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(*Chelonia midas*)
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A time for decision

The Government of the Netherlands and the European Union for Coastal Conservation have taken the initiative to organise an international conference on the coastal zones of Europe. It will be held at the highest level from the technical and political viewpoints, in November in Scheveningen, on the North Sea coast.

This initiative marks the interest shown for the European coastline which almost everywhere has suffered man-made damage. Yet, this coastline, alive and living in all its forms and in all seasons, is magnificent. Coasts where water and land meet have always inspired poets, painters, philosophers. Walkers, bathers and tourists in their millions are drawn to them, although work called as an euphemism "coastal management" often

deforms and sometimes even destroys these coasts.

Coastal zones have already formed the basis of studies and laws, protective measures, creation of organisms specialising in conservation and management. The Centre Naturoopa, too, devoted an information campaign to coastal zones, shores and riverbanks, and has organised a series of colloquies on the Mediterranean coastline.

The experience, conclusions and decisions of the Netherlands conference will no doubt have an impact extending beyond the European coastline.

The Centre Naturoopa thus wishes to contribute to the desired and essential success of the Netherlands conference by this "coastal" issue. A special Dutch edition has even been made possible by the Dutch authority concerned, the Ministry for Agriculture, Nature Management and Fisheries. Naturoopa 68, the next issue, will render homage to the work for the environment of the Parliamentary Assembly of the Council of Europe.

H.H.H.



S. Tougaard/Biofoto

Editorial

Over the past few years Europe has been startled by several environmental catastrophes. Accidents with chemical plants and nuclear power stations, leaking oil tankers, derailments of trains, heavy lorries with chemicals getting off the road; disasters such as these with their damage to the human environment have frequently hit the headlines.

Europe, however, has also witnessed another drama, less spectacular perhaps, but of similar impact and scope: that of the insidious damage done to Europe's natural heritage.

Over a period of barely 30 years the growth of the population and the developments in our economy have pushed nature in Europe to the background. Some figures will make this clear:

- of the approximately 6,000 species of plants in western Europe, 1,000 are threatened with extinction one way or another;

- of the approximately 150 species of mammals in western Europe, 30 (bats not included) are threatened with extinction;

- more than half of the 130 reptile and amphibian species found in the European Community are being threatened in one or more countries.

What many had not believed possible, seems to happen all the same: the enormous variety in nature we had is disappearing and making way for uniformity.

The Alps, for instance, unspoiled and inaccessible for so long, are now losing their natural grandeur. The World Conservation Union has even marked the area as the most threatened mountain area in the world.

There are more European ecosystems, however, of wide renown, where ecological damage on a large scale is taking place. The European coastal zone is an outstanding example. This "golden fringe" of Europe has a great variety of ecological coherent habitats. They range from sand dunes and beaches, salt marshes, tidal mud flats and river deltas to estuaries and cliff coasts. More than 50% of all the wild plant species in western Europe can be found in the coastal zones. Without exception the coastal zones in the several European countries are of major international significance. Without exception too, these coastal zones are under great pressure. Since long they have been the setting of intensive human activities, such as seafront urbanisation, harbours and marinas, tourism and recreation, agriculture and coastal defence works and fishing. Along large parts of the coastline the

combined effect of all these activities has been devastating. An example: more than one-third of all sand dunes and higher beaches have been destroyed over the past 25 years. This development has had serious consequences for flora and fauna, eg migrating birds, sea turtles, coastal bird colonies, seals and many insect species. But also the scenic and touristic attraction of many coastal areas is in rapid decline. Tourists now begin to turn their backs on the stretches of concrete holiday complexes.

From the beginning of the 1970s the problems facing the coastal zone have had international

through a combination of natural processes and increasing man-induced effects. The general feeling was that measures need to be taken urgently to conserve the remaining stretches of yet undeveloped natural coastline and to restore affected coastlines. The rising sea level underlines the necessity to work with nature instead of working against it.

The Dutch Government considers the conservation of the European coastal zone a shared responsibility of all littoral countries of Europe. In fact, the European coastal zone might be regarded as a vital axis of a European ecological network, which is aimed at in the proposed European Communities Habitat Directive. It is in the interest of both ecology and economy that further development and uses which take place in the coastal zones are sustainable.

That is why the Dutch Ministry of Agriculture, Nature Management and Fisheries and the European Union for Coastal Conservation are organising a European Coastal Conservation Conference in the Netherlands on 19-21 November 1991.

The aim of this conference is to discuss on a senior policy level the possibilities for an integrated Community strategy for the conservation and a wise use in the European coastal zone. In such a strategic plan the relevant initiatives could be combined and, where necessary, completed to establish an effective and comprehensive regime for the conservation and wise use of the European coast.

I sincerely hope that during the conference agreement will be reached on further European action at short notice. There is not much time left for debate. It is time to act now. ■

J. Dszjngisz Gabor
State Secretary for Agriculture,
Nature Management and Fisheries
The Netherlands



attention. The Council of Europe, for instance, adopted a resolution on the protection of coastal areas in 1973. Other measures followed, such as the European Coastal Charter, adopted by the Conference of Peripheral Marine Regions in 1981 and the start of the EC Mediterranean Strategy and Action Plan in 1984. The Council of Europe's Centre Naturoopa devoted four colloquies to the Mediterranean coastal areas, the last one in May this year in Corsica on marine parks.

But in spite of all these positive actions of international organisations and European countries, we cannot but conclude that the process of deterioration is still going on. In the United Kingdom European Workshop on Coastal Management, which was held in April of this year, experts from all littoral member countries of the European Community agreed that the European coastline has been subject to unprecedented changes

Act to protect

- Ensuring that developments in the coastal zone are sustainable and respect the precautionary principle.
- Ensuring that the natural resources of the coastal zone are wisely used. Attention to traditional uses by local communities.
- Effective control of pollution and developments in threatened coastal ecosystems, sand dunes, salt marshes, lagoons, estuaries, cliffs and intertidal areas.
- Conservation of remaining stretches of undeveloped natural coastline.
- Improvement of the ecological quality of both terrestrial and marine coastal environments. Maintenance of specific geomorphological and landscape ecological patterns and processes.
- Development of a European coastal ecological network, consisting of core areas, nature rehabilitation areas and ecological corridors.
- Priority implementation in the coastal zone of the European Communities directive on the protection of habitats, flora and fauna.
- Priority actions for the protection of monk seal, sea turtles, marine bird colonies and migratory birds.
- Conservation of unbuilt coastal areas as important buffer areas for future sea level rise. Recognition of the importance of coastal dunes as natural sand stocks for coastal protection.
- Public awareness campaigns through appropriate international organisations.
- International exchange of experience and knowhow between governmental and non-governmental organisations. ■

A. R. Wolters
A. Salman

European coasts: a great diversity

Patrick Doody

Man's colonisation of Europe in the early post-glacial period favoured settlement at the margin between the sea and the land because of its accessibility and abundant food resources. At that time sea levels were rapidly rising and as the bridge between Great Britain and Europe was flooded, the land occupied by man had to be abandoned. However, as sea level began to stabilise at about its present level some 7,000 years BP, the gradual process of land claim began.

Although there appears to have been a slow overall rise in sea level since that time, this has oscillated between periods of landward and seaward transgressions. During periods when sea level was falling relative to the land or when there were large volumes of sediment available on the coast, man took advantage of the natural tendency of the land to accrete, particularly in the low-lying alluvial valleys (estuaries and deltas). Embankments have been built from Roman times or even earlier to keep the sea at bay and extend the period when saltmarshes and other coastal areas could be used for grazing, the production of salt and hay-making. In these situations occasional flooding probably did little harm as the embankments were not major structures and easily replaced if damaged.

However, as the techniques of enclosure improved, more land was "won" from the sea and the structures used to protect this increasingly valuable asset became more substantial. The effect has been to "create" vast areas of new land at the expense of the natural habitats, both through major projects such as have been carried out in the Netherlands, where 18% of the country has been claimed from the sea, and by smaller scale piecemeal and progressive enclosure, associated with many estuary and delta systems of Europe. In addition to land claim for agricultural use, the building of ports and related development have also destroyed large areas of natural habitat, adding to the cumulative losses in low-lying coastal areas.

Man's battle with the sea

Having settled in these rich coastal areas and created valuable agricultural and other land from them, the desire to protect both land and property is natural. Shingle beaches, bars and barrier islands, sand dunes, sand spits and saltmarshes are good natural defences against both storms and sea-level change. However, the picture of sand dunes overwhelming settlements has led to the notion that these and other sedimentary structures are fragile places requiring stabilisation. Though this instability may have occurred through man's misuse by overgrazing and burning amongst other activities, many of the dune systems throughout Europe have been afforested or stabilised in some other way, to the detriment of wildlife. In Denmark for example, laws of protection date from 1539 and more than 35% of the dunes are now afforested with non-native trees. The same is true of Poland and France, and in Turkey the process continues today with the use of eucalyptus and acacia.

On many warmer, protected coastlines in north-west Europe, sometimes major housing developments have occurred, as on the south coast of the United Kingdom. Here, the population has not always chosen the most sensible locations to build permanent

structures, and in many instances the house "with a sea view" is perched on a cliff which may be subject to erosion. Having established a presence, protection of the buildings from falling into the sea is a major requirement. As a result these areas together with long-established towns and villages may be protected by sometimes massive concrete sea walls, revetments and groynes.

Throughout history man's battle with the sea may not be all that it seems. By imposing an artificial line of defence in an otherwise dynamic and flexible environment he has reduced the natural ability of the coast to absorb the energy of the sea. In addition, by interfering with the natural sedimentary processes and restricting the availability of sediment, he may have helped create further instability. Today a great deal of money is spent on maintaining what is in many areas, an artificial and unsustainable line of protection against flooding and erosion.

The nature conservation resource

It is against this background of exploitation and control that the present status of the wildlife resource on the coastline of Europe must be assessed. In the north where the land is still rising relative to sea level and the coast-

Judicious construction site?



P. Doody

line is formed from ancient rocks resistant to erosion, some of the most spectacular and remote cliffed landscapes occur. Because of the close proximity to the rich waters of the North Atlantic and the North Sea there are often large colonies of cliff nesting seabirds such as puffins, guillemots and other auks, as well as gannets and kittiwakes.

These same areas may support rich plant communities which include northern species such as *Primula scotica* and *Dryas octopetala*, in a matrix of heathland types which are more widely distributed inland. In the more exposed locations where salt spray is blown onto the cliff they may grow alongside species more typical of saltmarshes. Further south climatic amelioration allows southern warm-loving plants to extend further north than their normal tolerances allow and a rich flora develops. In limestone areas the cliffs may provide important refuges for species, such as *Orchis sphegodes* typically found in inland grasslands, which have increasingly been destroyed by agricultural intensification. In some areas cliffs provide the most spectacular natural rock gardens such as Cape St. Vincent in Portugal, where the endemic *Cistus palinhiae* is one of the many species present.

The rich tidal waters and flats, even in estuaries where there has been major land claim, may harbour both abundant and rare species of invertebrates and fish. The associated saltmarshes are composed of sequences of communities tolerant of different degrees of submergence by the tide, which may develop into transitions to other, terrestrial vegetation. These habitats are important in their own right for the specialist plants and animals which survive there. In combination they can support large waterfowl populations by virtue of their high productivity. The estuaries in north-west Europe provide winter food for internationally important concentrations of wildfowl and waders which

breed further north in the Arctic and elsewhere. Especially important are the estuaries of Britain and the Wadden Sea. Further south the estuaries, deltas and coastal lagoons are also important as migration and wintering areas, as well as of great significance for their populations of rare birds.

Associated with these flat sedimentary landscapes are sand and shingle beaches, sand dunes and shingle structures which may exist as part of an integrated coastal system, or as separate, sometimes large structures. These include the major sand dunes of the coastline of Denmark, Holland, Poland, the Atlantic coast of France, Portugal, south-west Spain and Turkey or the unique shingle foreland of Dungeness in south-east England. Each habitat has its own group of coastal plants which are specially adapted to bring stability to the usually hostile environment. On sand dunes *Ammophilla arenaria* and *Leymus arenarius* are important dune building plants, whilst *Crambe maritima* is a species specially adapted for survival on a mobile shingle beach. In addition they may provide important refuges for communities of both plants and animals which are restricted inland as a result of the intensification of land-use practices.

Tourism, a new perspective on the coast?

Europe's population has become more affluent in recent years and our view of the coast has changed from one of fear and a wish to control the action of the sea, to a desire to experience its great natural beauty. In particular, holidays by the sea have become an important part of our recreational activity. In recent years this has manifested itself in the upsurge of package holidays, which when taken together with the desire for more permanent summer residences, has caused dev-

astation of some of the finest coastal areas in both northern and southern Europe.

The summer migration of the north population to the warm south, in particular, has had the most significant impact on natural areas in the Mediterranean. This first affected the coastline of Spain where a high proportion of the population already lived. Urbanisation during the 1960s and 1970s to accommodate the tourist trade was largely uncontrolled and the 40 million tourists, 94% of which holiday on the coast, now visit areas with little or no natural landscape. The fact that this pattern of development has been repeated throughout the Mediterranean, and is still going on even in Spain, is a depressing indictment of our attitude to the environment.

The future

The process of land claim around the estuaries and deltas of Europe continues today, both for agricultural use and for industrial and port development. A recent review of the situation in Great Britain showed that in addition to the cumulative loss of some 25% of the natural intertidal areas on 155 estuaries over the last 100 years or so, in 1989 there were 123 cases of land claim affecting 45 of these sites. This continued loss of the intertidal zone further reduces the natural, wide and flexible barrier which, as well as providing important wildlife habitat, can help withstand storms and adjust to changes in sea level.

In Spain tourist development on naturally mobile structures such as sand dunes, spits and bars has not only caused their destruction but also, through the interruption of the natural sedimentary processes, lead to the undermining of buildings which in some cases are in danger of collapse. Despite this evidence mistakes continue to be made. In Turkey for example, the most recent country

to try to exploit the mass tourist market, many major sand dunes and associated sedimentary structures are being destroyed. In addition to this habitat loss, the survival of the loggerhead turtle is closely linked to the fate of a number of Turkish beaches where the species breed. In developing conservation measures, the condition of the beach and human disturbance are major considerations; however, the importance of the reservoir of sand in the dune to the maintenance of the beach has been largely overlooked.

The nature conservation issue continues to be one dominated by the destruction of natural habitat and perhaps of equal importance on the coast, interference with natural dynamic processes. Coupled with the associated effects of pollution and disturbance the picture is not at first sight encouraging. However, there are still large areas of coast relatively free from human destruction and with a more enlightened approach it should be possible to integrate their use and enjoyment by man with the needs of wildlife.

It may even be possible to begin to reverse current trends and to recognise the value of more natural areas for recreational needs. The lagoon and coastal dune belt close to the city of Valencia provides a good illustration of what can be achieved. Here between 1970 and 1974 some 30% of the sand dune barrier protecting the lagoon (itself already reduced since Roman times from some 15,000 ha to 2,350 ha today through agricultural intensification) was developed for recreational ur-



P. Doody

banisation. Further development in the 1980s would have destroyed the whole dune landscape. However, in 1979 the Valencia City Council decided to stop the development and to recreate the dune as part of the establishment of a natural park. Strong local opinion was the catalyst for this change of policy.

The future of the European coastline depends on a number of conservation requirements:

1. identification of the remaining areas of natural and semi-natural habitat;
2. protection of existing reserves from peripheral damage, such as an adverse change in hydrology, and establishment of new ones;
3. integration of uses in other areas on a sustainable basis taking into account the geomorphological characteristics of the coastal areas;
4. rehabilitation of degraded areas including the reinstatement of natural dynamic processes.

In the face of a predicted sea level rise accelerated by global warming, which will cause a further "squeezing" of the natural tidal land, building of bigger and better sea defence structures may not be the answer, particularly where these are being undermined by falling beach levels. Thus rather than continuing our battle with the sea, we should

learn from experience and work with nature rather than against it. This may include reversal of the present preoccupation with land development and coast protection, or more concern for widening the coastal zone in order to take advantage of natural processes both in the interests of wildlife conservation and coastal defence.

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P. Doody

Farne Island guillemots

The work of the Council of Europe

Ferdinando Albanese

Since 1973, the institutions of the Council of Europe have been concerned by the state of the environment in the Mediterranean basin.

The first document prepared by our Organisation was a recommendation of the Parliamentary Assembly of January 1973 dealing with conservation of Mediterranean forests. Later, the Parliamentary Assembly and the Standing Conference of Local and Regional Authorities of Europe (CLRAE) adopted a set of recommendations to governments expressing the need for an integrated policy to defend and manage the Mediterranean region.

The only text adopted at government level is a 1985 recommendation of the Committee of Ministers to member States on policies for planning maritime regions, proposing guidelines for coastal areas and setting objectives such as the balanced development of maritime regions, in-depth planning, the integrated planning of "land-sea systems", etc.

The situation in the Mediterranean has not been covered by any particular studies conducted by the various bodies of the Council of Europe, as our Organisation was unwilling to duplicate the action of other international organisations, many of which deal with the problems of the environment in the Mediterranean.

The preparation of the Blue Plan for the Mediterranean and the many threats it unveiled have, however, prompted the Council of Europe to make its own contribution to the major safeguarding work which is needed.

The Council of Europe has homed in on a particular topic, ie protecting the last remaining natural and semi-natural coasts along the Mediterranean from dangers which threaten them, in particular concretising over, as a result of urban, industrial and

tourist development with a very specific target in mind, ie local elected representatives with responsibilities and competences concerning regional development.

A public awareness campaign has been chosen to vehicle this work, including the use of the different communication means at the disposal of the Centre Naturopa as well as colloquies in sensitive localities on the Mediterranean.

Since the objective is to safeguard the coastline, all our initiatives have been directed towards studying and presenting various instruments for their protection.

The colloquy held at Messina, Italy, on 24-25 November 1988, focused mainly on land purchase as a means of protection. The experience of the French Coastland Conservancy (Conservatoire du littoral) and the British National Trust in this matter was analysed and put forward as a possible example.

The colloquy held in Limassol, Cyprus, in September 1989, took a fresh look at the relationship between tourism and the environment. It was pointed out that beyond a certain limit touristic development is liable to destroy the assets - nature, historical heritage - which attract tourists and the cost of restoring the environment might well exceed the extra income generated by further development.

This point was confirmed by the report made by the German "Studienkreis für Tourismus" institute for the colloquy held in Izmir (Turkey) on 19-20 November 1989. This report, based on market research, pointed to an important change in mentalities. The northern European tourist has become more aware of environmental conditions in the country where he plans to spend his holiday.

The Izmir colloquy also highlighted the importance of regional planning instruments as a means of protecting the coastline. In-depth development, in particular, was put forward as one means.

The colloquy held on 6-8 November 1990 at L'Escala, Spain, at the Aiguamolls de l'Empordà Park, looked at the "protected area" as an instrument for protecting the Mediterranean coast.

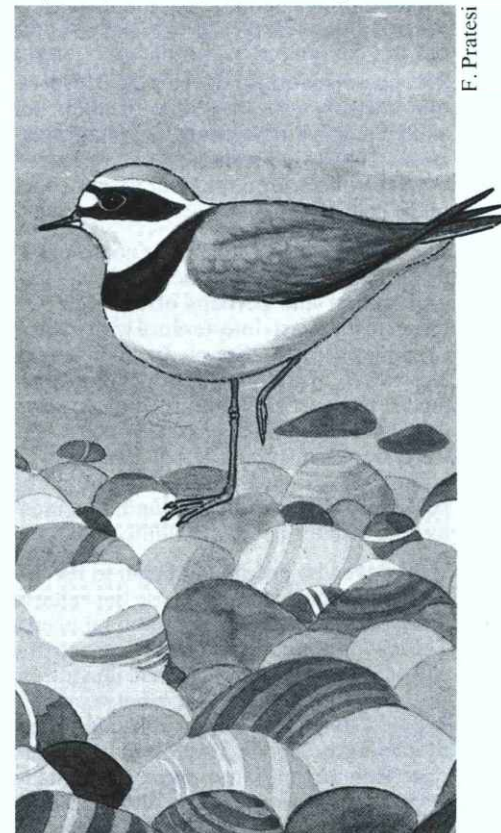
The colloquy at Bastia, France, on 30 May and 1 June 1991 examined the problems posed and possibilities offered by creating and managing marine parks in the Mediterranean with a view to protecting the coastline.

This colloquy also put forward a principle which, albeit apparently obvious on the face of it, is far from being widely accepted, namely the fundamental unity of the Mediterranean as an ecosystem and the need to include the Black Sea for the purposes of all Mediterranean protection activity. The waste discharged into the Mediterranean comes not only from Europe, Asia and Mediterranean Africa but also, to a large extent, from Central and Eastern Europe via the Black Sea.

By organising these colloquies, the Centre Naturopa intended to heighten awareness of the importance of the natural environment of the Mediterranean holds for all Europeans, whether they live or only holiday on its shores.

F. Albanese
Director of Environment and Local Authorities
Council of Europe

The Centre Naturopa used the little ringed plover as symbol for its campaign and colloquies



F. Pratesi

Prospects for a Community strategy

Laurens Jan Brinkhorst

For over 40 years now, the international community has been calling for the definition of a scheme to protect the coastal environment so that coastal areas may be developed in a lasting way and managed as part of a general approach.

In the early 1970s the United States of America armed themselves with a powerful federal law that operates along these lines.

This need has also been recognised in the latest activity programmes of the European Communities on the environment, together with those of a number of other organisations such as the Council of Europe, the United Nations Environment Programme (UNEP), the Organisation for Economic Co-Operation and Development (OECD) or the Conference on Maritime Peripheral Regions of the Community. The latter drew up a "European Coastline Charter" in 1981, leading to a European Parliament resolution in 1982 and a communication from the Commission to the Council in 1986.

The need for a global approach to the problems facing coastal areas has been widely recognised by everyone since the European Charter was published.

Most member States, however, and the European Community are still without a legal tool or established method permitting the definition and effective implementation of a strategy of this kind.

Existing national legislation is mostly a patchwork of provisions scattered among different codes or separate sections of regulations, each with a different objective and in most cases without any co-ordination: nature conservation, regional planning, town planning, transport, water, fishing, waste, aquaculture, etc.

When there are special regulations applying to coastal areas - and they are few and far between - they prove difficult to apply either because they are still too vague or because

they come up against the dispersion of the departments in authority.

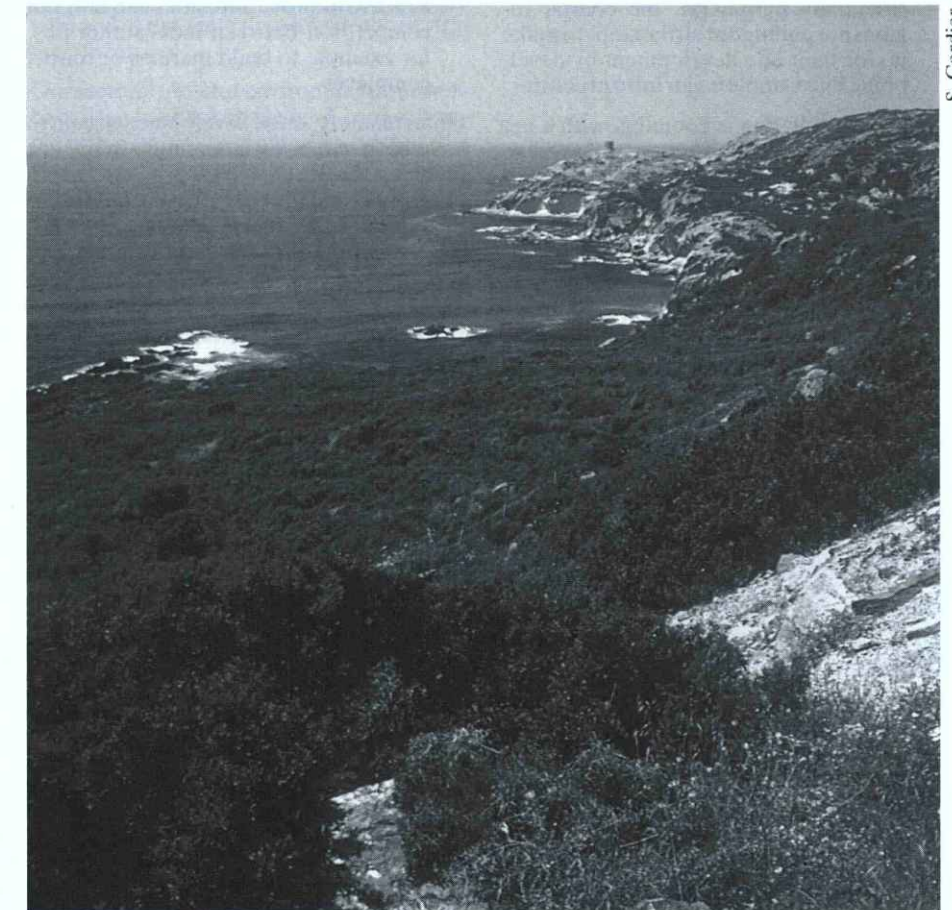
When it comes to Community legislation on the environment, similarly, while most regulatory provisions in force or being prepared have or will have positive effects - I hope - on the coastal areas of the Community, they have not yet been fully integrated into a genuine coastal strategy.

A fragile and threatened environment

Set against this political void we see the extensive range of constraints at present beleaguering our coastal environment. We are dealing with an irreplaceable heritage, both

because of the wealth and variety of its fauna, flora, landscapes and cultural or economic resources, and because of the importance of its role as an interface where sea and land meet.

While Europe's coasts include over 50% of the richest and most sensitive ecological areas in terms of rare species and threatened habitats, coastal waters and their water-plant communities, eg Posidonia beds, are also indispensable for preserving all pelagic and benthic species. On the state of this coastal environment as a whole depends the survival of all vegetable or animal species on the planet (monk seal, otter, migratory birds, etc).



S. Cordier



Saintes-Maries-de-la-Mer (France)

B. Pambour

Alarming developments

The coastal environment is no less fragile and current developments are alarming. Despite some positive actions, such as the purchase or setting aside of land by specialised bodies in Great Britain or France, pressure on our coastal areas is mounting steadily:

- essentially peripheral, the coastal regions are pulling out all the stops to make up for their late development by developing for example major infrastructures;
- their population is booming, with a net increase above the Community average to the extent that specialists speak of a population swing to the coast;
- the rising importance of sailing and water-sports has given the fashion for tourism by the sea a new lease of life and it seems that coastal areas will figure for a long time at the top of the list of holiday destinations in the European Community: in Mediterranean coastal areas as a whole, international tourism has doubled the numbers of its adepts in under 20 years and in Greece, for example, figures have increased five-fold.

Environmental crisis

These pressures are rarely compatible with the actual capacities of the coastal environment and its natural resources. The result is:

- marked shrinking of open spaces and natural sites, as a result of galloping urban development, often haphazard in nature (especially in the area stretching from the Balearic Isles to Sicily, without forgetting the Costa Brava or the Côte d'Azur – the French Riviera) with considerable changes to the landscape (the coastline is described as moth-eaten or

concreted over), changes in cultural behaviour patterns and serious problems for local management;

- numerous conflicts in the use of ground and water as a result of excessive demand, especially in the most heavily frequented areas and the islands;
- a race to improve amenities and harmful competition between local authorities, for example to build marinas or tourist complexes.

Unfortunately, these developments seem to have been gathering momentum in the last few years: the recent UNEP predicts that between 1984 and the year 2000 the land occupied along the Mediterranean shore by hotel infrastructures, and resultant drinking water demand, solid waste and discharged sewage (if the present rate continues) will increase by over 80%.

More and more marinas are planned the length of the Community coastline (especially in British estuaries) and urban development on the French and Spanish Mediterranean coasts is continuing at a speed apparently unhampered by the publication of recent laws on coastal matters in both countries. Even in Denmark, the number of second homes built along the coastline has risen to such a level as to prompt new legislation banning any construction less than 3 km from the shore-line.

The result is an increase in polluting waste of all sorts being discharged into coastal waters, together with an increase in various forms of pollution resulting in more and more frequent incidents of agricultural origin, marine dystrophy.

Overall, it must be acknowledged that our coastline faces through an acute environmental crisis, reflected in the continuous

shrinkage or disappearance of forests (fire affects 200,000 hectares of Mediterranean forest each year), moorland, dunes and wetlands (75% of dune systems in southern Europe have disappeared since 1960), together with part of the continent or marine fauna and flora.

Towards a global strategy

The extent of this crisis demands overall action designed to impose limits on local development which are compatible with safeguarding the coastal environmental heritage in the European Community. Any action should be carried out on several levels simultaneously:

- In effect, it is at local or regional level that practical decisions are taken concerning town planning, economic planning and regional planning. It is therefore at this level that the principles of integrated management of coastal areas must be put into effect.
- It is at national level, however, that the legal strategies and instruments are adopted which apply, in particular, to environmental protection and regional planning. The competent bodies or authorities overseeing their application are also established at this level.
- Lastly, the common or overall problems (probable rise in sea level, international estuaries, transfrontier habitats, hydrocarbon pollution, etc) and areas covered by the Treaty (environment, agriculture, fishing, energy, transport, regional policies) are targeted by Community policies and international conventions.

In order to implement a common environmental policy in our coastal areas and apply

Article 130 R of the Treaty, the Commission of the European Communities should shortly be putting before the Council a global strategy for the coastline.

Its aim is to achieve ecologically sustainable development of the coastline and its resources, by keeping a firm hold over the development of coastal areas, which needs to be integrated within a tight environmental framework, and at the same time building up a genuine local momentum in the integrated management of coastal areas.

This form of management should take under its wing all aspects of Community environment policy and co-ordinate all levels and agents concerned with the coast. An overall understanding of each factor and sector of local development is also included. The coastal environment needs to be treated as a homogeneous entity rather than two separate environments, and its identity must at last be recognised.

This strategy will take in all coastal areas of the Community including the whole shoreline, coastal waters and estuaries plus land reaching as far as the confines of maritime influence.

The main planks would be:

- formation of networks for data collection and exchanging experiences on the coastal environment, the keystone to which might be a coastal area observatory, set up in conjunction with the European Environment Agency;
- sensitisation and mobilisation of the public, and agents as to the wealth and fragility of the coastal environment;
- promotion of a set of dynamics that will boost integrated management and the planning of coastal areas at regional and local levels:

There should be a pilot scheme in order to work out blueprints for the integrated management of coastal areas aimed which will provide a framework for local development in such a way that the coastal heritage is safeguarded.

These blueprints will set critical limits on the environment, economic development and regional planning, by working out how much environmental burden any given coastal area can be expected to tolerate, according to environmental indicators. If prepared in conjunction with all local partners concerned and with the widest possible public participation, these blueprints would act as safeguards when guiding local decision-makers towards a level of development of their coastal area that is ecologically sustainable.

They should also include arrangements – with a definition of possible structures – for the integrated management of their area of application.

- proposal of a legal instrument defining coastal areas and making it compulsory to draw up such a blueprint for each coastal area, ie along the whole Community coastline.

This coastal strategy would be easier to implement if it were funded by LIFE (the financial instrument for the environment) which I hope will soon be adopted by the Council, given the crucial importance of such a tool for the Community's environment.

As an epilogue

A few months back, the cover of a popular French magazine bore the legend "Le Var Assassiné" (The murder of the Var). Inside a six-page article described the rapid decline of the coastal area of this department as a result of property speculation.

More recently, under the headline "End of a Dream", a major German weekly devoted over 13 pages to the subject of coast pollution in the Mediterranean warning its readers against bathing there.

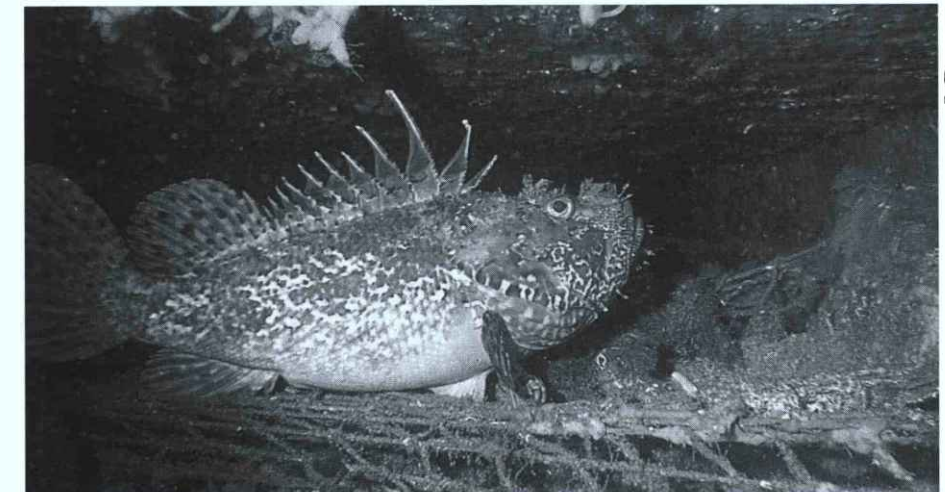
Certain elected representatives in Spain and Brittany have resorted to the bulldozer in a bid to combat coastal erosion, with the mushrooming of all kinds of constructions against which even the finest natural coastal sites are no longer proof.

These sporadic clashes – just like these inevitable alarmist clichés – reflect a real crisis in the coastal environment, a definite legal void and at the same time a real lack of strategic measures.

Our sectoral tools for environmental protection, it has to be acknowledged, cannot grapple with such a wide-ranging problem as that facing coastal areas, in a local context subject to such pressure, particularly in the matter of property speculation.

This has been repeated time and time again but there is now an urgent need for such a global strategy of this sort, deployed across the board at all relevant levels, on a basis defined

Hog-fish



S. Dumont

by the Community in order to establish a true environmental framework for management of coastal areas.

The time for hollow discussions about the principle of subsidiarity, I feel, is past, since the success of this collective action will determine whether a significant part of our common heritage will be saved or destroyed in the very short term.

We must not forget that all fish resources directly depend on the state of conservation of the coastal environment.

The total destruction or dramatic decline in numbers of many species (eg sturgeon, elver and salmon) are already ringing alarm bells so loudly that we should mobilise without further ado.

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Critical state of dunes

Albert Salman

Nature conservation

Coastal dunes are one of the most natural and dynamic landscapes in the world. They can form and reshape themselves from the foreshore up to the higher dune ridges, while geomorphology and ecology result in a variety of desert and wetland environments and habitats. And their presence is often vital for the very existence of river deltas, lagoons, estuaries and saltmarshes. Dune systems are vital for the protection of rare and threatened plants and animals, many of which can only be found in the coastal zone, eg sea turtles, seals and many bird species (eg terns). The conservation values of dune systems have been recognised throughout Europe. However, management should be reconsidered fundamentally to safeguard their very existence. The critical geomorphological system should be protected against levelling, building or large-scale dune afforestation.

Recreation

Sand beaches are very popular places for recreation, while the remaining sand dunes are increasingly important for nature-oriented recreation. In general it will be necessary to restrict access exclusively to footpaths, in order to prevent damage to vegetation and soils and to protect wildlife.

Many dune systems have been transformed into golf courses. If this happens, geomor-

phology and hydrology are changed, natural vegetations and wildlife are removed and the sprinkling, necessary to maintain the "greens", tends to exhaust the very limited fresh groundwater resources. Therefore, new golf courses should preferably be made outside dune systems.

Coastal protection

Many coastlines suffer from erosion and a variety of measures have been taken for coastal protection. Most commonly used are solid structures such as dikes and groynes. However, experience from all over the world has shown that these structures will only help for a very limited time and will mostly cause more erosion further "downstream". The recent building of dikes and groynes around the western Camargue (France) shows that this is still insufficiently understood. The wish to protect an area thus results in the destruction of its landscape and its basic ecological requirements.

It should be realised that coastal erosion on a particular spot is often caused by harbour piers, dikes and groynes in an adjacent shore. If a dune coastline has to be maintained, artificial beach nourishments with sand will generally be the most effective and least expensive solution, although they will normally have to be repeated regularly. The sand has to be taken from deeper sea areas, outside the coastal sand system.

European Union for Coastal Conservation (EUCC)

The EUCC is an association aiming at nature conservation and wise use of European and Mediterranean coastal environments. Until June 1991 the name of this Union was European Union for Dune Conservation and Coastal Management (EUDC). The EUCC consists of 22 national branches and edits a newsletter and a journal ("Coastline"). Members are individuals, government bodies and non-governmental organisations. Various joint projects are carried out together with EUCC member organisations in Ireland, the United Kingdom, the Netherlands, Portugal, Spain, Greece, Turkey and Israel. The EUCC is a founding member of the European Habitats Forum.



R. Humler

No landscape is more truly coastal than sand dunes. They are essentially a part of marine sand systems, which are constantly rearranging along our shores, causing sedimentation and erosion. It is essential that beach and foreshore are seen as parts of dune systems and that management takes into account all processes within the system as a whole.

More than one-third of the European dune systems have already been destroyed and the future of our sedimentary coasts is at risk. River dams and canalisation have severely diminished new sand supplies to the system, while sea level rise is bound to cause very critical situations in the near future. This will be detrimental to nature conservation, to recreation and tourism and to coastal protection as well.

Dune afforestation

Many dune systems have been artificially stabilised with exotic trees. Extensive pine, fir or eucalyptus forests have been planted, fundamentally changing the soil, geomorphology and hydrology of the systems. It is often thought that a lack of stability is caused by a lack of trees. In reality, instability is mostly caused by levelling, sand pits, overgrazing, too much recreation or off-the-road traffic. The best solution is to readjust management and to allow restoration by natural vegetations. If planting is inevitable, only indigenous dune species should be used, preferably scrubs.

Building and private use

Urbanisations on dune systems have immediate impacts on the natural landscape and on ecology, but they are not very wise in the long term either. The building of private estates and holiday apartments will have major

consequences in the longer term, because they set arbitrary limits to future changes in the coastal system. Higher dune systems provide natural sand stocks, which guarantee the presence of sandy beaches in a much larger coastal stretch. If major parts of the dune sands are locked up within the urbanisations, beaches may disappear by erosion and will not be restored anymore in a natural way. Only by allowing some of the dune sand to be redistributed onto the beaches can this problem be solved and can the system fulfil its coast protection role. The problem above will increase enormously as a result of the expected sea level rise. Thus, private interests will tend to make great demands on public finance, required for coastal protection. These costs may exceed the short-term commercial profits by far.

Managing coasts

There are excellent possibilities for a management of dune systems which serve vari-

ous public interests. Building and other exploitation should be effectively controlled, while our efforts to stabilise a naturally unstable system should be replaced by a new, "dynamic" approach. There is a danger that many of our dune systems will be stabilised too much. On the other hand, destabilisation should be prevented as well, so management is critical and often difficult. It is not without reason that an international experts' network on coastal dunes has been set up in 1987 within the EUCC (see box). So international expertise is now easily accessible and it should be recommended that authorities are advised by experts on geomorphology and ecology. It may be still in time...

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Around the Mediterranean

Gregorio L. Tsunis

The term Mediterranean implies the sea in the middle of the earth. It is a small ocean washed by 46,000 km of coastline (peninsulas, bays, islands and cities).

The Mediterranean Sea washes 18 countries, the coasts of which are immense. Greece stands out with its total length of 16,000 km of coastline, whereas Italy comes next with its 8,600 km, then Yugoslavia with 2,500 km, Spain 1,748 km and France with 600 km.

It lies between the wild climate of north and central Europe and the terminal xerothermical zone of the coastline of north Africa. Rainfall varies from 200 to 1,400 mm annually and becomes more frequent in spring and autumn. However, in the north and east basin it is heavier in the beginning of winter. Obviously the differences between geographical latitudes are great; ie Gibraltar has 909 mm, Genoa 1,343 mm, Palermo 750 mm, Athens 405 mm and Alexandria (Egypt) 200 mm. Throughout the year the sunlight varies from 2,200 to 2,600 hours on average in the Mediterranean region.

The whole basin could be defined by an ecological index, the olive tree (*Olea europaea sativa*) which derives from the wild olive tree (*O. europaea oleaster*). This tree thrives only where the mean temperature does not fall below 3°C during the coldest winter, and not above the 600-800 m line.

Diversity

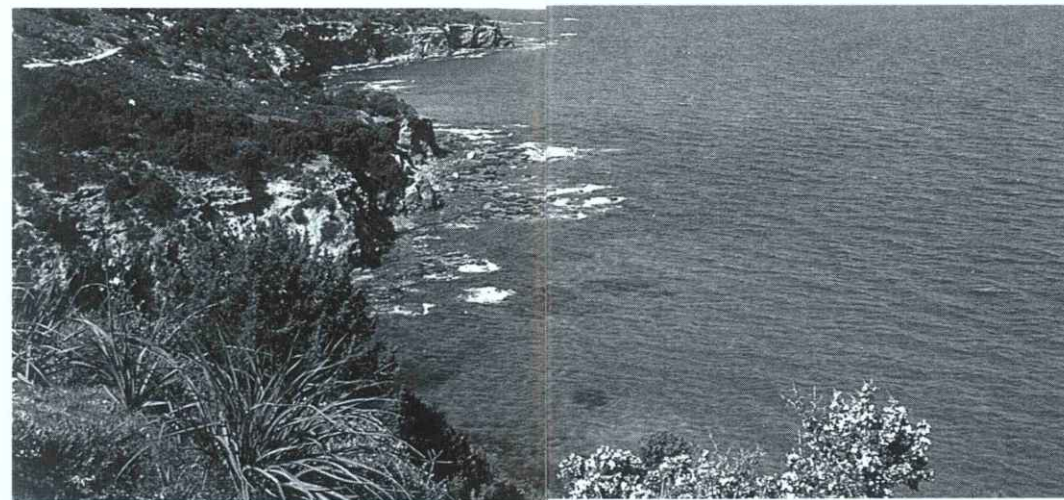
Not only are the Mediterranean coastlines marked out by a variety of shapes, but also by a variety of species that live there. The vegetation and flora is of the most abundant in the world. 20,000 plant species lives there, belonging to 171 families and 1,649 genus. It is also calculated that 38% of them are endemic, ie they exist only in the Mediterranean region. However, the species and plant associations differ when coasts are flat and sandy, or high, steep and rocky.

The Mediterranean coastlines are rich in sand dunes. Greece has not a great deal of sand dunes, although it is particularly a country of coasts. Some sand dunes exist in the west and south Peloponnese (Kaiafa, Zacharo, Pylos), in west central Greece, in Messolongi, in north Greece, south Crete and on the Aegean and Ionian islands (Zakynthos). The sea plant *Posidonia oceanica* (the predominating species) is found around the coasts. *Zostera* (*Zosteramarina*) and *Cymodocea* (*Cymodocea nodosa*) are two other species belonging to the Spermato-phyta family and resemble *Posidonia*. Their ecological role is significant as an abundant ichthyofauna lives and reproduces in the underwater meadows, such as *Spicara smaris*, *S. maena*, *Boops boops*, *Diplodus annularis* and many others. Also, plants (epiphyta) and animals live in plenty on the leaves and roots of *Posidonia*, such as Hydrozoa, Bryozoa, Gasteropoda, little crabs, shrimps, amphipoda, Polychaeta, etc.

The black "phykiades" – so called by the fishermen – form the final and most constant ecological grade in the Mediterranean sandy submarine regions. This affluence in life ecosystems exists only in the Mediterranean Sea and it is an integral part of our seas and a conspicuous fishery. It is in danger from pollution, particularly in the big urban centres (Tunisian and French coasts, Saronic Gulf). For the time being at least, in the Greek islands the danger of pollution is limited. The towing of the trawler to the "phykiades" constitutes an additional danger for that plant. It is remarkable that this towing destroys even the fish biotope.

Sandy coasts

On the sand dunes, vegetation is scanty, as it is adjacent to the sea, and consists of species like *Ammophila arenaria*, *Cakile maritima*, *Eryngium maritimum*, *Euphorbia paralias* and *Pancretium maritimum*, which is known from the old frescos (frescos in Knossos palaces and Santorini, destroyed by earthquakes about 1450 BC). It used to live on almost all the sandy coasts of Greece in the old days. Nowadays, it is relatively rare and in jeopardy, since its biotopes are at risk because of human activities (sand-taking and biotope destruction).



A. Demetropoulos

Another endangered plant is the Palm of Theophrastus (*Phoenix theophrasti*) living on the sandy coast of eastern Crete and it has also been found recently on Turkish coasts. Its presence on Crete is known from the Minoan period when it was used as a motif.

Among the ancient authors, Theophrastus, the father of Botany, names it. Gaius Plinius Secundus (23-79 AD) confirms the palm's abundance on Crete. Apart from this, *Linaria hellenica*, having a limited geographical distribution in the region of Laconia and Elaphonissos (North Peloponnese), is also an endangered species by reason of human activities (tourists, camping, etc).

Centaurea pumilis is another species that spreads to several sandy coasts of the eastern Mediterranean. In Greece it only grows on four parts of west Crete and in two regions on Elaphonissos.

Should man intervene on coasts apparently to develop them, that would be fatal for the species themselves, since such interventions would entail their disappearance.

At a first glance, one thinks that no kind of life exists on the sand dunes. If we happen to look, we can see that a good deal of rare species of invertebrates live in the poor vegetation.

On the sand dunes rare birds feed and nest, like the oystercatcher (*Haematopus ostralegus*) in poor numbers in the Ebro Delta of Spain, Rodans Delta of France, in Italy, in Albania, in Greece in the islets of Messolongi, in the Evros Delta and finally in Turkey.

In that ecosystem four more birds nest, the Kentish plover (*Charadrius alexandrinus*), the little ringed plover (*C. dubius*), the little tern (*Sterna albifrons*) and the common tern (*S. hirundo*). Furthermore, on the Greek sandy coasts (Zakynthos, Rethymnon on Crete, Peloponnese) and in Turkey, the rare loggerhead turtles (*Caretta caretta*) lay their eggs, while in Cyprus on Akama sands (Lara) the green turtle (*Chelonia mydas*) and the loggerhead turtle also lay their eggs.

Rocky littoral

The Mediterranean coastlines are beautiful, as along the kilometres of the sandy coast exist high rocky coasts and small islands scattered all over the blue sea. The rocky coasts are covered by Mediterranean maquis, which consists of mastic tree (*Pistacia lentis-*

cus), Kerm oak (*Quercus coccifera*), Phoenician juniper (*Juniperus phoenicea*), myrtles (*Myrtus communis*) and strawberry tree (*Arbutus unedo*).

Over the Mediterranean maquis the pine trees are scattered. The Mediterranean clump of pine trees consists of four species: *Pinus pinea*, *P. pinaster*, *P. halepensis* and *P. brutia*.

Among the mastic trees in the low vegetation the dwarf fan-palm (*Chamaerops humilis*) grows in Sardinia, Sicily, Spain and Tunisia. In Greece they are gone nowadays, but in 1988 I discovered some fossils in South Lesbos, an island famous for its petrified forest spread with different genus like *Laurus*, *Alnus*, *Carpinus*, *Pinus*, *Populus*, *Quercus*, *Sequoia* and so on.

At the end of spring the rocky coasts are covered with caper flowers (*Capparis spinosa*). Here one can find many flowers of the Iris genus, like *Iris cretica*, which grows on the Ionian islands, Crete and on the mainland, *I. chamaeiris* in France, Italy and Greece, and *I. attica* which grows in Greece and especially on Attica.

On the rocky coasts of the Mediterranean a great number of birds nest. Here live the colonies of Manx shearwater (*Puffinus puffinus*), Cory's shearwater (*Calonectris diomedea*), storm petrel (*Hydrobates pelagicus*), herring gull (*Larus cachinans*).

The Audouin's gull (*L. audouinii*) nests on the small barren islands and it is one of the rarest gulls in the world. It is threatened by extinction and for that reason it is on the Red List of the IUCN and on the Red List of birds of Greece.

We have calculated that 3,000 couples still exist all over the Mediterranean, on the islands of Spain, Morocco, Tunisia, Corsica, Sardinia, on the coast of Syria. In Greece in the marine park of the North Sporades on small remote barren islands and on several islands of the Cyclades, the Audouin's gull nests, but it is particularly threatened by pollution by toxic substances such as mercury and in the summer by maritime tourism.

In the highest rocks nest the birds of prey. One is the osprey (*Pandion haliaetus*) which feeds exclusively on fish. It nests on the coasts of Corsica, the Valearides and the coasts of Algeria. Its Mediterranean population is considered to come up to 25 couples. Unfortunately in Greece it has not nested

Akamas: cradle of life

Andreas Demetropoulos

Akamas is Cyprus' last extensive coastal wilderness area. Covering some 150 sq km, its complex geology and morphology have endowed it with a diverse range of species and habitats. Much of it is coastal maquis with junipers and lentiscs. Spectacular gorges traverse its limestone slopes, harbouring sensitive rare and endemic species. Caves shelter many species of bats, including fruit bats, while inaccessible cliffs provide breeding grounds for many endangered birds of prey and keep many species of plants, such as the endemic *Centaurea*

akamantis, out of reach of the ubiquitous goats.

Akamas' extensive and mostly surf-swept coastline includes the much coveted and vital green and loggerhead turtle nesting beaches of Lara and Toxeftra. On Lara beach the only Mediterranean turtle hatchery centre operates as a seasonal station, providing not only help to the ailing turtle population of Cyprus, but also training for Mediterranean scientists in turtle conservation. The project, which is government-run, is currently being sponsored by the European Commission in the framework of the Mediterranean Special Programme of Action (MEDSPA) project.

Moves are under way, amidst much controversy, towards declaring the area as Cyprus' first National Park.

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since 1967 when fishermen ruined the last nest in the Evros Delta.

The population of the peregrine falcon (*Falco peregrinus*), however, has had better luck, as has that of the kestrel (*F. tinnunculus*). Among the birds of prey of the Falconidae family exists one of great endelic importance, the Eleonora's falcon (*F. eleonora*), which by reason of its limited distribution in the Mediterranean basin, is also on the Red List of the birds of Europe. Its largest population lives on the Aegean islands (Crete, the Dodecanese, the North Sporades, Mount Athos); there is a population on the Ionian islands, which come up to 2,500 couples, representing 60% of its total number. Moreover, in the Mediterranean basin 250 couples nest on the rugged coasts of Sardinia, 150 couples in the archipelago of Tuscany and on other small rocky islands of central and west Mediterranean.

The Mediterranean is also very significant for bird migration. A great number of birds cross the Mediterranean or stop on its coasts and small islands for rest and food.

The monk seal (*Monachus monachus*) lives and breeds on the isolated coasts and rugged islands with caverns and beaches. They were known to the ancient Greeks and the Romans, because they are cited by Homer, Aristotle, Plinius and Plutarchus. This species is greatly threatened by extinction and estimates show that its worldwide population is around 500 individuals. The major regions where its Mediterranean population is massed are the Aegean Sea (the Dodecanese, the marine park of North Sporades), Ionian Sea (Ithaka, Zakynthos, Kephallonia), Sardinia and the Island of Montecristo.

The Mediterranean coastlines are under severe strain from human activities. The Mediterranean, "il mare nostrum", is dying, because man deploys industries on its coasts under the name of "tourist development". It is also dying because of crude oils, pollution by heavy metals, pesticides (herbicides, insecticides), organic and domestic effluents, radioactive pollution, but above all the apathy of governments and the people that border the sea.

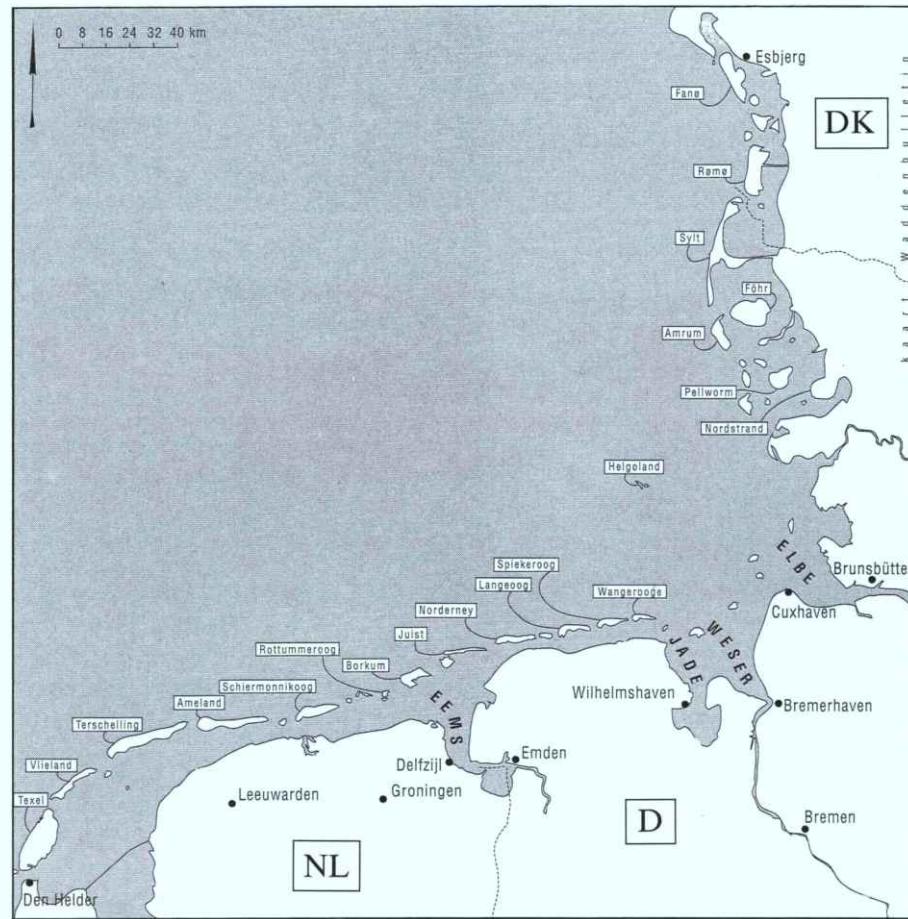
The indicators of the course of this sea are its animals. Seal, marine turtle, Audouin's gull are likely to pass their last decades of their lives on our planet. Therefore, to my thinking, it is high time that all the Mediterranean countries co-operated in order to save the Mediterranean Sea, "il mare nostrum".

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“Measures must be taken urgently to conserve the remaining stretches of yet undeveloped natural coastline and to restore those already damaged.,,





Effective international co-operation

Jens A. Enemark

The Wadden Sea is a tidal nature area extending from the island of Texel, the Netherlands, in the west along the islands and the coast of the German Bight to the peninsula Skallingen, Denmark, to the north. It is a highly dynamic ecosystem containing tidal channels, sandbars, mudflats and saltmarshes. An island barrier of 23 islands with sand dunes and 14 high sands separates the area from the south-eastern North Sea. The Wadden Sea area is about 900,000 ha, of which about 10% belongs to Denmark, 60% to Germany and 30% to the Netherlands.

The Wadden Sea is one of the world's most important marine wetlands. Its ecological importance is perhaps most clearly demonstrated with respect to fish and birds. It is the main nursery area of fish of the North Sea, because it offers shelter, a suitable temperature and, above all, an abundance of food.

The millions of birds which migrate from the breeding grounds in the arctic areas of Siberia, Greenland and north-east Canada to the wintering grounds in Europe pass through the Wadden Sea and stay for a short or longer period to feed, rest and moult. The Wadden Sea "store-room" makes it possible to build up the necessary energy reserves for the long-distance flights. In addition, the breeding population in the saltmarshes and the islands amounts to about one million individuals.

Protection

Human activities and utilisations have an adverse environmental impact on the Wadden Sea. There are basically four categories of impact:

- damage to or loss of biotopes as a result of embankments and construction or major modification of port facilities etc;
- disruption of processes that maintain the productivity and the health of the system through the input of a surplus of nutrients and pollutants which reaches the Wadden Sea via the rivers, the North Sea and the atmosphere;

- exploitation of renewable resources, e.g. blue mussels;
- disturbance to wildlife as a result of recreation, hunting and military activities etc.

In order to protect the Wadden Sea as a nature area of international importance, the larger part of the area has been declared protected area, nature reserve and national park by the responsible authorities of the three countries. In addition, major parts of the Wadden Sea have been designated for inclusion in the List of wetlands of international importance of the Ramsar Convention.

The three Wadden Sea countries co-operate to protect the Wadden Sea as an ecological entity. The trilateral co-operation is based on the Joint Declaration on the Protection of the Wadden Sea (1982), in which the governments declare the intention to consult each other in order to co-ordinate their activities to implement a number of international legal instruments in the field of nature protection, e.g. the Ramsar, Bonn and Bern Conventions. In the framework of the trilateral co-operation the parties have established a common secretariat in 1987.

The objective of the trilateral Wadden Sea co-operation is to conserve and protect as far as possible the natural processes of the ecosystem. This policy aims in particular at:

- maintaining the water movements and the attendant geomorphological processes;
- improving the quality of water, sediment and air;
- safeguarding the optimal conditions of flora and fauna, including the nursery function for North Sea fish;
- optimising the feeding and roosting areas for birds and the birth and resting areas for seals, as well as the prevention of disturbance in these areas;
- maintaining the scenic qualities of the landscape, in particular the variety and the specific features of the wide, open scenery including the perception of nature and landscape.

Wise use

The activities and developments mentioned above have an adverse impact on the ecosystem. An assessment of the present state of the Wadden Sea leads to the conclusion that the quality of the ecosystem needs to be significantly improved in order to restore and maintain the natural potential. It is therefore necessary to define the "wise use" of the Wadden Sea as stated in the Ramsar Convention.

The wise use of wetlands has been defined in the framework of the Ramsar Convention as being "their sustainable utilisation for the benefit of humankind in a way compatible

with the maintenance of the natural properties of the ecosystem". The wise use of the Wadden Sea is seen in the light of the conservation of the actual natural values, which means that human activities are not only considered on the basis of the long-term potential of the area but also considered against the background of the actual values.

It is therefore necessary to describe both the natural actual values of the Wadden Sea and the natural potential as a basis for the formulation of common political targets.

Common principles for the management of the Wadden Sea as coastal and marine natural area have been formulated. These principles, which were stated at the last Ramsar Convention Conference (1990), are:

- the principle of careful decision-making on the basis of the best available information of the environmental impact;
- the application of the precautionary principle to avoid a potentially damaging impact, i.e. the benefit of the doubt to the preservation of the Wadden Sea;
- the principle of translocation of a harmful activity to an area where it causes a less adverse environmental impact;
- the principle of compensation, i.e. ecological compensation of the harmful effects of an activity which cannot be avoided or translocated;

- the principle of restoration, i.e. the application of restoration measures if it can be demonstrated by reference studies that the actual situation is inoptimal;
- the principles of best available technology and best environmental practices as defined in the framework of international organisations.

This approach will result in measures in the Wadden Sea itself via the application of appropriate legal and management instruments, e.g. zoning and measures in adjacent areas of the Wadden Sea to reduce and limit the adverse impact of, for instance, input of surplus nutrients and pollutants.

The implementation of the wise use management principles requires a monitoring of the area in order to examine whether the targets are being fulfilled and if necessary to make the necessary adjustments of measures and activities. The framework for a common programme has been developed. It includes a broad spectrum of physical, chemical and biological parameters.

Trilateral governmental conference

Trilateral governmental conferences on the protection of the Wadden Sea are held every three years. The Sixth Trilateral Governmental Conference will be held in Denmark of this year to discuss the implementation of

the decisions of previous conferences and the current state of the Wadden Sea as a basis for further common measures and activities. A main item will be the further implementation of the concept of wise use of the Wadden Sea in order to achieve a sustainable ecosystem for the benefit of nature, and present and future generations.

It is thereby also hoped that the activities and measures to protect and conserve the Wadden Sea, and the experiences in wise use management will contribute to conserve also other European coastal areas as essential ecological components between our seas and mainlands and as a part of a European ecological network, in which the Wadden Sea is a core area.

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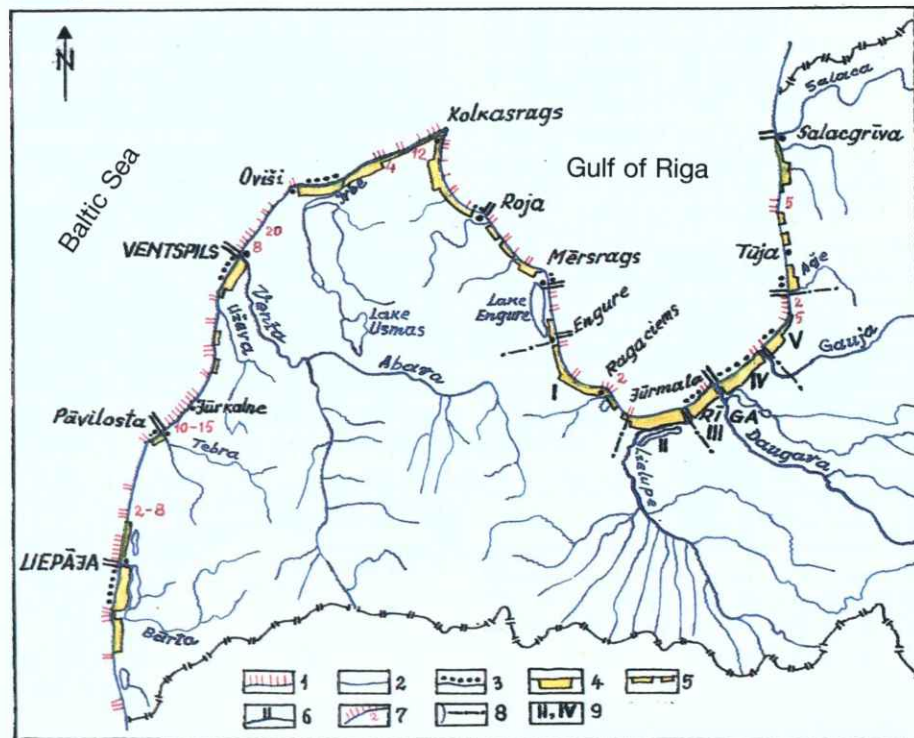


J. van de Kam

The Common Wadden Sea Secretariat was established in 1987. Its main duties are:

- to provide assistance with regard to trilateral meetings and consultations;
- to collect and disseminate information on conservation measures;
- to collect information on activities that have or may have significant effects on the natural environment of the Wadden Sea, to identify and signal such activities, and give suggestions for appropriate actions;
- to make suggestions for a coordinated approach by the Wadden Sea states in international form.

The secretariat is presently located in Wilhelmshaven in Germany.



In Latvia

Güntis Eberhards

Referring to three Baltic Republics, Latvia has the longest coastline – 500 km long, including 250 km of the recent coastal zone were inherited from Littorina transgression due to the following fluctuations of the sea level (V. Gudelis, 1967), and due to human activities (breakwater and seaport construction, sand and gravel deposit mining) in the lowest part of the river channel which have taken place during the period of 40-50 years.

According to the morphogenetic classification of the Baltic coast proposed by V. Gudelis, abrasional and accumulative and graded coasts are predominant in Latvia. Low coasts (2-6 m) mainly dominate, particularly in the Riga Gulf coastal area. Only the Baltic coasts, on longer distances, between Pāvilosta and Uzavu, Ventspils and Oviši cape, vary in height from 10 to 15 m, maximum reaching 20 m (the lighthouse of Busenieki to the north of Ventspils).

According to the recreational potential, a special beach survey and cartographic estimation of the whole coastal area of Latvia was carried out during the summer and autumn of 1989. The total coastline under survey constitutes 410 km. In the survey area we have noted that 45% are abrasional type of coasts (in the Gulf of Riga, 38%), 53% the accumulative type of coasts, but the artificially fortified coastline-breakwater, landing etc. – constitutes about 2%.

Erosion effects

The activity of the present-day eksodynamic processes has a varied impact on the whole coastal zone. Generally, there remain the dynamic balance conditions (48%). At present, regular cliff erosion, up to 10-15 m high, and steep banks are being subjected to active coastal wash-out. New accumulative sea terraces and eolic forms, up to 108 km long, also undergo active coastal wash-out (21%). Intensive cliff erosion takes place in the 45 km length (on the average 2-4 m per year) (Fig 1). Most of abrasional coasts prevail in the coastal area of the open Baltic sea (67 km). Abrasional coasts were noted in Bernāti, Liepāja-Ziemupe zone, between Pāvilosta and Jūrkalne, to the north of Ventspils till the lighthouse of Busenieki, as well as in Oviši and Kolkas cape.

Considering the Riga Gulf coastline, abrasional coasts were noted in Roja, Abrogciems, Rojasciems, Zvejniekiems etc.

As to the accumulative type, it is generally weak and mainly connected with the southern coast (Bullu sala from Daugava till Līlaste) as well as with Roja, Mērsrags and Skulte ports due to the construction of breakwaters.

Contemporary processes in the coastal zone of Latvia and distribution of important sandy beaches

1. abrasion,
2. dynamic balance,
3. accumulation,
4. high quality vast sandy beaches,
5. other sandy beaches,
6. breakwater,
7. height of abrasional cliff,
8. boundary of separate coastal dynamic subsystem,
9. separate coastal dynamic subsystem

Heavy coastal deposit accumulation takes place near Liepājas southern pier, less active accumulation takes place near Ventspils, Pāvilosta and Irbes coastal strait to the north of Ivisu cape till Irbes river mouth. The total length of the coastline where coastal deposit accumulation takes place totals 113 km. There are beaches of 40-80 m in width; optimal width is in summer, maximum width is 200 m (in Liepāja). The beaches have half profile, sandy, well-formed dunes, regularly growing from 2-4 m to 6-7 m high foredune.

In addition to coastal and beach geological and geomorphological estimation, the beach assessment was carried out taking into account the recreational potential. As an example standard, the valuable and wide beach zone (ranging from 50 m to 70 m) of Jūrmala has been especially chosen, formed of fine well-sorted sea sand and accompanied by more or less distinct foredune and sea shore dune ridge.

The total length of sandy beach is 190 km. Its average area reached 780 ha during summer holidays in 1989. The longest coastal sections of sandy beaches are found along the coast of the Riga Gulf. We can distinguish between 12 coastal sections ranging from 2 km to 25 km in length (resort of Jūrmala), but there are seven coastal sections along the Baltic sea coast. Especially valuable sandy beaches stretch up to 80 km in length.

Beaches unfit for recreation and unsuitable coastal sections containing boulders, construction sites, places with underground water flow, reed growths are estimated to be of 47 km of total length. They are most widely distributed in abrasional coast districts in the Riga Gulf. Dangerous and actively sliding down sea cliffs are found in Kurzemes coastal zone, its total length being 22 km.

Monitoring system

Since 1987 a regional monitoring system has been set up to decipher and predict the coastal eksodynamic process changes of beach conditions (Saltupe, Eberhards 1990). The necessity of such a monitoring system was due to the fact that the most suitable and valuable beaches used for recreation are mainly concentrated along the Riga Gulf coast, especially in its southern coast. The fact that several seaports and breakwaters have been built along the coastal area of the Gulf also determined the necessity of establishing the monitoring transport on the underground water slope along both coasts of the Gulf stretching to the south. Secondly, it was determined by long-term sand extraction for construction purposes from the Lielupe and the Daugava rivers.

The situation was enhanced also due to the construction of a hydropower station on the Daugava (1940-74). Thus, due to the above-mentioned reasons, the transportation of sand deposits has been practically stopped. Therefore, the coastal deposit budget has considerably changed on the southern coast of the Gulf of Riga.

Taking into consideration also the general rising of sea level trend which is characteristic of the whole coastal area of Latvia, it is reasonable to suggest that an intensive valuable sandy beach and coast erosion may begin in the near future.

Beach and coastal regional monitoring of the Riga Gulf has been created at the Department of Geography, University of Latvia, and it is supposed to do the investigation for at least a 10-year period. The basic network of measurements includes the southern coastal area along the Gulf ranging from Engure till Skulte (104 km) and it contains 160 stationary profiles, eight sea coast abrasions and two eolic accumulative stations. The frequency of instrumental measurements is diverse in different coastal sections of the Gulf and they vary from 10-12 fold to 1-2 times a year.

Evaluation

The four-year investigation gives the possibility to clarify seasonal and cyclic fluctuations of beaches and their variability in different coastal sections. It also allows to state the total volume of sand deposit transportation between subareal beach and underground water slope, as well as suggesting coastal deposit budget change which formed as the result of eolic deflation. Thus, the surface height changes of vast sandy seasonal beaches, including those ones occurring during severe autumn and winter storms, reach the height of 0.5-0.8 m, but those concerning cyclic ones occur in 3 to 4 years, reaching 1-1.2 m in height.

Budget seasonal changes of beach sand may reach 15-30 m³ per 1 m beach section (20-40%) in coastal districts where accumula-



G. Eberhards

tion occurs or where the dynamic balance remains. Main changes are associated with north-west winds. Beaches generally achieve their optimal size and sand volume during summer vacation period (June-August). It should be noted that during spring storms like the one on 9-11 March 1990, seasonal beach recreation is diverted in time and it finishes late in autumn or even the beginning of winter. Sand material formerly washed out by storms returns back on the beach (about 70-90%) in spring or at the beginning of summer in the course of 30-90 days, seldom in a longer period.

In addition to the above mentioned seasonal changes, we can well note cyclic budget changes of beach sand taking place in 3 to 4 years. On the whole, these changes correlate best with those of sea level average cyclic changes occurring in a year. It should be mentioned that budget cyclic changes of sand takes place in various coastal sections of the Gulf, and even if the exposure is the same, the occurring changes have got different trend. This gives evidence that a united system does not function but several autonomous subsystems in the southern coast of the Riga Gulf. Such subsystems were noted to be five. Judging by the figure, such division is considerably determined by three main rivers (the Lielupe and the Gauja) which on the whole split the levelled sea coastline in separate parts.

From Engure to Jūrmala which is the first part of coastal subsystem, the dynamic balance remains with a transition to abrasion in some parts. In the second part of the coastal subsystem, being the resort of Jūrmala, the dynamic balance also remains but with a trend, especially when sandy beach budget decreases. Bullusala belongs to the third part of the coastal subsystem, the Daugava and the Gauja being the fourth one, and partly the fifth one where the accumulation dominates.

The volume of the present-day eolic accumulation in the foredune gives evidence concerning the accumulation in the third, fourth, and partly in the fifth subsystems.

According to recent instrumental measurements done in the course of the 3-4 years,

eolic accumulation reaches the volume of 3 to 7 m³, maximum 10-13 m³ per 1 m foredune section in a year. Along the whole southern coast of the Riga Gulf eolic "loss" from beaches comes to 100-120,000 m³ per year.

According to the data provided by R. Knaps, this volume exceeds twice the capacity of longshore coastal deposit transport, being 40-50,000 m³ per year. It is also larger than the volume of extracted sand material which is being formed by the Daugava, the Gauja and the Lielupe, and it constitutes 12-15,000 m³ per year.

The average volume of eolic accumulation being formed during 20 years has been calculated according to obtained sand material from foredune since 1967, thus, it constitutes 55,000 m³ per year.

Consequently, the data obtained from the survey area concerning the volume of eolic sand accumulation, the general condition of beaches, and sand balance, indicate that southern beaches and coasts of the Riga Gulf are not considerably affected by wash-out, although there is a tendency of increasing the coastal abrasion.

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Portugal

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Background

For many centuries, the coast has significantly influenced population trends on the one hand and the development of Portuguese society itself on the other. Despite the existence of vestiges of very ancient archaeological remains, the epoch which most deeply marked the history and social and economic development of the country and which, at the same time, made Portugal renowned throughout the world, was the era of discovery.

King Dinis's activities along the northern coast of Portugal in the 13th century were of particular historical significance. His move to have pine trees planted on the wandering dunes of this part of the coast is still famous. The aim was to anchor the dunes and prevent them from harming the agricultural areas in the hinterland.

The need to give the coast the status of public state property was recognised in the 19th century.

"The salt waters of the coast, creeks, bays, artificial ports, docks, river mouths, deltas, arms of rivers and their beds, quays and beaches, up to the line reached by the highest tide at the equinoxes" were declared public property by Decree No. 8 of 1 December 1892.

The permission of the relevant administrative authority had to be sought for the utilisation of these waters. A hundred years ago, the government considered that the coast constituted a national resource which could not be acquired by private citizens and its use was hedged with conditions.

Although this principle has remained unchanged up until now, it has not prevented the deterioration or destruction of parts of the coast or even its privatisation. In some cases, the depredations were actually caused by privatisation.

One of the main reasons for this is the lack of co-ordination between sectoral targets (in other words, the absence of coherent objec-

tives for the management of the coast and activities engaged thereon) plus the non-existence of a management policy resting on the principle that the coast is a finite resource of national interest with a fragile environment.

More recently, the idea of protecting the coast as an extremely valuable area from the point of view of the environment and landscape has been enshrined in law. The latter defined two separate types of area where different management methods apply:

- Classified protected areas, where the most outstanding ecological features must be managed in a manner suited to their specific characteristics (Legislative decree No. 613/76 of 27 July 1976). At present, Portugal has 11 protected areas enjoying the status of nature reserve, national park or protected site. They cover a total area of 152,991 ha, or 31% of the total surface area of protected areas in mainland Portugal and make up almost one-third of the coast.
- Generally speaking, the remainder of the coast is equally important. It has therefore been included among the areas which will form part of the national ecological reserve. Human activities here are subject to special rules (Legislative decree No. 93/90 of 19 March 1990). At the same time, legislation has introduced more stringent town planning regulations for the "coastal strip" (Legislative decree No. 302/90 of 26 September 1990). The "coastal strip" is understood to mean the strip along the seaboard, stretching 2 km inland from the line reached by the highest tide at the equinoxes.

Although the way in which the coast and its role are perceived has changed over the years, so that they are now seen as national assets and, more recently, have come to be regarded as an area of particular ecological value, much has yet to be done with respect to the management of the coast.

The Ria Formosa Natural Park, a lagoon system covering 15.000 hectares, is of international importance for birdlife.

Guidelines for coast management

a. Correct current abuses of the environment

The various buildings illegally sited on coastal public ground are symptomatic of the situation. Public assets have been misappropriated and this is almost always accompanied by a degree of chaos on the one hand and an absence of or poorly functioning sanitation on the other, with the result that wide stretches of coastline have been defiled.

Some action has been taken since 1986 to remedy this situation: about 4,600 illegal buildings have been demolished. Almost all of them were second homes occupying approximately 770 ha of maritime public ground between northern and southern Portugal. Half were in protected areas. In the wake of clearance measures, steps have been taken whenever possible to rehabilitate these areas, or to use them as a site for the public amenities to which they are still suited.

b. Facilitate the use of certain coastal areas through the provision of infrastructures

The ways in which some stretches of the coast are utilised and the number of users may depend on the infrastructures there. It is therefore up to central government to define objectives for each coastal area within an integrated policy taking account of the value and frailty of each zone. It also behoves central government to promote the provision of infrastructures whenever this proves necessary to enable the use of an area.

c. Incorporate "protection" in the management of coastal estates belonging to the state

Several estates along the coastal strip are state owned. Most of these are managed by the Directorate General of Forestry which ought to draw up management plans that take the ecological assets of each area into account.

d. Reject the principle that ownership of a plot of land is necessarily synonymous with right to build on it

Each plot of land has its own setting conditioning possible use.

e. Seek different remedies against coastal erosion for urban or non-urban zones

As the coast constitutes an ever-changing ecosystem, alterations must not be hindered unless this is absolutely necessary, ie when inhabited areas are at stake. Moreover, solutions imposing as few obligations as possible must be sought in the other areas. The wide variety of situations and characteristics mean that any technical measures proposed or taken along the coast must reflect this diversity.

The voyages of discovery contributed towards making Portugal's coast famous. The coast is still helping to advertise the country throughout the world today. No longer do the Portuguese leave the shores of their country to conquer the world, on the contrary, people come from all over the world to "conquer" the Portuguese coast because of the beauty of its landscapes, its uniqueness and the quality of its culture and environment - all of this in a southern European setting. In 1990, they numbered some 8 million and came mainly from the United Kingdom, Germany and France.

The Portuguese coast could still be part of the international heritage of future generations, but only if immediate integrated action is taken and given the international support it deserves.

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P. Doody

Legal survey

Albert Salman
Robert Tekke
Secretariat of the European Union for Coastal Conservation

Netherlands

Most important is the implementation of the Nature Conservation Act in the coastal dunes and the Wadden Sea. Government has decided to bring all coastal dune systems and many intertidal areas under the protection of this Act before the year 2000. Another example is the National Nature Policy Plan, in which a national ecological network is designed, including the Waddensea and all coastal dunes. Priority will be given to protection and restoration of natural habitats in these areas.

United Kingdom

The National Trust (the largest NGO in the UK) has a special programme, Enterprise Neptune, to buy coastal areas in England, Wales and Northern Ireland which are unspoilt and worthy of protection. In 1990, over 800 km of coastline were owned and managed. A second example are the Heritage Coasts, beautiful and undeveloped stretches of coast, now including 30% of the coastline in England and Wales. They are identified jointly by the Countryside Commission and local authorities and are non-statutory.

Denmark

The summer cottage directive prohibits a further extension of summer cottage areas in a 3-km wide zone along the coast. The Conservation of Nature Act can also be mentioned. This Act contains measures for the general protection of biotopes and directives for the protection of separate areas.

Sweden

Gullmars Fjord on the Swedish west coast is of extremely high biological value. It is a marine reserve which imposes restrictions on some activities. The five local councils near the fjord have agreed in a local council plan how to deal with different types of development or pollution.

Ireland

The Wildlife Act allows the establishment of national nature reserves. The Wildlife Service makes a management plan in consultation with the owner. Furthermore, the Foreshore Act can be mentioned. This Act can be used to control development and activities on the foreshore or in shallow coastal waters, eg to limit sand exploitation in dunes and on beaches.

France

The Conservatoire de l'Espace Littoral et des Rivages Lacustres (commonly abbreviated as Conservatoire du Littoral) is a special public organisation which purchases land in the coastal zone for permanent protection.

Belgium

In 1985 the government started to support NGOs and private investors financially in the purchase and management of reserves.

Germany

The German Wadden Sea is almost entirely protected by three National Parks.

Portugal

The protected landscape of Alentejo and Sao Vicente, in the south-west of Portugal. The main goal of a protected landscape is the protection of traditional rural and urban areas of cultural or architectural interest. New activities are submitted to rules defined in a management plan for the areas.

Spain

The Devesa de l'Albuera is an important dune area near Valencia. In the 1960s in the Devesa, roads and apartments were built and plans were made for further development. In 1979 the local government took initiatives to save the dune area. A restoration plan was approved and in 1985 they began with the restoration by breaking up a part of the existing infrastructure and actively regenerating the dunes. N.B. the Ley de Costas protects the beaches against building, but its implementation is rather weak.

Italy

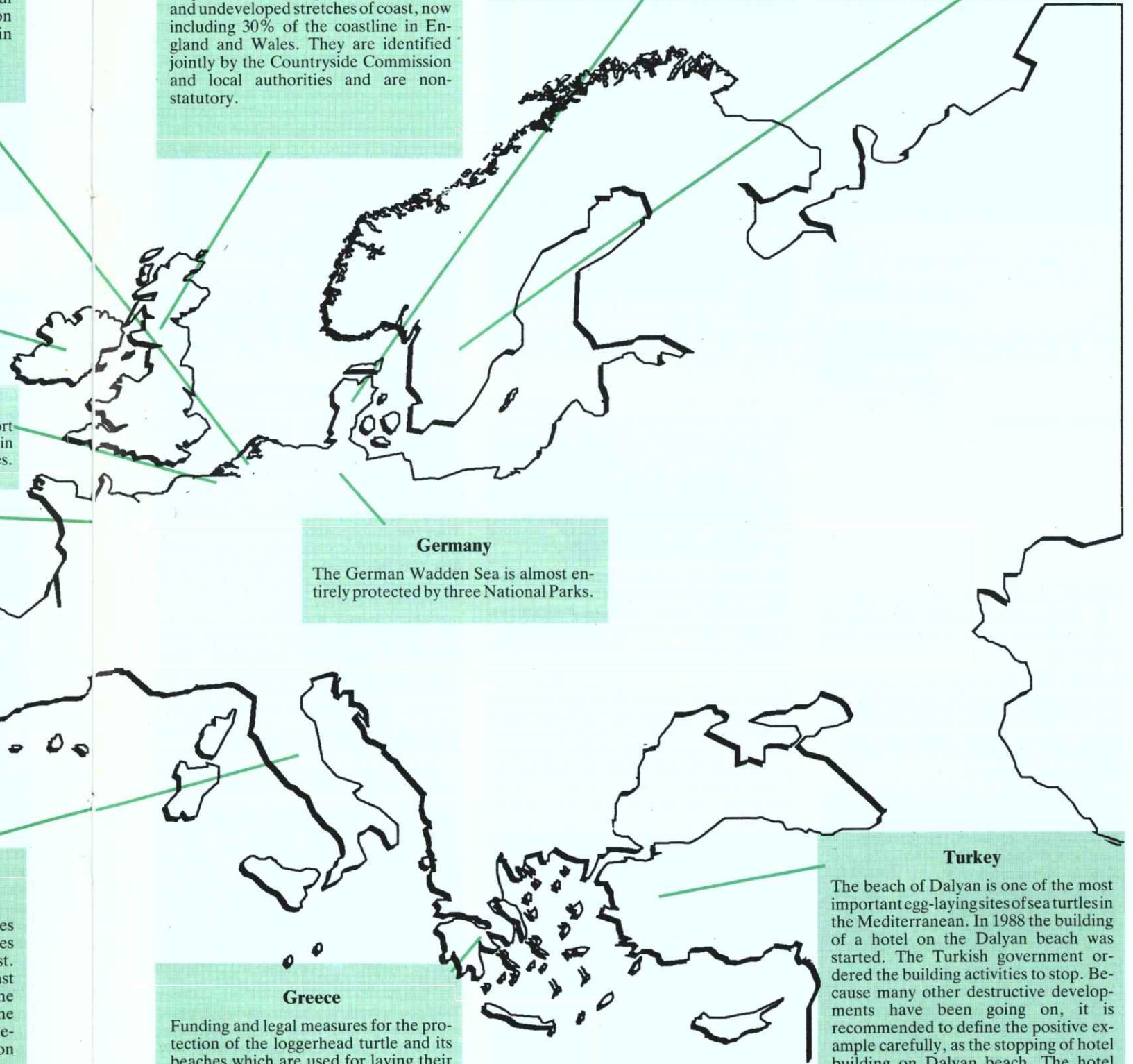
The Legge Galasso contains guidelines for the protection of zones and territories of specific environmental interest. Along a 300-m wide zone along the coast all developments are blocked up to the approval of regional plans in which the landscape values and plans have been described. However, the implementation of the law is very weak.

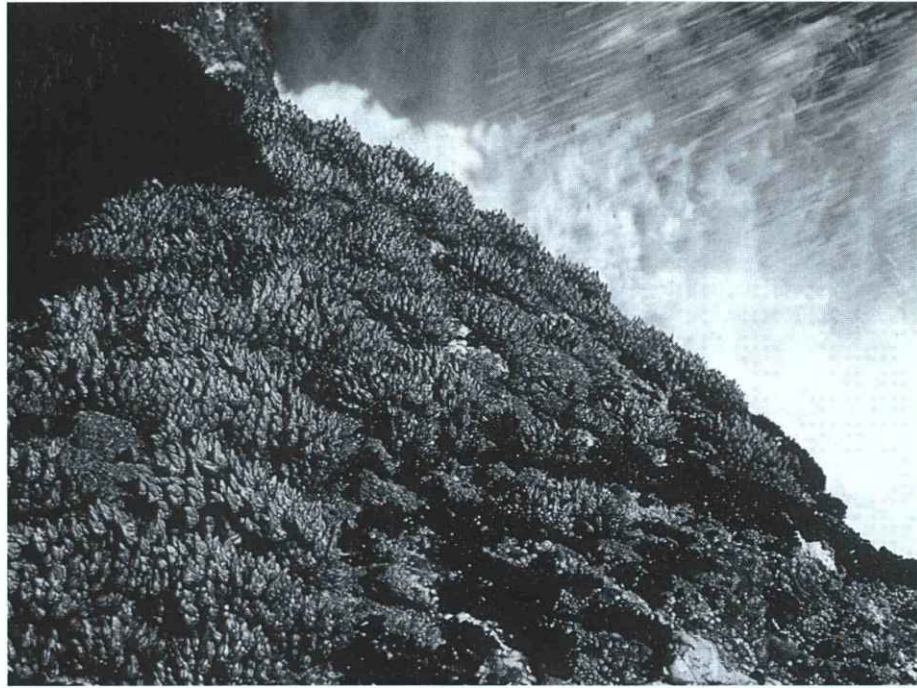
Greece

Funding and legal measures for the protection of the loggerhead turtle and its beaches which are used for laying their eggs.

Turkey

The beach of Dalyan is one of the most important egg-laying sites of sea turtles in the Mediterranean. In 1988 the building of a hotel on the Dalyan beach was started. The Turkish government ordered the building activities to stop. Because many other destructive developments have been going on, it is recommended to define the positive example carefully, as the stopping of hotel building on Dalyan beach. The hotel foundations have not yet been removed.





S. Cordier

Goose barnacles and mussels

Preserving biodiversity

Jacques Lhonoré

The coastline, the frontier between land and sea, is a source of conflict and exchange and it is constantly being modified.

Conflicts take place between complementary physical mechanisms (for example, erosion and sedimentation, due to determining factors such as winds, marine currents or temperature fluctuations) and the living beings which settle there.

Exchanges take place between materials: the erosion of rocky coasts provoke the formation of loose sediments from which sandy coastlines originate. The depositing of organic or inorganic terrigenous material allows land to encroach on the sea (silty foreshores, "slikkes", "liquor", estuaries). It was Lavoisier who said, "Sea water is the result of the washing of the whole of the earth's surface".

Oceans and seas cover 71% of the earth's surface and living organisms account for 10% of organic matter. 1.5% of our food comes from the sea. The diversity of marine life diminishes with increasing depth and lower temperatures. It is in the first 60 metres of the continental shelf that biodiversity and productivity are at their greatest (half a sea hectare produces 3.8 metric tons of organic animal or plant matter). Phototrophic plants, which are primary producers, gener-

ate varied food chains involving herbivores and several levels of carnivores. Among the "exchanges", it is worth mentioning changes of environment: at the land-sea interface some terrestrial organisms live along the shore or adapt to the sea (arachnids and insects) while "Neptune's children" advance onto land (gastropods and crustaceans).

The stability in time of these ecosystems is linked to specific diversity. It increases with higher temperatures (in contrast with the effect of latitude, therefore) with the presence of warm currents and with the quantity of available food.

A current such as the Gulf Stream raises the average water temperature (18°C in summer in Brittany, 10-11°C in winter). It allows fixed crustaceans such as *Chtamalus stellatus* to survive in the Channel as far south as the Cotentin and as far north as Scotland. In addition the Gulf Stream or similar currents maintain a thermocline with tepid surface water that is rich in mineral salts, promoting the growth of plankton which in turn encourages the migration of certain species (herrings and sardines) caught by fishermen.

Biological productivity and diversity

The hard substrata of the coastline favour the settlement of varied animal and plant species. Larvae and seeds attach themselves to the substrata and bring about a vertical distribution of organisms which can vary according to exposure to the daylight spectrum, structure water turbulence, temperature and desalination. Such zone formations can be seen nowhere else; they are linked to the phenomenon of tides and total three layers: the upper littoral, mid-littoral and lower littoral zones.

The height of each varies according to the type of water turbulence and biodiversity decreases with depth. More than 150,000 species belonging to 30 or so different phyla with over 300 taxons per are can be found on Europe's coastal fringe, a density unrivalled on land.

These zones often have an underlay of bands of plant life, with lichen in the upper littoral and brown seaweed in the mid-littoral. Each zone shelters a particular invertebrate population.

In the upper part of the upper littoral animals adapt to living in anfractuosités so as to resist dehydration (they are emerged twice daily) and desalination (from rainfall). At this level, insects live in anfractuosités together with various predators and consumers. Physiological adaptation affects particularly respiratory and excretory functions. Thus the little gasteropod (*Littorina neritoides*), instead of processing the gills usually found in this genus, has an air-breathing mechanism. Similarly the ligia, an isopod crustacean, tends towards air respiration of the kind already acquired by terrestrial wood lice. The periwinkle's excretory rate is adapted to twice-daily emergence. When submerged, it excretes chiefly ammonia, the end waste product of purin catabolism. At low tide, it is uricotelic and stores uric acid which, as the tide rises, it will begin to break down into water-soluble components.

In the mid-littoral, local survival implies that the organisms must be able to reduce evaporation areas by closing shells (operculum of prosobranchia gasteropods), retracting tentacles and appendices, curling up, (barnacles, *Chtamalus stellatus*, limpets) and moving towards cooler areas into cavities or under seaweed (periwinkles). There is one species of bug that lives even in anfractuosités which are uncovered only during the spring tides and one species of springtail (*Actalectes neptuni*) that occupies the crampons of seatangle up a depth of 7 metres!

Tide pools, hollows, basins and rock pools constitute low-tide reservoirs, whose temperature, salinity and oxygen levels can vary considerably. The seaweed found there harbours a host of animals, some of which come up from the lower-littoral (sea urchins and abalones). Similarly in sheltered pools in caves it is possible to find sponges, coral generally found in more southerly seas and pedunculate Cirripeds.

Loose substrate

The loose substrate poses a number of problems for marine invertebrates whose penetration of it depends on its particle size and physical and chemical properties. Its texture makes it an unsuitable habitat for itself to animals. Furthermore, the surface is disturbed by currents, the strongest of which bring coarse sediments to form an unstable base (gravel). The "microclimate" of the sediment depends on its mobility, density and hardness and the circulation of air and water. Thus, whereas sunlight can raise the surface temperature from 20°C to 30°C at low tide, at a depth of 15 cm it rises only from 10° to 15°C and at a depth of 25 cm the variation will be a mere 2°C. Vagile surface species (crustaceans, decapods and gasteropods) become rarer while sedentary species (lamellibranchia and polychaeta) predominate and serve as a temporary food source for passing predators (wadlers and other summer birds).

An emerged foreshore at low tide often becomes desalinated owing to rain or fresh water run-off from further inland. The small flatworm (*Convoluta roscoffensis*) is emerged on the sand at low tide. Symbiotic seaweed can benefit from the sun's rays to ensure correct chlorophyll functioning and manufacture sugars that are essential for the flatworm. At high tide these worms burrow into the sand.

Large populations of two groups of invertebrates, polychaeta worms and lamellibranchia molluscs, are found in the loose substrate. Silt together with large particle size encourages the development of edible lamellibranchia such as carpet shells and clams. It is no coincidence that oyster parks, mussel beds and sea-fish farms are located in loose substrate zones such as estuaries or lagoons with high primary production (100g of living matter per sq m of seabed or 100 to 150g of carbon per sq m per year).

Silty undisturbed sands favour the development of polychaeta worms which fishermen with bait. They also house large populations of lamellibranchia - several kilos per sq m.

At a greater depth, in the lower littoral (up to 20 m), such granular sandy zones are ideal for flowering plants with lacinated leaves which form plant communities (eel-grass, Posidonia), which are unrivalled for their specific richness and productivity. The substrate is colonised by many fixed organisms (sponges and sea squirts) or silt-dwelling organisms (sea anemones, and polychaeta worms such as the peacock-worm and fan-worm). The leaves support uncommon organisms (lucernaria), sea hare and cephalopod eggs. These plant communities are veritable nurseries. However, whereas they were once abundant, they are now shrinking constantly. In 1935, a parasitic disease due to a fungus decimated them, both on the European coasts and on the North American coasts. Moreover, increased turbidity, modifications in current flows and pollution hinder their regeneration. They have be-

come extremely rare between the Cotentin and the Escaut estuary.

The richness of a sandy coast is also linked to the presence of wrack on the foreshore edge. Wrack takes the form of strips roughly parallel to the tide, consisting of seaweed or marine vegetation, and washed-up dead animals as well as decomposers. Although the number of species is small, productivity is exceptionally high. Wrack harbours decomposer insects, amphipod crustaceans (sand fleas), bacteria and a host of larger predators such the forclicula species of sand crab. The almost systematic cleaning of beaches before the holiday season by machines which remove between 5 and 10 cm in depth of marine deposits is destroying this fauna on most beaches!

The coasts are migration routes for birds and insects. Beaches and estuaries, on account of their vast invertebrate population, twice a year constitute the main source of food for migratory birds and limicolae in particular. Dunes and the areas behind the dunes are favourite nesting sites.

Warning

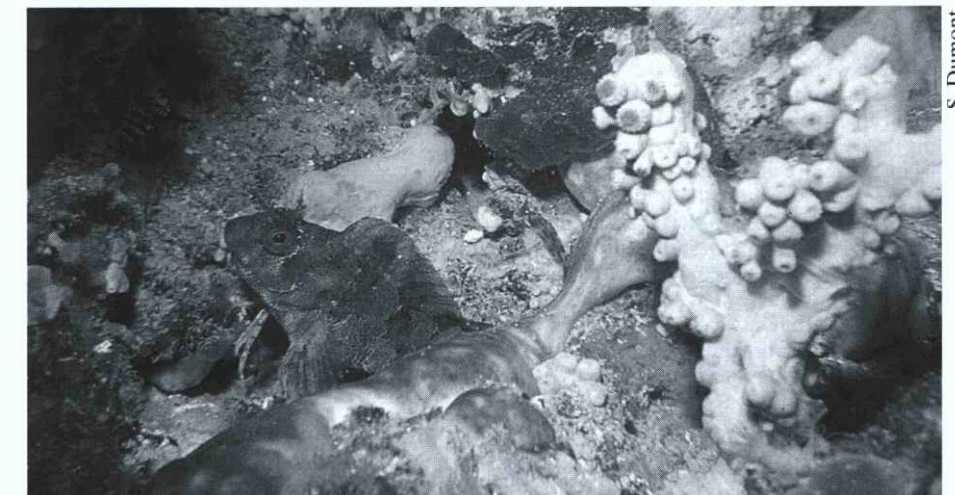
The coastal fringe is a collection of rich and diverse biocenoses which have remained virtually balanced since life on earth began. With the exception of accidental changes resulting from pollution (oil slicks and chemical pollution, for example) or man-made disturbances (urbanisation and tourism) it remains possible to define "zero points" for these ecosystems and thus to have reference data. This is no longer possible for land or lake ecosystems, all of which have become dirty or have deteriorated, except maybe at high altitude. The protection of coastal biocenoses remains possible provided drastic monitoring and rational administration measures are taken rapidly. In the last 20 years, 50 or so international agreements have been signed particularly concerning pollution. According to Part XII of the United Nations Convention on the Law of

the Sea (1982, Montego Bay), States have the obligation (in principle) "to protect and preserve the marine environment". But, protection of the coastline must not be the responsibility of administrative departments or come under two distinct sets of legislation (one for the land, one for the sea) the applications of which are contradictory, as protection provisions frequently conflict with economic interests. What is needed is to set up fully fledged research and monitoring structures along the lines of the Conservatoire de l'espace littoral et des rivages lacustres.

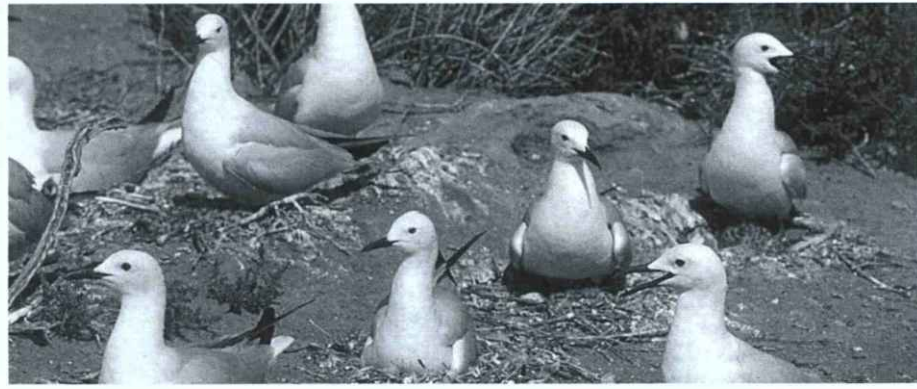
A further - and fundamental - problem is that of public ignorance and marked shortcomings in biology teaching in secondary schools.

The land/sea interface is a marvellous laboratory for multidisciplinary studies such as taxonomy and evolution, ecology (basic and applied) or physiology.

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J. G. Walmsley

Misappreciated salinas

John G. Walmsley

The production of salt by the natural processes of evaporation is one of the oldest industries known to man. Many artisanal salinas have long since been replaced by large industrial saline complexes comprising hundreds, and even thousands of hectares. The Mediterranean basin is ideally suited to salt production, the vast salt plains ("Sebkhas", "Chotts") of North Africa are witness to the remarkably high evaporation rates in this region; so too are the largest European salinas, situated on the northern shoreline.

Besides producing salt for industry and commerce, industrial salinas support internationally important breeding populations of flamingos, shelduck, avocets and other seabirds, among them rare and endangered species like the Mediterranean gull, slender-billed gull, Audouin's gull, gull-billed tern and the little tern, endangered throughout its breeding range in Europe. Salinas are also used as stop-over and refueling sites each year by thousands of long-distance migrants, especially waders, moving between the Palearctic breeding grounds and their winter quarters in Africa. There is also evidence to suggest that industrial salinas are important breeding sites for another highly endangered species, the stone curlew.

Salt companies and saline managers therefore automatically become the "custodians" of these wetlands and wildlife. They should be made aware of the need to preserve our natural heritage, which today is disappearing fast. In industrial salinas, former natural islands in saltwater lagoons once occupied by breeding laro-limicoles (gulls, terns, waders) have now been levelled to create a larger surface area of water for salt production. The result is that birds are now forced to breed on dykes, in more sensitive parts of the saline, where disturbance of nests and eggs, and chick and adult mortality is high. The lack of suitable breeding habitat is just one of the causes of this movement of birds.

The yellow-legged herring gull is another threat: over 30,000 pairs are breeding along the Mediterranean coast of France, the ma-

majority are sedentary and spend their time scavenging on public refuse dumps, or preying on breeding laro-limicoles. We are responsible for this unbalanced situation which will continue to spread unless we do something to change our system of waste disposal.

For many years these biologically rich industrial salinas have been completely ignored by both the salt companies and conservationists alike, and considered only as factories producing salt. The time has come for us to change our ways and opinions before it is too late, by recognising industrial and abandoned salinas as wetlands of international importance. Every effort should be made to maintain the breeding and feeding habitat that salinas afford to all protected species, by moving towards the future, and an integrated management for these fragile ecosystems.

Practical management is all that is required to meet the demands of the birds. This can be achieved by creating artificial islands in permanent lagoons; the surfaces should be a mixture of sand and gravel and the edges protected by stones against erosion.

Besides creating optimal conditions for salt exploitation, salinas can be managed in ways that are beneficial to seabird conservation. Maintaining and safeguarding the bird communities in these important saline wetlands requires no drastic changes or modifications to the existing habitat or its water management; other than providing undisturbed breeding sites in the form of artificial islands.

A project of this kind is in operation in the saltwork in Mesolonghion, Greece, and another is in the planning stage for the Canary Islands, Spain.

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Slender-billed gull breeding in an industrial salina

Threatened flora

Jean-Marie Gehu

The flora of the European coastline is extraordinarily rich and varied but is also in grave danger. A highly unusual flora, it is to be found in extremely varied habitats, determined by endless variations in the coastal geomorphology.

In France over one-tenth of the flora, including several dozen endemic species, live along the coastal rim covering a total surface area less than half of one-thousandth of the national territory. But the same strip is home to 10% of the inhabitants of France, not to mention holiday-makers! This same area has recently taken on considerable geo-economic importance.

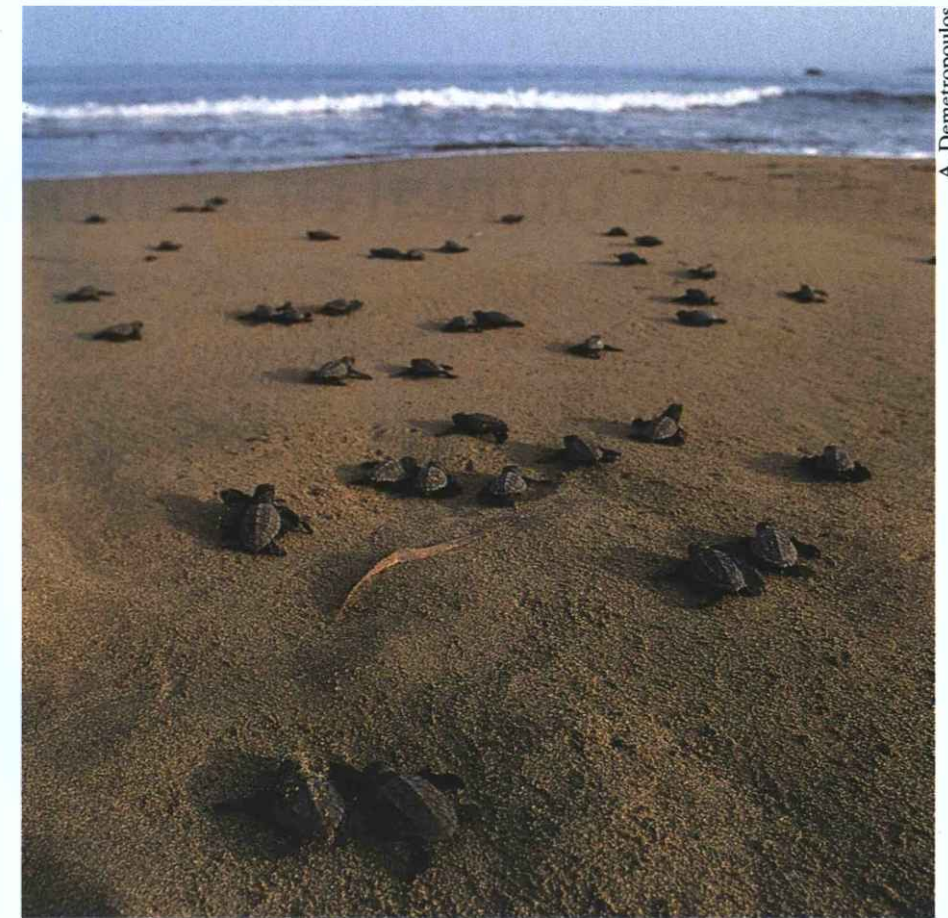
Since life in the coastal area is organised on the basis of narrow zones, it has considerable in-built fragility. Man-made pressure is constantly on the increase and irremediable destruction is becoming more alarming with each passing day.

Euphorbia pepilis, once abundant above Atlantic beaches, is now confined to the Mediterranean. *Halimione pedunculata*, a rare species growing in salt-marshes, could be found in 15 locations around the eastern English Channel 30 years ago, but now in only three. *Hieracium eriophorum*, a magnificent species endemic to the coastal sands of Gascony, is now limited to a few dozen kilometres of coastline south of Arcachon, while *Alyssum arenarium* is confined to a few kilometres on the Basque Country coast.

In France alone, as many as 72 coastline species are liable to disappear, apart from the numerous eco-types and epharmonic forms due to powerful micro-speciation factors in coastal areas. The situation is apparently less serious in the north but worse in the south, where the number of taxa is far greater and protection measures, if they exist at all, less effective. Whatever measures are taken, it seems that only a genuine "all-out mobilisation" on a Europe-wide scale can save the precious floristic and phyto-genetic heritage of the coast.

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Young loggerhead turtles (*Caretta caretta*) rush towards the sea as soon as they hatch. Let's hope it will always be so.



A. Demetropoulos

Marine turtles

Lily Venizelos

Having existed for over 100 million years, marine turtles are now threatened with extinction. Despite the various researches, debates and paper protection measures over the last few years, their situation in the Mediterranean continues to decline. Females used to nest on several Mediterranean shores. Today, Greece, Turkey and Cyprus retain the largest concentration of nesting females. The last remaining important nesting beaches are threatened by habitat degradation due to coastal development, tourism, disturbance, sand removal, pollution and other human interferences.

Illegal beach front development, noise, lights, vehicles, sun umbrellas, deck-chairs, propeller-powered speedboats and out-of-control tourism disturb, disorientate, frighten, injure and prevent turtles from nesting. Added to these pressures are incidental catches through fisheries interaction and deliberate harvesting at sea. It could be that incidental catches have been removing more turtles that nest annually on Mediterranean beaches. It is also possible that as the adults which are currently reproductively active die off, marine turtle populations in the Mediterranean will suffer rapid declines in the face of steadily declining recruitment.

The Mediterranean being an enclosed sea, it rapidly becomes affected by toxic effluents, dumped waste, coastal destruction, etc. Turtles get entangled in discarded and broken

nets and ropes, feed on discarded plastic (mistaking it for jellyfish), thus blocking their digestive systems, and are also contaminated by tar and oil. Little is known about the occurrence and effects of other pollutants.

Marine turtles are classified as threatened species and are "protected" by most Mediterranean countries; however, the flouting of their "protection" laws and the indifference of government in not enforcing them continues. International conventions and campaigns have so far met with governmental inactivity.

Conservation priorities and actions to save the Mediterranean marine turtle should include:

- Further research to assess all remaining potential Mediterranean nesting beaches is needed, so that additional protected areas can be established to ensure the survival of the species. Once Special Protected Areas (SPA) are established, the central governments alone cannot carry the full responsibility for the conservation and protection of these areas. A range of different institutional arrangements should help to support them at national, regional and local levels and with the participation of all interested parties.
- Public awareness programmes, for local people and tourists alike, across the Mediterranean.
- Assessment of accidental catchings through further investigation of technical and educational means, to reduce in-

cidental catch and reduce mortality at sea.

- Investigation of the pattern of turtle movement between the Mediterranean and the Atlantic.
- Immediate cessation of intentional harvesting of turtles.
- Further investigation is needed for the location of foraging grounds, overwintering areas etc.
- Investigate the extent to which pollution is affecting the turtle population.
- Co-ordination of conservation efforts.

Conservation of the Mediterranean marine turtles is an international issue and as such, international solutions and finances are needed.

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At the Council of Europe



The European network for scientific co-operation on oceanography of the European Association for Marine Sciences and Technologies (EAMST), which was set up in 1985 on the occasion of a congress in Lisbon, has adopted coastal oceanography as one of its action priorities, in the belief that it is of considerable significance from the science and technology viewpoint and also in socio-economic terms.

In that same year, 1985, an intensive European course was accordingly held in Bordeaux on the subject of the knowledge and management of the shoreline and the nearby continental shelf, following which EAMST organised the following, in the framework of the Institute for Advanced Studies in Oceanography (IEAO):

- a European workshop held in Athens in 1985 and 1988 on coastal problems in the light of coastal physical processes and structures;
- an international coastal oceanology colloquy in Bordeaux in February 1988.

Problems of the shoreline are also a major pre-occupation in the Council of Europe's open partial agreement on catastrophes. For example, in 1989 the European Centre in Malta (Euro-Mediterranean Centre on marine contamination hazards) organised a European course on the role of remote sensing in the surveillance of sea and coastal pollution. It is preparing the International CLEAN SEAS 91 Conference, which will devote a considerable proportion of its debates to the problems of development and coastal pollution (Valletta, 19-22 November 1991).

Similarly, the European Centre in Monaco (European oceanological observatory: forecasting major risks and rehabilitation of the environment) is concentrating its research on coral ecosystems, which protect tens of thousands of kilometres of coasts from erosion by waves and currents.

The section of the European Centre in Strasbourg which is concerned with geomorphological risks is preparing a European course to be held in 1992 on ways of preventing the risks of coastal erosion and submersion.

Many other instances of activities could be cited, bearing ample witness to the growing concern felt by those in charge, from the social, political, economic and ecological viewpoint, which suggests that short-, medium- and long-term action is needed to combat alterations to our coasts; such action would have to be properly co-ordinated among all the institutions engaged in this sector. ■

Alterations to coasts

So complex are the phenomena that affect shorelines, with their different morphologies, that if they are to be mastered – as they must – genuinely multidisciplinary teams will have to be set up to deal with them. These teams must be capable of elucidating the interactions between parameters – be they static or evolutive – and also of training those who tomorrow will be responsible for managing such areas.

Coastal developments often proliferate in the wake of initiatives with an inadequate back-up and notwithstanding the body of expertise built up, they are responsible for damage that can never be made good. The management of the coastal heritage that is needed stems from as complete a mastery as possible of the criteria governing the natural evolution, in the name of coastal environments.



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