contemporaries who set more store by economic than by cultural values, these arguments do not carry sufficient weight to plead the cause of coastal wetlands. What is their economic value? It is certainly not negligible. The estuaries and lagoon systems of Europe yield enormous catches of fish, shellfish and molluscs, and demand for these products is increasing while demand for most agricultural produce is declining. Moreover, coastal wetlands often serve as spawning grounds or nurseries for species which are caught by fishermen later on the open sea. There are many instances where coastal fishing has suffered a serious decline as a direct result of the disappearance of coastal marshes.

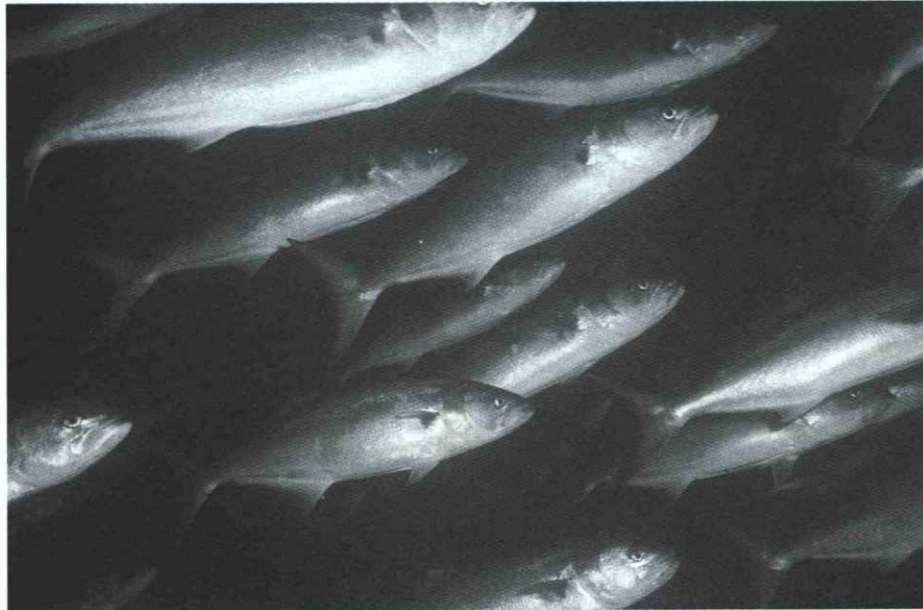
The greatest importance of coastal wetlands lies in the more subtle and less immediately perceptible area of exchanges

with their environment. Our understanding of these exchanges is still limited, but more and more they are attracting the attention of researchers, who talk of the "ecological services" provided by a limited area to a much more extensive territory. We have mentioned the spawning-ground, or nursery, function but wetlands also, on account of their very high primary productivity, export organic material into neighbouring seas and, in so doing, fertilise them. They may also, on the other hand, act as filters to remove matter in suspension or solution in the water flowing into them, thus helping to reduce pollution. Often, too, they supply and stabilise groundwater in the surrounding area and act as a buffer to maintain and equilibrium between the high and low water levels in estuaries.

For all these reasons, and for many others which for reasons of space cannot be mentioned here, individuals' and governments' attitudes to coastal wetlands are changing. Not so very long ago, most European governments and the European Community were encouraging the drainage of wetlands by offering financial assistance. Today, the emphasis is more and more on their conservation and "integrated development" for the benefit of the major ecosystems and human communities that depend on them.

The Ramsar Convention

The Ramsar Convention on Wetlands of International Importance has contributed greatly to reinstating the importance of wetlands in public opinion and government



Yves Gladu/EXPLORER

... of immense importance for the fishing industry...

policy. It was signed at Ramsar, Iran, in 1971 and is administered by the International Union for Conservation of Nature and Natural Resources (IUCN) and the International Wildfowl Research Bureau (IWRB). In it, the Contracting Parties recognise the great value of wetlands and undertake to pay due heed to them in their planning and management activities. More specifically, they list wetlands of international importance within their territory, and undertake to preserve them intact. All the European states have acceded to this convention, with the exception of Czechoslovakia, Romania and Turkey. As a result, all the Baltic and North Sea coasts and all the Atlantic and Mediterranean coasts of Europe are protected under the convention.

It has to be said that the Ramsar Convention is not a panacea. All too often, the Contracting Parties tolerate the destruction and degradation of wetlands and, in some areas, even encourage it. Nonetheless, in many cases, reference to the Ramsar Convention has succeeded in securing the conservation of wetlands whose existence was threatened. The reorientation of the Common Agricultural Policy may also further the cause of wetlands conservation. This rejects the former policy of awarding grants for the drainage of wetlands in favour of a policy which, instead, gives financial support for management of wetlands which promotes their conservation. After all, it is not simply a question of conserving wetlands; they have to be managed as well, not only to safeguard their flora and fauna, but also to maintain the ecological, economic and social service they provide to adjoining areas and their inhabitants. And this is no easy task.

Each wetland is unique

Our knowledge of how these ecosystems work is still very limited and it is therefore difficult to determine how their resources may best be used by animals and men, especially in the longer term. There is still a great need for further research in this field. Furthermore, the many demands made on wetlands by their neighbours are conflicting and often incompatible; precautions are necessary in order to prevent one or other category of users damaging the system as a whole. In the final analysis, one has to bear in mind the great diversity of coastal wetlands. Each area has its own ecological, economic and social characteristics and although we can learn to a certain extent from experience in managing other wetlands, it is vital that each zone should be examined individually.

If conservation is to succeed, there must be planning and integrated management for each individual coastal wetland. As far as this field is concerned, however, we are still at the drawing board. Although some tentative efforts have been made, they still remain very much the exception and have yielded only inconclusive results.

I should like to give some examples to illustrate the complexity of the problems:

The Wadden Sea, which extends from the Netherlands along the German coastline as far as Denmark, is the largest coastal wetland in Europe. In recent centuries it has

been the scene of major works designed to reclaim agricultural land and protect it against the sea. Even so, 8,000 square kilometres of intertidal zone remain and continue to be of immense importance for the fishing industry and migratory birds. Under the aegis of the WWF, nature conservation groups in the three countries concerned have protested against major new projects affecting this area and have co-ordinated their efforts to engage the respective governments in dialogue. With goodwill on all sides, a number of polder projects in the Netherlands, Germany and Denmark have been postponed or cancelled and two large national parks have been established in the German part. The three governments have, between them, set up a permanent bureau to study jointly the problems involved in managing the Wadden Sea, such as prevention of pollution and protection of seals.

The British Government and nature conservation associations have been the first to encourage, by awarding grants, practices which promote the conservation of wetlands. In the Norfolk Broads, for example, marshland of immense richness has been maintained as a result of the government subsidising farmers who harvest the aquatic vegetation, and thus perpetuate a practice which, in itself, is no longer profitable.

France hesitated for a long time before acceding to the Ramsar Convention, and has so far only designated one zone, the Camargue, for inclusion in the List of Wetlands of International Importance. However, a number of interesting experiments have been carried out in the Seine estuary and in Vendée. In the first case, the introduction of Scottish cattle and Camargue horses into a nature reserve has helped to thin out the marshland vegetation, improve diversity and increase its capacity as a habitat. In Vendée, agreements between nature conservation associations and rural municipalities have brought about a revival of farming practices which, in turn, has increased the diversity and capacity of the habitat. In the Camargue, a large nature reserve and regional natural park have been established and the possibility of management is currently under study.

... and migratory birds.



Henri/JACANA

In Spain at the beginning of the 1960s the government ordered the complete drainage of the Marismas of the Guadalquivir river. Through the intervention of Spanish biologists and international organisations, notably the WWF, this drainage did not take place, and today what remains of the Marismas is to a large extent protected by a large national park. However, there is competition between the park and other users for the water. A satisfactory compromise has, fortunately, been found and approved but the government is having problems in securing its application.

In Greece, a large number of coastal wetlands were drained during the 1930s, with financial assistance from various international organisations. Despite this, Greece was one of the first countries to accede to the Ramsar Convention and it has designated an impressive list of sites for inclusion in the List of Wetlands of International Importance. Unfortunately, this has not succeeded in putting a stop to destruction, even in areas included in the List. Mention must be made, however, of the Nestos

Delta where the government had wanted to develop a major industrial complex in a listed area but the Supreme Court ruled against this development on the grounds that it was incompatible with the undertakings given under the Ramsar Convention.

These few examples only scratch the surface of a multitude of problems which arise in promoting the conservation of coastal wetlands. The value of wetlands is now much more appreciated and the arguments in favour of their conservation much less contested, though many destructive practices still continue. Many problems are still encountered in the management of these wetlands. Ultimately, wetlands conservation will only secure the support of the public and governments insofar as their integrated management brings a satisfactory return in ecological, economic and social terms. This, as far as the management of coastal wetlands is concerned, constitutes the major challenge of the coming decades. ■

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Europe's seas - a case of rape?

Keith Ulyatt

Much has been said about the seas of Europe; of the world for that matter. Comparisons have been made between the Atlantic and Arctic Oceans. Debates have raged over the boundaries between the North and Barents Seas. But the fact remains that we have only one sea. All our "named" seas are interconnected. The sea is an environment which ignores borders. So when we come to talk about the sea's use and abuse it is essential to remember that the sea we fish off Norway is the same sea being sailed off the coast of Spain. The cooling water used for Britain's coastal power stations comes from the same sea that helps keep the electricity generators of France going. And the sea we use as a dumping ground off Germany is the same sea that suffers radioactive waste around the north of Scotland.

This all may seem pretty obvious. But if so, then why has the North Sea been allowed to become so heavily polluted that European governments have seen the need to hold emergency international conferences to decide how to deal with the problem? That is not easy to answer. But the search for an answer allows us to dwell on the positive aspects of our sea. So let us indulge in a little natural history for its own sake: it makes better reading.

A world teeming with wildlife

Every group of animals and plants known to man has representatives living in the sea and indeed many groups of animals and plants are found only in the sea. Every part of the sea is inhabited, from the inner space of the open oceans to the muddy banks of our estuaries, to the surface waters where masses of planktonic organisms live. It is a world teeming with wildlife but, what is more, it is a relatively untouched world.

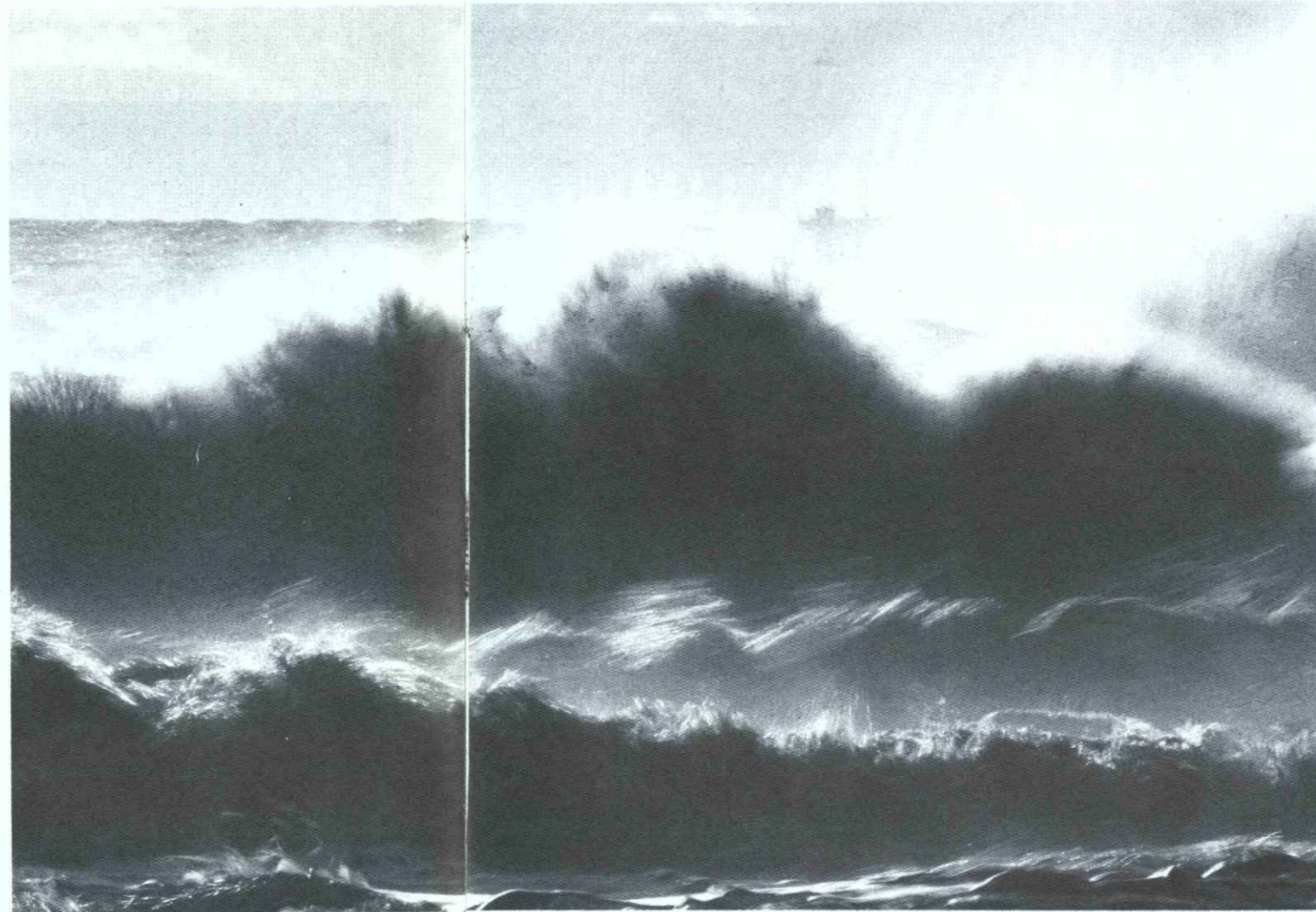
In terms of nature, the seas of Europe present us with a tremendous opportunity—

an opportunity we no longer have with our land. In the sea we can create protected areas of wilderness to rival any in the world. We can create marine parks, marine nature reserves—on whatever scale you like—which are relatively untouched by man. A National Park in Canada or Africa is not so much a conservation area as an area of protected wilderness. A National Park in Britain is no such thing. People live in them. There are towns and factories in them. They are supreme examples of conservation areas which are managed in an effort to let man exist harmoniously within a protected area. Create a marine park in the English Channel and you are indeed setting up an area of protected wilderness with all the wildlife that lives there; just as the Serengeti is.

Threats by human activity

But why, if the sea is indeed this wilderness, is there the urgency for establishing areas of protection? Well, the idea has developed in tandem with the only too obvious increase in the impact that man is having upon our oceans. In the last few decades the marine environment has become increasingly threatened by human activity and although the emphasis of these threats may be different from man's impact on the land, the categories are the same. The seas are suffering in three basic ways, and every impact you can think of slots into one of these categories. It helps greatly to clarify the mind. Threats are either to individual species (e.g. overfishing), to the destruction of wildlife habitat (e.g. coastal development or dredging) or through pollution.

The more we can promote the natural wonders of our seas, the more support we will get for their protection. Marine reserves, parks, sanctuaries—call them what you will—can provide a focus of attention. Set up a marine park and curiosity will be aroused. Why? What is there? Why does it need protecting? The message starts getting spread. But of course the message does not end at the borders of the marine park, it is carried through to cover whole seas themselves. If we can see, in every sense of the word, the value of the sea, then the "out of sight, out of mind" syndrome



Rolf Sørensen

in the middle of the North Sea, have been related to heavy metals such as lead and mercury that have been dumped in the area.

Destruction of habitats

Destruction of habitats, in the form of coastal development, is also taking its toll. Loss of estuaries and wetlands to the developers of ports and marinas has meant declines in the wading bird populations, because their food supply—the invertebrates and crustaceans of the shallow mud flats—have also been destroyed. Seals too are now suffering at the hands of fish farmers who, in the sea lochs of Scotland, often resort to shooting these predators to protect their salmon breeding cages.

So there has been a debate about the North Sea, and we must be hopeful that attitudes are going to change and the sea, its resources and its wildlife will, along with man, be the beneficiaries. As mentioned before, it all came about because not so long ago it was unthinkable that a "whole sea" could be affected in this way. Surely we have learned our lesson. Or have we? The Institute of Oceanographic Sciences in England have recently been giving advice regarding the dumping of sewage sludge, dredge spoils and toxic heavy metals. They are suggesting that the deep Atlantic will provide a solution to the problem. The scientific arguments are all there. Waste products will respond to the laws of gravity: pollution sediment will always sink to the sea bed and since the water at these depths is so still, there is no possibility of it rising again. This is based on the science we know now. But science is ever changing and there is still a feeling that we are merely putting pollution further "out of sight, out of mind" and that if it ever comes back and hits us in the face it will do so on a scale that will make the North Sea problems look minor.

It is all interconnected: the individual seas, the impacts that affect them, and the arguments and methods for helping to save them. Can a concept like marine parks really have a significant effect? Could they, through spreading awareness, be the kind of thing needed to make us avert another North Sea disaster? It may seem like a long shot, but at this stage of the game, long shots may be the only thing that we have left. ■

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could be laid to rest forever. It is that syndrome which has led to the desecration of the North Sea and what has gone wrong there cannot be allowed to be forgotten.

Overfishing

Even as late as the last century it was widely held that the bounty of the sea was infinite. Even the decimation of seals, whales and walrus during the heyday of whaling in the great southern oceans seemed to do little to alert people to the dangers. The result has been phenomenal overfishing. Boats scooped up whole schools of fish, 50 tonnes at a time. Year after year this practice went on around virtually all of the continental shelf of Europe. It caused a catastrophic decline in our fishing industry with enormous economic consequences. Some populations, like the tuna fishery of the North Sea, have never recovered. There used to be a North East Atlantic whaling industry, too. North Sea herring has been another classic example and it was only through a complete ban on the fishery a decade or so ago that the species has recovered.

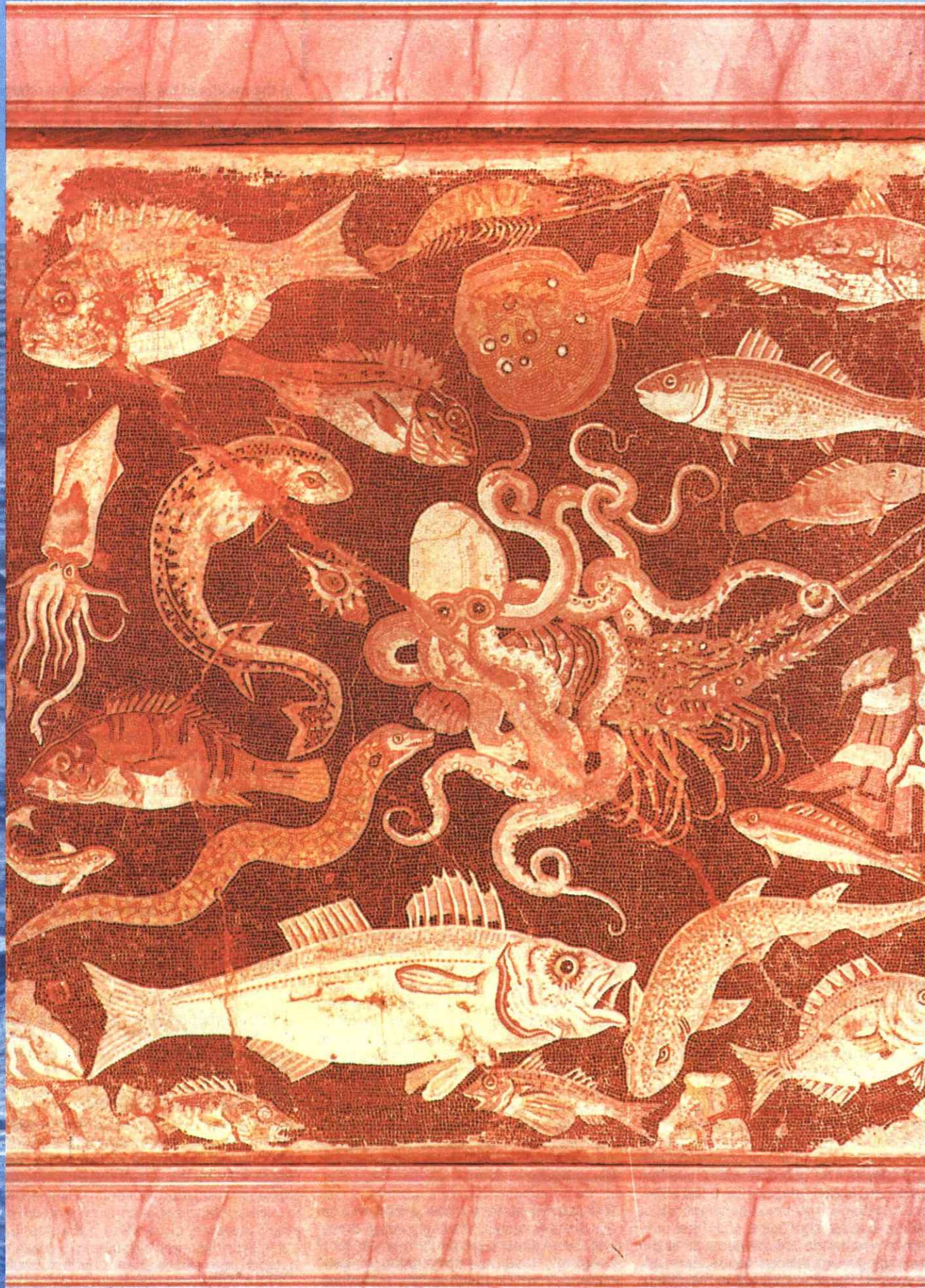
Pollution

Even as recently as 15 years ago it was unthinkable that an entire sea could be killed off through pollution. But since that time the Baltic, the Black Sea and part of the Mediterranean and many similarly enclosed but smaller bodies of water have shown the symptoms in the scenario of a dying sea. Often, the smaller pollution hotspots could be tackled simply because they were not big enough to get out of control. But the North Sea is. The fear is that that is now dying too. In November last year, ministers from the countries bordering the North Sea gathered in London to discuss the problem. The outcome was a positive agreement to take steps to curb the pollution. A victory for common sense at last, it seems. It was significant that the conference was held in London because as the proceedings progressed to become apparent that Britain's attitude to the dumping of waste in the North Sea was markedly different to the rest of Europe. Indeed, Britain's Marine Conservation Society, who

co-ordinated the voluntary conservationists' input to the conference, had been saying for some time that Britain could end up being called the "dirty old man of Europe" unless its attitude changed.

Sewage pollution, agricultural run-off of fertilisers into rivers and estuaries, and the intensive animal husbandry now practised in estuarine areas have resulted in a phenomenon called eutrophication. In short, this is the "fertiliser" effect of all these nutrients being dumped in the sea. There has been a dramatic increase in phyto (plant)-plankton. Off the Netherlands coast this has increased fourfold as it has in the German Bight. The plankton itself has changed too. There now occur species not previously recorded in the area and the "blooms" of one in particular have been associated with the natural production of toxic byproducts which kill organisms on the sea bed.

Fish stocks, already under pressure from overfishing, are increasingly being drawn into the argument, particularly where local pollutants lead to heavy loads of toxic chemicals which result in fish mortalities. This is especially evident in fisheries for mussels and oysters. High levels of fish disease on the Dogger Bank, which is right



1

This splendour testifies to man's fascination for life in the seas in antique times.



2



3

What, in 2000 years hence, will be said of us?



4

The Mediterranean deserves better than this



Greenpeace

Xavier Pastor

Since 1986, the defence of the Mediterranean, one of the world's most threatened marine ecosystems, has been one of the most ambitious campaigns tackled by Greenpeace.

The motivation behind this campaign is a conviction that the situation is not yet irreversible and that technical and scientific progress can provide Mediterranean societies and governments with solutions which will help them put a stop to the growing deterioration of this sea and ultimately reverse the process. It is possible to restore the quality of the water, and it is equally possible to bring the exploitation of its natural resources and fish stocks back to reasonable, sustainable levels.

Through the campaign, Greenpeace also wishes to help safeguard the survival of rare species such as the monk seal, sea turtles and the Mediterranean cetaceans. We are trying to conserve the last fragments of coastline still in their natural state and we insist that it is imperative to eliminate any type of nuclear threat from this traditionally conflict-prone area.

Pollution: a progressive phenomenon

For thousands of years, Mediterranean peoples have used the seas off their towns and cities to discharge waste water and even, on occasion, their refuse. Until midway through this century, the impact of this effluent seemed to be absorbed by the Mediterranean without undue problems. Until that time, the population was small compared to present levels. The major migrations from inland areas towards the coasts had not yet taken place and the tourist centres were yet to be developed. No

big industrial and petrochemical plants had yet been built, and the waste produced consisted basically of degradable organic products of natural origin.

Over the past 40 years, the situation has changed radically. Today, 350 million people living in countries bordering the Mediterranean discharge waste produced by their urban and industrial activities directly into the sea, the rivers that flow it or the aquifers from which drinking water then has to be obtained. They are joined every year by 100 million tourists who increase the pressure on the ecosystem in a multiplicity of ways.

It is not just the number of people discharging waste that has changed. The rise in standard of living and consumption in Mediterranean countries, and changes in lifestyles have also led to a spectacular increase in the volume of waste water per inhabitant. The quality of the effluent is also different. Together with natural and biodegradable products, growing amounts of synthetic, toxic, bioaccumulative and persistent compounds are discharged today, against which living organisms lack adequate defences and for which they do not have adequate elimination mechanisms.

Today, according to data collected by the United Nations Environment Programme (UNEP) through its Mediterranean Action Plan (MAP), 85% of urban effluent is discharged directly into the sea without any previous treatment. The presence of pathogenic micro-organisms can cause hepatitis, cholera and paratyphoid infections among bathers and consumers of shellfish and other seafoods. At the same

time, two million tonnes of crude oil are discharged into the Mediterranean by tankers in the course of the loading, unloading and tank-cleaning operations.

From the coast and through rivers, 120,000 tonnes of mineral oils, 12,000 tonnes of phenols, 60,000 tonnes of detergents, 100 tonnes of mercury, 3,800 tonnes of lead and 3,600 tonnes of phosphorus as well as other environmentally harmful substances enter the Mediterranean every year.

Solutions to pollution within our grasp

This situation is not inevitable. The treatment of urban effluent has been highly perfected and suitable methods exist for any size of community. Purification plants for medium-sized and large towns can ensure 100% purification of domestic effluent. If the sewage network is kept separate from industrial discharges, this water can be reused for agricultural or urban irrigation or to restore salt-laden aquifers. For small communities, there are biological purification techniques using lagoon systems and other methods. Adequate undersea outlets, properly maintained and discharging at a suitable distance from the coast and at a sufficient depth may be an acceptable system for communities of several thousands of inhabitants.

Due recognition must be given to the efforts being made by some Mediterranean states to purify their urban effluent. In some cases the quality of the water has begun to improve—purely from this point of view—in the last few years. Nevertheless, it will take at least a decade before the plans are sufficiently advanced and operational to produce a clearly noticeable effect. Such progress is coming up against obstacles which will have to be overcome. Along with the usual problems of maintaining purification plants, it is vital to ensure that their design is not immediately overtaken by the scale of the requirements. At the same time, the population explosion taking place in the countries of North Africa and the Eastern Mediterranean may mean that any progress made in some parts of the Mediterranean will be dramatically overshadowed by a drastic worsening in areas which, until today, were not among the worst affected. Only international aid to the countries in this critical state and an adequate policy of population control in the developing countries can prevent this situation from slipping irrevocably out of control.

The situation of industrial waste has taken a parallel course. In the 50s, 60s and 70s, a series of multinational or national industrial and petrochemical plants sprang up along the Mediterranean coastline, taking advantage of low labour costs, the need for development in the countries around its shores and the virtual absence of environmental protection legislation. These have had a tremendous impact on both the coastal environment and the living organisms which have accumulated halogenated organic compounds and heavy metals.

In this case too, there are viable and realistic solutions which depend solely on the willingness of governments to force companies to remedy the damage they have done to the collective environment.

There are manufacturing processes which eliminate or drastically reduce the production of toxic wastes and which should be adopted as standard. For the proportion of waste which cannot be totally eliminated, purification or closed circuit recycling processes should be set up to reduce discharges into the sea or rivers to nil.

Other pollution factors: oils and pesticides

The problem of oil discharge into the sea has been alleviated to some extent with the growing application of the Marpol International Convention for the Prevention of Pollution from Ships. Crude oil slicks and pitch balls are still very common in the Mediterranean, but there has been a reduction over the past few years. Nevertheless, there is still a long way to go before all Mediterranean ports possess the mandatory ballast-water reception facility in pro-

per working order and all ships sailing this sea comply strictly with the rules which prohibit or strictly control discharges.

Every year tens of thousands of tonnes of pesticides are carried into the Mediterranean by overflowing rivers. Products such as DDT whose manufacture, sale and use are prohibited in many countries, continue to be used in many parts of this region. The progress of biological methods for prevention of infestation, and the study and use of alternative pesticides with lesser ecological impact, are imperative if we are not to arrive at extreme situations in which bioaccumulation threatens the viability of animal and plant populations and jeopardises human health.

Over-fishing

Many of the Mediterranean's natural resources are being severely overexploited. The case of fish stocks is a classic example. The sea has traditionally been a source of food and economic activity for the inhabitants of the countries around it. However, in the past three decades, the situation has changed from one of balanced and sustainable exploitation in most cases to one of very serious depletion of many of the stocks. This has obviously been a result of a heavy increase in fishing activity and the fact that breaches of the legislation which attempts to regulate the exploitation of fishing grounds have gone unpunished.

The wooden vessels which tourists still see in a romantic light as small traditional fishing boats have been equipped for several years now with powerful engines and equipment, efficient echolocation and depth scanning apparatus and extremely unselective nets.

The oversized fleets of most Mediterranean countries perpetrate all manner of abusive fishing practices: they fish far above legal depths, use nets with non-regulation mesh and catch fish much too small to enable the exploited populations to be maintained at a sustainable level. The use of dynamite for fishing is common practice in some countries. Moreover, a growing number of "sports" vessels use professional fishing techniques and divers using compressed air cylinders capture all kinds of crustaceans, molluscs and regular size fish to be found at depths of less than 50 metres.

Furthermore, it is not only Mediterranean fishermen who work this sea. Recently, the crew of the Greenpeace vessel "Sirius" discovered during its expedition this summer a fleet of a dozen or so large Japanese fishing boats operating with flags of convenience in international waters to catch spawning tunny during their annual migration to their breeding grounds around the Balearic Islands.

All these factors are compounded by increased pollution on the coastal fringe and destruction of the vital banks of seagrass (*Posidonia oceanica*). The depletion of fish stocks—and of corallines, which are suffering a similar fate—has been at a worrying level for several years now. The fleets continue to operate simply because tourist demand for fish enables prices in the markets and restaurants to rise indefinitely as catches diminish. For some years, most of the fish consumed regularly by people living in Mediterranean countries has had to be imported from Atlantic fisheries.

Fish biologists have been recommending solutions to overexploitation for many years. The establishment of—and compliance with—controls on fishing which will allow stocks to recover before it is too late would make possible a return to sustained maximum catches, greatly to the benefit of all concerned—fishermen and the ecosystem alike. All that is required is, yet again, political will and the proper establishment of supervisory and disciplinary services at sea, in markets and in the restaurant trade.

Destruction of habitats and extinction of rare species

Once the coasts of Spain, France and Italy became covered with concrete in the form of hotels, urban development and marinas, the eyes of the tourist industry turned towards other areas such as Greece, Turkey, Yugoslavia and North Africa, which had not yet suffered such assaults. Apart from the serious aesthetic, environmental and sociological damage caused by this phenomenon, massive use of the shore for industrial or tourist purposes is robbing the Mediterranean of the last surviving re-

representatives of species which lived in this sea for thousands of years before man, in only a few decades, placed them in serious danger of extinction.

For instance, monk seals and sea turtles no longer have suitable habitats in which to live and reproduce and are being driven out from their last refuges in Greece and Turkey in spite of a few recent, timid efforts by the governments of those countries.

While their habitats are being destroyed, seals, turtles and dolphins are also victims of the activities of fishermen who capture them either deliberately or accidentally.

In spite of innumerable promises, and although a growing number of governmental and non-governmental organisations are concerning themselves with the seals, turtles and marine mammals of the Mediterranean, their numbers are falling as a result of incompetence and a lack of determination on the part of the authorities in many countries. The only hope for the survival of these creatures is the establishment of strictly managed nature reserves in their

few remaining refuges—the economic cost involved being borne internationally—and the effective imposition of severe penalties for anyone harming these species or their habitats.

The nuclear threat

The Mediterranean, like many other places on this planet, lives in the shadow of the nuclear menace, through the presence of 70 nuclear power stations on the coasts and besides the rivers of the states around its shores, and constant manoeuvres in this strife-prone sea by four of the world's five nuclear-armed fleets. The USA and the USSR between them have over 500 nuclear warheads permanently installed in ships sailing the Mediterranean, many of them also propelled by atomic reactors which are much less safe than the power stations built on land.

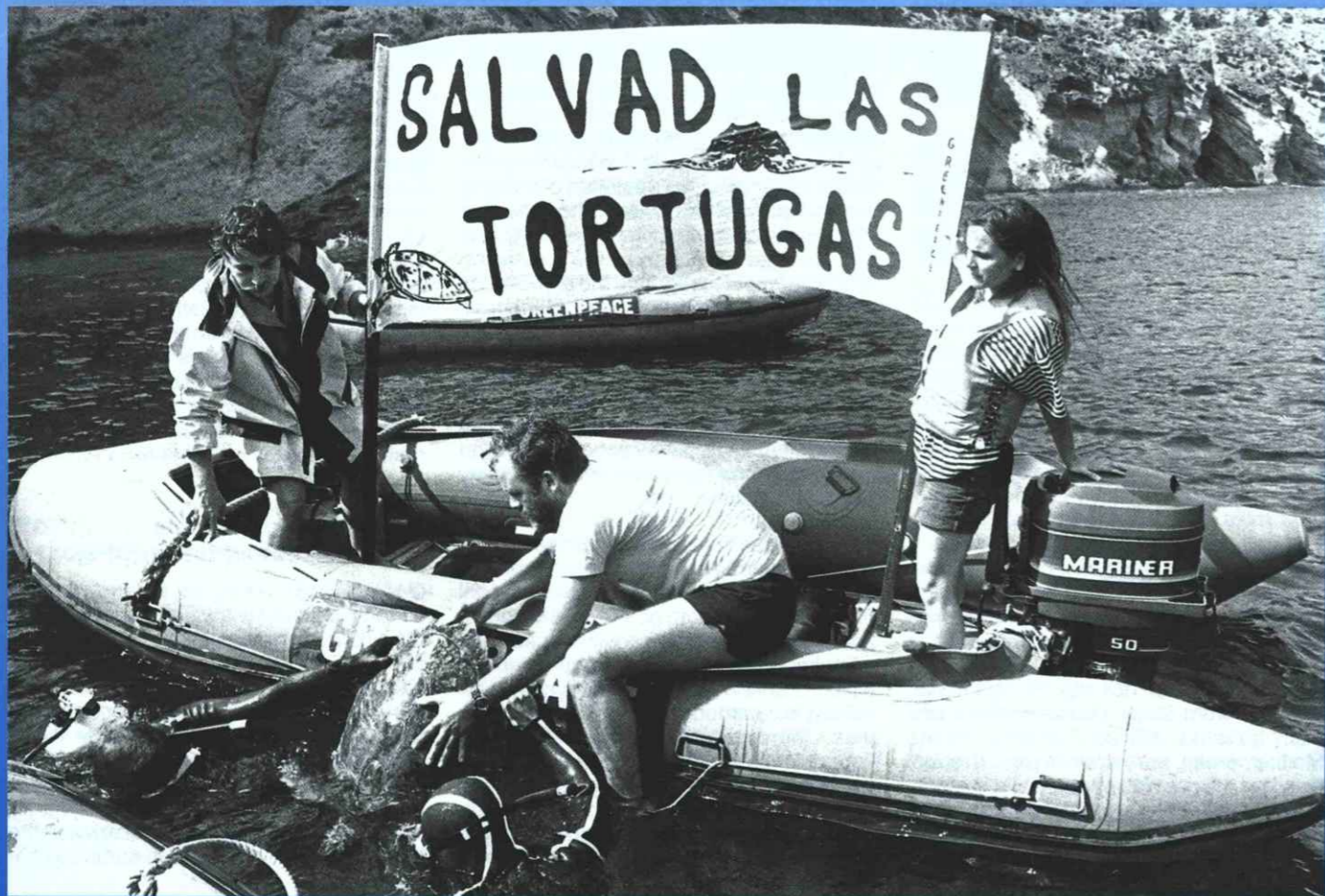
The Mediterranean states can and must replace their nuclear power stations and promote the production of electricity by a variety of traditional and alternative non-polluting methods using renewable resources.

By leaving the Mediterranean, the nuclear fleets can help to make it a true sea of peace, a less polluted place where the harmonious coexistence of man and nature is a positive reality.

These are the objectives of the Greenpeace campaign. ■

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This *Caretta* was returned to its natural habitat after having been saved from a fish shop.



Lorella Doreboom/Greenpeace



Fin whale.

Francis Gohier/JACANA

Of whales and men

Kieran Mulvaney

Whaling for science

However, this decision did not mean an end to Icelandic whaling. In 1985, Iceland announced a plan to kill a total of 80 fin whales, 80 minke whales and 40 sei whales every year for four years for "scientific" purposes. This was allowed under Article VIII of the International Convention for the Regulation of Whaling, which states that any member government of the IWC "may grant to any of its nationals a special permit... to kill, take and treat whales for purposes of scientific research".

But the IWC's Scientific Committee expressed grave doubts about the value of Iceland's planned research. This, and the fact that Iceland planned to sell the whales' meat to Japan for profit led to concern that Iceland's "scientific whaling" was, in fact, just commercial whaling under a different name, designed to keep the markets supplied with meat and the fleets operational, at least until the review of the moratorium in 1990. In addition, the Icelanders admitted, in an unguarded moment, that some of the money raised by selling the meat would go towards financing other forms of research—something which is definitely not allowed under the Whaling Convention.

In 1982, the International Whaling Commission (IWC) voted to impose an indefinite moratorium on commercial whaling. This moratorium was to take effect from 1986 (from the 1985/86 season in the Antarctic) and be subject to review by 1990 at the latest.

Of the seven nations in the IWC which voted against the moratorium, two were from western Europe. Those two were Norway and Iceland. Norway went on to lodge an official objection—which, under IWC rules, meant that the Norwegians were technically under no obligation to abide by the decision. (Indeed, Norway did not officially end commercial whaling until 1988.) Iceland considered objecting, but, after debating the issue, the Icelandic Parliament voted—by a majority of just one—not to do so.

At its 1987 meeting in Bournemouth, England, and following criticism of the proposed research whaling programmes by the Scientific Committee, the IWC passed a resolution requesting Iceland not to implement its research whaling proposal.

The IWC, however, has no way of enforcing its decisions. The only enforcement measures available are through the United States of America, which, under federal law, has the authority to impose sanctions against any country which acts in such a way as to "diminish the effectiveness" of the IWC. When Iceland announced its intention to carry on and kill its 80 fins and 40 seis (it had already decided not to bother with the 80 minkes it had originally requested) in 1987, regardless of the resolution passed in Bournemouth, the US made it clear that it was seriously considering imposing sanctions. But the Icelandic Government reminded the Reagan Administration that there was a strategic NATO base at Keflavik, and hinted that this base's survival could not be guaranteed if sanctions were imposed. The Americans immediately withdrew the sanctions threat, and, in return, the Icelanders agreed to take 20 seis less than planned.

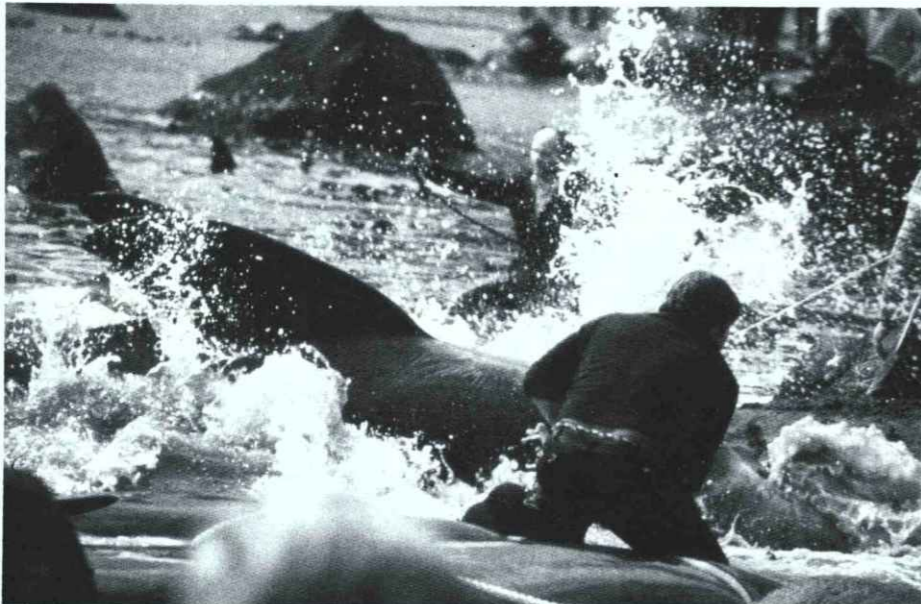
After the IWC again criticised Icelandic research whaling at its 1988 meeting in Auckland, New Zealand, the US struck another deal with Iceland, this time reducing the Icelanders' catch to a maximum of 68 fins and 10 seis—although this reduction may have been due less to American pressure than the fact that the prolonged political negotiations meant the whaling fleet did not leave port until several weeks later than usual.

The 1988 meeting also saw Norway follow the official end of its commercial whaling with an announcement that it, too, wanted to kill whales for science. The plan involved killing 30 minke whales in the North-East Atlantic in 1988, and an unspecified number—possibly up to 200 annually—in future years. The Norwegian programme also called for five minke whales to be captured alive and anaesthetised in 1988—a ludicrous idea, which will definitely result in the whales' deaths, as whales, unlike land mammals, cannot breathe while unconscious. (For that reason, when whales sleep, only one half of the brain sleeps at a time, and then only for short spells.) During the Auckland meeting, the IWC voted to ask Norway not to conduct this programme, but the Norwegian Government announced its intention to carry on as planned anyway.

Whaling outside the IWC

Scientific whaling is not the only reason whales are being killed after the start of the moratorium. Because Portugal is not a member of the IWC, the commercial hunting of sperm whales—for their teeth, which were sold as tourist trinkets on the black market—continued on the Portuguese territory of the Azores for several years after the Commission's members had voted to end sperm whaling in the North Atlantic. Azores whaling ended in 1984, prior to Portugal's entry into the EEC, but surprisingly resumed briefly in 1987, when four whales were killed. No more were taken in 1988,

Of men and whales.



Gerry Fraenkel/C.S.

however, so it seems that the days of sperm whaling in the Azores may well be over after all.

In addition, there are some species of whale over whose fate the IWC chooses to have no jurisdiction, because of constant objections by several member nations—particularly Denmark and Norway—to it doing so. Foremost amongst these is the pilot whale, around 2,000 of which are killed every year in a traditional drive fishery on the Faroe Islands. This is not a commercial hunt, as most of the meat is distributed free of charge amongst the islanders. However, it has come in for much international criticism, principally because of the cruelty of the hunt and because the Faroese apparently no longer need the whalemeat to survive.

A pilot whale drive—which the Faroese call a "grindadráp"—involves herding—amidst much shouting and slashing with knives—a group, or pod, of pilot whales towards the shore. There, waiting islanders wade into the water, bury hooks into the whales' heads, and drag them on to the beach, where they kill them by slicing through the jugular vein and carotid artery with a knife.

When the whaling began 400 years ago, the Faroese were a poor people, who needed the whalemeat to survive. Today, however, they have one of the highest standards of living in the world, and critics say they are continuing the hunt for recreational, rather than nutritional, reasons.

Member nations of the IWC may also kill whales over which the organisation does have jurisdiction, if they can show, to the

Commission's satisfaction, that the whaling is conducted for indigenous subsistence purposes, and not for commercial gain. At the 1988 Auckland meeting, for example, the Eskimos, or Inuit, of West Greenland were granted a quota of 60 minke whales and 23 fins a year to satisfy their nutritional and cultural needs. However, despite the undoubted importance of whales to the culture of the Inuit, there is a strong commercial aspect to this supposedly aboriginal hunt, and there is also much concern about the fact that the minke whale stock on which the Inuit prey is feared by many scientists to be extremely low.

The Inuit of East Greenland came way from Auckland with an annual quota of 12 minke whales. Greenlanders also regularly kill belugas, narwhals and harbour porpoises, but these are species for which the IWC does not set quotas. Other marine mammals taken by the Inuit are walrus and harp, ringed, bearded and hooded seals.

Killing or culling?

Slightly envious of the relative ease with which those who operate outside the mandate of the IWC are able to conduct their business, and increasingly frustrated by the predominantly conservationist stance the IWC has adopted in recent years, the remaining whalers inside the Commission—including both Norway and Iceland—have frequently threatened lately to leave the organisation, and thus free themselves from any legal or moral obligation to abide by its decisions.

However, neither country can just walk out: the United Nations Law of the Sea, to which both countries are signatories, stipulates that countries must co-operate, as far as possible, through existing international conventions—which, in the case of whaling, happens to be the one on which the IWC is based. The only way, therefore, that Norway or Iceland could legitimately leave the IWC and escape the Commission's authority would be if they could prove—at least to their own satisfaction—that the IWC was not competent to regulate the sort of whale management activities they wished to pursue.

The first indication that this is indeed the path they have chosen to take came at the 1987 IWC meeting in Bournemouth, when the Norwegian commissioner made several references to the need to "control" whales as part of a multi-species management programme for the whole marine ecosystem. In other words, the claim is that, as commercial whaling ends, whales will have to be culled to stop them increasing in numbers and eating too many fish. (The Japanese have said much the same about minke whales in the Antarctic.)

The seriousness with which Norway is apparently considering this approach was illustrated in November 1987, when the Royal Norwegian Ministry of Fisheries published a glossy brochure in which it was claimed, amongst other things, that continued minke whaling is necessary "to secure an ecological balance in the sea areas around Norway". Indeed, the Norwegians even claimed that the purpose of their scientific whaling programme was not to contribute information towards IWC research on whale stocks, but to provide data that would assist them in developing their multi-species management programme. And, at the 1988 IWC meeting, Iceland, too, argued the case for killing whales as a way of maintaining ecosystem balance.

It does not matter in the slightest to either Norway or Iceland that there is no scientific evidence whatsoever to support these arguments. What is important to them is the fact that the IWC only has the authority to regulate directed harpoon fisheries, and not multi-species management programmes of the sort they are proposing. Consequently, if either country was to implement such a management programme, then it would provide that country with an excuse—however transparent—to leave the IWC and continue whaling under the banner of a new regional fisheries convention of its own construction.

Invasion of the harp seals

Whales are not the only marine mammals to have been accused of increasing in numbers and so causing declines in fish stocks. When, for example, an "invasion" of Norwegian coasts by huge numbers of harp seals in 1987 coincided with one of the worst commercial fishing seasons on record, the international fishing press, as well as some Norwegian fishermen and politicians, immediately claimed that, as a direct result of the 1983 EEC ban on the import of harp seal skins, the region's harp seals had undergone such a massive population explosion that there were no longer enough fish to feed them all. Having eaten out their own supply, the explanation continued, the seals then came inshore in search of more nourishment. The only way



Of birds and whales.

to save the fisheries—and, ultimately, the seals themselves—was, it was argued, to implement a seal-culling programme.

But the idea of exploding numbers of seals eating all the fish in sight is not supported by the evidence. For one thing, seal "invasions" in Norway are nothing new: they occurred every summer between 1978 and 1984, for example, while similar incidents took place as long ago as 1901, 1903 and 1916. Furthermore, in the Barents Sea—whence the "invaders" almost certainly came—populations of capelin (a principal food source for the seals) are believed to have declined by 98 per cent in the last eight years. This, and the fact that the seals were all highly emaciated, strongly suggests that the reason there was an invasion was not because there were too many seals, but because the seals' food supply had been so heavily over-fished—at a time when the Barents Sea ecosystem may have been undergoing some form of natural change anyway—that they had to look elsewhere for sustenance.

Elsewhere in the North-East Atlantic, as in many other places in the world, it is a similar story, with declines in local populations of seals and cetaceans coinciding with the demise, through overexploitation, of the same areas' fishing industries. One of the more famous examples in Europe is in the southern North Sea, where bottlenose dolphins and harbour porpoises fell into decline at the same time as the region's herring stocks collapsed during the 1960s and 1970s.

Proving conclusively that marine mammal declines are directly related to over-fishing is, however, difficult, partly because of the complexity of marine ecosystems, and partly because of the abundance of other suspects—such as pollution by PCBs, TBT or mercury, or entanglement in fishing nets, which accounts for innumerable marine mammal deaths around the world. In the North Sea, for example, as many as 3,000 harbour porpoises are believed to die each year as a result of the Danish "wreck-fishery", while the fact that a similar number of harp seals are taken in cod nets off Norway only serves to compound the problems which we have already seen that the species faces in that area.

In one sense, then, Norwegian fishermen and politicians are right to say that the control of marine predators is the only way to safeguard the ecological balance in Europe's seas. What they have so far been unable, or unwilling, to face up to, however, is the fact that the marine predators whose activities need to be curbed are not seals or cetaceans—or, for that matter, predatory fish or seabirds—but humans.

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Parks under the waves

Gerard Peet

about the marine ecosystem, about the relations between human activities and the marine ecosystem, and consequently also about the relations between the various types of human activity at sea.

Management policies were very often aimed at just one activity at sea, and neglected the relations with the sea's ecosystem and other maritime activities.

This has worked reasonably well for some time, but over the past decades problems and conflicts are increasing.

The seas and oceans are becoming increasingly polluted, especially coastal waters. Pollution affects other activities. Fish and shellfish caught at sea are not always fit for consumption as these may contain too high levels of substances which could be dangerous for human health. Swimming is not without health risks in many coastal waters all over the world, again as a result of pollution. But there are also conflicts between various activities wishing to use the same space at sea. Especially in the North Sea several activities may, in certain areas, be competing for the same bit of space. Oil and gas exploration platforms have been put near or even in important shipping routes, at times even creating the need to change internationally established shipping routes. Fishermen lose access to those areas where oil and gas exploration takes place.

Whilst these problems and conflicts have developed over the years, new developments may add to them. Plans have been developed for artificial islands off the coast in several regions of the world; large areas of the sea may once be used for the production of energy (wind, waves).

Sectoral management, aimed at just one activity at sea, can no longer provide the framework for a proper management of sea areas. A more integrated and comprehensive system of sea use planning or ocean management has to be developed. The first steps towards this have already been set in some countries. As the North Sea is the world's most intensively (ab)used sea,

it will be no surprise that important progress has been made here, especially in the Netherlands. Yet, this has not been enough to prevent the seven weeks of disaster in the North Sea area from May to July 1988.

Marine life

Where does all this leave marine life?

Marine life of course suffers directly from the abuse of seas and oceans. The developments in the fisheries industry have led to massive overfishing over the past decades and have affected several fish-stocks. Cetaceans too have suffered from overexploitation. Pollution has affected marine life; birds and seals have been dying, in some areas of the North Sea alarming high levels of diseased fish are being caught.

The protection of marine life, the sea's nature, is also dependent on the development of a proper, integrated and comprehensive management system of the seas and oceans. Yet, there could be something extra one might do to protect marine nature.

In several areas of the world marine protected areas have already been established, areas where marine wildlife is protected. Many of such areas include coral reefs, but there are also several areas in more temperate zones. In Europe attention for marine protected areas has, until now, been limited. Marine parks which have been established can almost all be found in coastal waters and do not include large parts of the sea itself.

It would be very useful to consider whether there would be a need to establish marine protected areas in open waters of the European seas as well. A study conducted for the Dutch Government has indicated that this would indeed be useful and possible. Certain areas which would be representative for the various marine ecosystems should be set aside and allowed an undisturbed natural development.

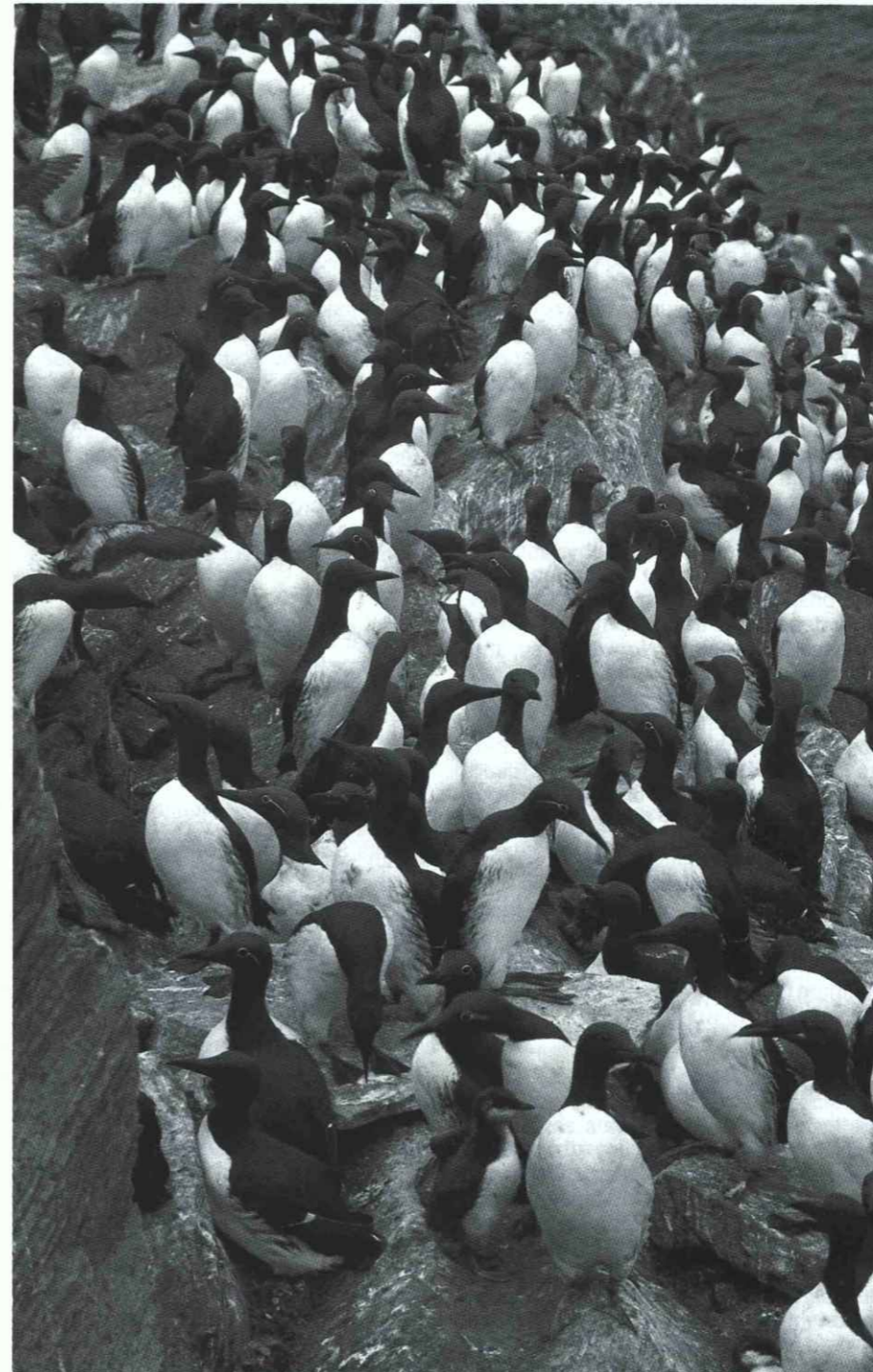
It would help in improving the protection of marine life and also in improving the understanding of the marine ecosystem. And some of these areas might even be suitable for educational purposes; to help people see and understand that there is a rich natural system beneath this seemingly empty grey or blue surface of the sea. ■

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A challenge for science

Wim Vader

Guillemot: its population dropped in some areas by over 80 % between 1985 and 1987.



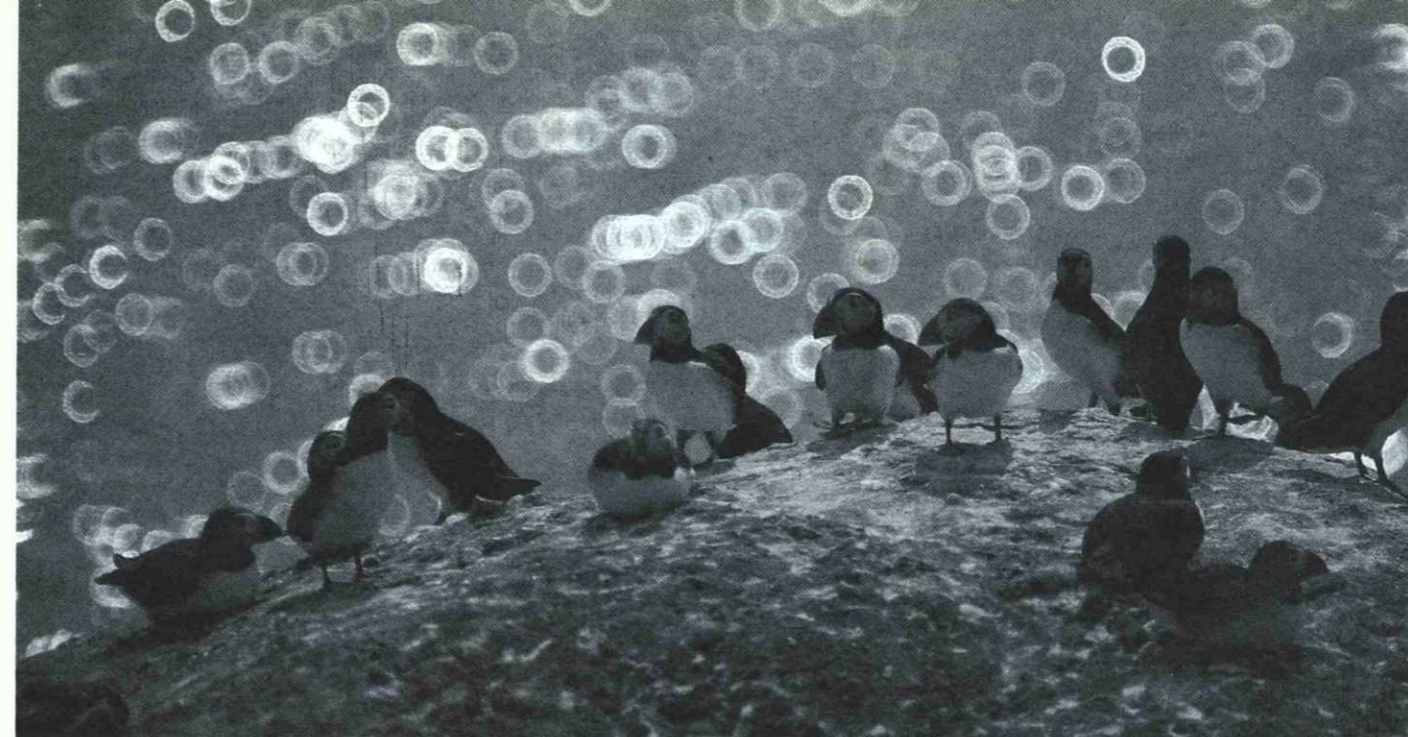
Rob Barrett

The capelin or lodde (*Mallotus villosus*) is a small silvery schooling fish in the smelt family, that occurs in enormous numbers in subarctic waters of the northern Atlantic. It is a very "fatty" fish and has never been very popular for human consumption, apart from the recent sudden craze for adult female capelin in Japan. Large-scale capelin fisheries are therefore a comparatively recent development. In the Barents Sea north of Norway capelin was not harvested in earnest before the crash in the atlanto-scandian herring (*Clupea harengus*) stock in the late 1960s. Since then, however, millions of tonnes have been caught yearly, mainly by Norwegian trawlers and purse-seiners and processed into oil, until the Barents Sea population suddenly crashed in 1985-86.

During the last few years, the coastal cod (*Gadus morhua*) fisheries in northern Norway have failed, and the cod taken by trawlers off-shore is often in extremely poor body condition. Numbers of fish-eating seabird species, particularly the common guillemot (*Uria aalge*), have decreased dramatically in the area, and the southern coasts of the Barents Sea have on several occasions been invaded by tens of thousands of hungry harp seals. This has further aggravated the situation for the coastal population, for whom fisheries are the prime source of income. Northernmost Norway is therefore in the throes of a severe economic crisis.

In the Norwegian media the situation is of course much discussed, usually under headings as "Ecological catastrophe in the Barents Sea" or "The Barents Sea ecosystem is off balance"! Strictly speaking, such headings are misleading. Some years ago, the Norwegian Government instigated a large arctic research programme in oceanography and marine biology called "Pro Mare". In this programme, scientists from different government institutes and universities cooperate in an integrated study of the energy flow in arctic marine ecosystems, especially highlighting the role of seasonally ice-covered waters. Thanks to Pro Mare, we are reasonably certain that there has not been a dramatic decrease in primary production in the Barents Sea since fieldwork began in 1984, nor are there particularly large perturbations in the zooplankton biomass. The capelin crash of 1985-86 must therefore have a different explanation.

Norwegian fisheries biologists have tried to reconstruct the history and fate of the major fish stocks in the Barents Sea, an area for which unusually complete documentation is available. The Barents Sea is an area of high productivity, but quite low biological diversity. In other words, there is a lot of fish but these belong to relatively few species. This makes the areas especially attractive



Puffin

tions with variations in the extent and duration of ice-cover in the northern and eastern Barents Sea.

The Barents Sea story as told here is in some ways at variance with much of the media debate in Norway and abroad, in that human management or mismanagement of marine resources plays a far less dominant role. I have neither stated unequivocally that the crash of the capelin stock was caused by crass overfishing, nor that the seal invasions are a result of the recent decrease in seal catches which themselves is the result of pressure from animal protection lobbies. Both accusations have surfaced time and again in the media debate.

To be sure, the Barents Sea capelin stock was clearly overfished in the years 1984-86. As usual the fishable quota of capelin proposed by the fisheries scientists were gradually increased on their way through the fisheries management and political decision processes, because of intense lobbying of people whose livelihood depends on the fisheries. In addition, the models used by the fisheries scientists did not allow for the greatly increased predation on capelin by the very strong year-classes of cod from 1983 onwards. This does not necessarily mean, however, that a more prudent fisheries management would have been able to prevent the capelin crash altogether. Historical records make it clear, that similar crashes have occurred earlier, e.g. in the first decade of this century, long before capelin fisheries became a factor of importance.

In the same way, devastating invasions of harp seals have hit the coasts of northern Norway before. There is simply no proof to assert that the recent invasions have been primarily caused by the decreased seal harvest of the last decade.

In conclusion, the present situation in the Barents Sea is probably not a sign of an acute ecological crisis in the marine ecosystem caused by human mismanagement of the marine resources. It should rather be viewed as a periodic extreme phase in the game of "checks and balances" that constitutes this particular ecosystem. On the other hand, the situation clearly constitutes a severe economic crisis for northern Norway, a crisis of much greater magnitude than e.g. the recent *algae*-problems in the Skagerrak. Fisheries research and management resources need therefore to be applied on a high-priority basis, with the primary aim of restoring the stock of the key species and herring in the Barents Sea ecosystem. ■

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In the early 1980s, a series of warm years resulted in a reduced spawning of capelin, but some exceptionally strong year-classes of cod especially from 1983 onwards. In the absence of herring, these young cods exerted a very heavy predation pressure on the already diminishing capelin stock and this, together with continued heavy fishing pressure, has led to the capelin population crash of 1985-86. Up to 1988, the capelin population has shown few signs of repair.

This development has had a number of consequences of great and negative impact on the coastal fisheries of northern Norway. The cod that used to follow the spawning migration of the capelin to the coasts of northern Norway and thereby became available to the coastal fishermen, now stays offshore and can only be taken by the larger deep-water trawlers, many of which are based in western Norway. Also, the large cod population is clearly starving: most fish caught are underweight and of inferior quality, and cannibalism is common. Fish-eating birds also suffer. Some, like the gulls, kittiwakes and fulmars, used to get an important part of their food from spills and discards of fishing boats and fishing industry. Others, like guillemots, shags and terns, are specialised catchers of small schooling fish. In the southern Barents Sea these are mainly herring, capelin and sand eel (*Ammodytes*), all stocks that have been at an absolute minimum these last years. These specialist bird species are worst hit.

"Checks and balances"

The invasions of arctic seals are as yet imperfectly understood. They are very few studies on behaviour and diet of harp seals in normal years, and Norwegian and Soviet scientists disagree about populations numbers and trends of the Barents Sea harp seal populations. As nearly all invading harp seals are clearly underweight, it is reasonable to assume that the invasions are primarily migrations in search of food, although there are also apparent correla-

for fisheries. As changes in the stock of one key species can easily affect the fate of its predators or competitors, low diversity tends, however, to lower the stability of an ecosystem. The Barents Sea is a good example of this relation, as present events show.

The Barents Sea is anyway an area of large annual variations, since the all-important influx of warm Atlantic water varies enormously from year to year. This results in "warm" and "cold" periods, affecting climate, extent and duration of seasonal ice-cover and, most importantly, spawning and feeding conditions for the key fish species in the area.

The present crisis may have its roots in an apparently quite unrelated happening, i.e. the crash of the vast atlanto-scandian population of herring in the late 1960s. This herring stock had its spawning grounds on the Norwegian west coast, whence the larvae drifted with the current into the Barents Sea, where they constituted a major competitor of the capelin and an important prey to cod, seabirds, seals and whales. Although no good quantitative data exist, it is thought that the stock of capelin in the Barents Sea at first increased considerably as a result of the demise of the competing herring. Additionally, a series of cold years gave good spawning conditions for capelin, but less good conditions for its main predator, the cod. In spite of heavy fishing pressure, capelin stocks therefore remained high in the Barents Sea in the 1970s and numbers of fish-eating seabirds also tended to increase, at least in eastern Finnmark.

International legislation now!

P.G.H. Evans

Somewhere between 70 and 140 million seabirds breed in Europe. Although many species nest in discrete colonies, our knowledge of breeding numbers is still poor and estimates imprecise. Whilst the gannet nests in 34 colonies in Europe, with an estimated breeding population (in 1984-85) of 200-245,000 occupied sites, the fulmar nests in innumerable colonies or scattered pairs which together number anywhere between 2 and 12 million sites. Similar uncertainties exist for the nocturnal petrels and shearwaters, and high arctic gull and auk species.

Knowledge of population sizes varies not only between species but within a species between areas. In Britain and Ireland, for example, there have been major efforts to count seabirds ever since the national seabird census of Operation Seafarer in 1969-70. No colony is remote or inaccessible compared with some arctic regions, whilst there are teams of enthusiastic ornithologists anxious to mount expeditions to the less accessible islands. Contrast this

with the situation in Iceland or Spitsbergen where only a handful of seabird ornithologists exist, the terrain is on an awesome scale, as are the sizes of many of the colonies. Small wonder that a recent estimate of the Icelandic population of the razorbill ranged from 100,000 to one million pairs. In a total population of up to 1.2 million pairs, this represents a significant margin of error.

Although total population estimates for European seabirds enable one to put local populations into context, status changes are best determined by monitoring at sample sites preferably throughout the geographical range. Despite poor coverage in some countries and for certain species, we now have a good idea of recent status changes for the majority of seabirds. During the 1960s, attention focused upon auks, after earlier widespread declines of razorbill, guillemot and puffin. However, in the 1960s and 1970s most populations of these species remained stable or increased. Puffins continue to increase through the 1980s in northern Britain and northern Norway, but razorbills have declined in parts of west Ireland, and guillemots in the Faroes and

north-west Norway. Since 1985, guillemots have declined elsewhere in the Barents Sea (eastern Finnmark and Bear Island), and may also be declining at some colonies in northern Britain.

During this century, both fulmar and kittiwake have steadily increased, with the latter spreading southwards and colonising Spain by 1975. However, kittiwake numbers have since stabilised or started declining in several areas. Other gull species such as common, herring, great and lesser black-backed gulls also increased during this century, expanding their range, often inland. Many now nest in numbers in Holland, Belgium and France where previously they were rare or absent. The yellow-legged gull, a close relative of the herring gull, has undergone a dramatic spread in the Mediterranean northwards through Spain and France. By contrast, the Audouin's gull is restricted to the Mediterranean where around 4,000 pairs breed. Although one of the rarest of Europe's seabirds, it has increased since the 1960s, following protection particularly at its main colony on the Spanish islands of Chafarinas. Ironically its greatest threat comes from the recent increase in yellow-legged gulls which compete for nest sites and predate eggs/young.

Status changes of the nocturnal petrels are scarcely known, mainly because their nocturnal habits make censusing difficult.

Some breed in Europe in only a few colonies in the western Mediterranean and west of Africa, where they face threats of human exploitation and disturbance.

Terns are particularly vulnerable to human disturbance. This has resulted in widespread declines for various species: the Caspian tern which no longer breeds in France, West Germany or Denmark; the gull-billed tern which has declined almost to extinction in Denmark; roseate tern in Britain and France; common and little terns in West Germany, Holland, France, and until recently, Britain. Where breeding sites have been protected, tern populations have generally increased. The roseate tern, probably the European seabird in most serious decline, has suffered heavy mortality from humans in its West African winter quarters, reducing its mainland European population to about 600 pairs (another 600 pairs nest in the Azores).

Many status changes can clearly be laid at our own door. Human persecution and exploitation undoubtedly had a strong influence during the last century. Widespread increases in the gannet, shag, cormorant, and several gull and skua species have resulted, at least partly, from relaxation of those pressures since then. Where exploitation continues, declines continue to be observed. A notable example is the Brunnich's guillemot, which has declined markedly over the last 25 years in west Greenland, after excessive hunting.

Fishing, pesticides, PCBs

Changes in food supply also have important effects on seabird numbers. Some changes are probably natural, related to general climatic oscillations in the North Atlantic. Others are man-induced. The provision of fish offal and other forms of refuse probably contributed to increases in fulmar, gulls and skuas. On the other hand, over-fishing of prey species such as herring, mackerel, and sandeel may be responsible for recent declines in some auk and kittiwake populations, and repeated breeding failure (puffins in Lofoten, west Norway; kittiwakes and arctic terns in Shetland, north Scotland).

Since oil-burning engines were introduced for shipping early this century, there have been numerous oiling incidents, and tens of thousands of oiled seabirds, particularly auks, have been washed ashore along North Sea and Channel coasts. Past declines in razorbill and guillemot populations in those regions are attributed at least partly to oil, not so much from large oil spills as from the routine washing out of tanks by ships at sea. The effects of insecticides, polychlorinated biphenyls, and heavy metals are less easy to observe and although high levels have been found in various

seabird species, particularly in polluted regions, the extent to which they cause mortality or reproductive failure is generally unknown.

Monofilament nylon fishing nets came into widespread use during the 1950s. Their inconspicuous and durable nature render them a particular hazard to diving marine birds and mammals. Auks are particularly vulnerable and it is a major cause of mortality for shag and cormorant. During the 1960s and 1970s, up to 300,000 Brunnich's guillemots were estimated to drown annually in salmon driftnets off south-west Greenland. More recently, thousands of razorbills have drowned in illegal salmon nets off western Ireland, and hundreds in gill-nets off the Portuguese coast. Between 1982 and 1987, an estimated 20,000 seabirds (over 90% common guillemots) were drowned in cod and herring gill-nets in the southeastern Kattegat, and many guillemots drown in nets off the Norwegian coast.

We can identify many of the potential threats to European seabirds and observe some of the damage they can cause. It is much harder to evaluate their relative importance in population changes of a species. This requires more extensive monitoring schemes operating internationally, and studies of mortality and reproductive success (conducted presently only at a few sites). We also badly need a better knowledge of the ecology of seabird prey, which fisheries presently cannot provide.

As we approach the 1990s, it is clearer than ever that most threats facing seabirds in Europe have an international basis. Over-

fishing of important prey species, entanglement in fishing nets, and marine pollution all involve a number of nations. Their effects are not confined to territorial waters but extend far beyond. The North Sea is occupied by fishing fleets from many European countries. Until we have sorted out enforceable international laws regulating the damage we cause collectively to our marine life, the 44 species of seabirds that grace our coasts will increasingly suffer. ■

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Oil pollution is but one of the threats to seabirds.



L.M.O.

An underwater heritage to be cherished and respected



K. Ansel/EXPLORER



Yves Gladu/EXPLORER



At the Council of Europe

An essential step on the way to protecting the marine environment is the protection of coasts, which act as an interface between land and sea. In 1974 the Council of Europe accordingly brought out two studies on the protection of coastal areas in Europe (Professor Steers) and legislative measures taken or to be taken by the member states of the Council of Europe for the protection of the coastline (Professors Amselek, Cohen and Prieu). There were echoes of these studies at the 4th European Ministerial Conference on the Environment, held in Athens in 1984, which adopted several important resolutions for the attention of the states and also a policy guide which has lost none of its topical significance.

As long ago as 1970 the Committee on the Environment, Regional Planning and Local Authorities of the Parliamentary Assembly invited Commander Cousteau to address its members, who listened to his spine-chilling plea for the protection of marine life from pollution.

It was this event which prompted the preparation of a report on coastal protection in Europe, and in 1978 a second report was presented on the pollution of coastal zones by hydrocarbons.

One year later the Standing Conference of Local and Regional Authorities of Europe discussed problems of marine pollution.

A number of reports and recommendations of the Committee on Agriculture of the Parliamentary Assembly have dealt with living resources. One such report was that presented in 1977 on conservation of the living resources of the sea, followed by a special resolution on conservation of the living resources of the Mediterranean and another on conservation of the living resources of the north-east part of the Atlantic and the Mediterranean.

Lastly, the Assembly is to organise a colloquy with representatives of the chemical and petrochemical industry, agriculture and shipping companies, at which consideration will be given to ways and means of rapidly reducing pollution in the North Sea.

It is becoming urgently necessary to adopt measures to improve the general conditions of the sea, but also to protect zones where living species can be left undisturbed or not exploited. The studies carried out concerning the Mediterranean, the North Sea and the Baltic identify a whole series of sites for inclusion in the European network of biogenetic reserves. The aim of the network of protected areas is to provide a setting, in fact, for the conservation of representative examples of European flora, fauna and natural areas, including the marine environment. The designation of biogenetic reserves is based on rigorous scientific studies specifically concerned with a certain type of biotope or species, making a selection of sites whose protection is felt to be a matter of priority at Europe-wide level.

Several sea and coastal ecosystems have so far been included in the network. The European Diploma, the quality label awarded to outstanding protected areas in Europe, has been awarded to the Scandola Nature Reserve (France) and the Monte Cristo Reserve (Italy), both of which boast magnificent protected marine areas.

The Steering Committee of the Bern Convention also continues a number of campaigns for the protection of the Mediterranean monk seal and that of marine turtles and their habitat. Four recommendations on these questions, Nos. 6 (1986) and 7, 8 and 9 (1987), have been submitted to the governments of Parties having ratified the Convention.

The Environment Conservation and Management Division has for several years been concerned with the problem of protecting marine areas. Numerous publications have been devoted to the study of such biotopes and making the public, planners and those responsible for the environment aware of the need to protect sea and coastal biotopes.

In the last few years the use made of the oceans and their resources in the name of development has gathered considerable pace, and it now offers significant economic prospects for the future. The scope for taking an active part on the "race for the oceans" which will be a feature of the next decade will depend on the scientific and technological potential at the states' disposal, their geographical situation and the investments they have succeeded in making. This was the thrust of the views expressed by the European Ministers of Research when they met in Lisbon on 21 May 1988.

With this in mind the Council of Europe has promoted the creation of a European scientific and technological co-operation network for oceanography: the European Association of Marine Sciences and Techniques, which brings together research workers in order to boost co-operation between European oceanography institutes, exchanges of experience and communication. It develops the multidisciplinary aspects of research and training in the fields of marine sciences and technology. More than ten summer schools have already been organised, with the support of the Council of Europe.

A research group on underwater archaeology has also been set up as part of the PACT European network (physical, chemical, mathematical and biological techniques in archaeology). European courses have been organised concerned with prospecting excavations and preservation of the underwater cultural heritage in seas, lakes and rivers.

Following the establishment of the Open Partial Agreement of the Council of Europe concerned with major disasters, a Euro-Mediterranean Centre on marine contamination hazards has been opened in Malta. It is active in the fields of information, training and research. A European warning system in the event of major catastrophes at sea has also been set up.

An important European symposium on the role of aerospace technology in oceanography was held in Malta in December 1988, under the auspices of the Council of Europe, the European Space Agency (ESA) and the Commission of the European Communities.

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