The Siren

Number 45 March 1992

NEWS FROM UNEP'S OCEANS AND COASTAL AREAS PROGRAMME

Lessons of war

In only two weeks after the cessation of the hostilities ending the armed conflict over Kuwait, the United Nations Inter-Agency Plan of Action was launched at the Second U.N. Inter-Agency Consultation in Geneva on 15 March 1991. By August 1991 the U.N. teams of experts completed the 90-day initial survey and preliminary assessment phase of the Plan, and moved onto the next phase towards the mitigation of the adverse effects and the preparation of a Consolidated Rehabilitation Programme (CRP) for the ROPME Region.

Some of the findings published last October after a review by regional and international experts:

- In a few days during the war, four damaged oil tankers leaked as much oil into the sea as the yearly pollution resulting from oil production and transport.
- The Kuwait Oil Company (KOC) reported 613 burning oil wells, most south of Kuwait City, with smoke detected hundreds of kilometres away over Oman (though in rarefied quantities). It is claimed that the plumes may have caused "black rain" and "black snow" as far away as the Indian Continent.
- The carbon dioxide emitted daily by burning oil wells represented 3% of the world's total annual fossil-fuel emissions. An estimated four to six million barrels of oil and about 70 million m^3 of gas were being burnt daily for a period of over 300 days.
- Some 400 km of coastline, particularly in Saudi Arabia, may have been polluted and severely affected by an oil slick that reached 50 km long and 5 km wide.
- Heavy mining and unexploded ordnance and military material still restrict access to the marine and

coastal zone of Kuwait, hampering field surveys, monitoring and rehabilitation efforts.

The draft assessment was prepared by UNEP-OCA/PAC and was based on the results of the initial surveys carried out by several U.N., national and international teams of experts and consultants whose work was co-ordinated as much as possible with the U.N. Plan of Action by a Core Group established by UNEP at the Secretariat of the Regional Organization for the Marine Environment (ROPME) in Kuwait.

The UNEP report on phase I of the Plan of Action was reviewed and updated at a UNEP/ROPME meeting held in Kuwait on 28-30 September and attended by representatives of the co-operating agencies and organizations and selected regional and international experts. The revised version of the UNEP report was presented to the Fourth Extraordinary Session of the Council of ROPME convened in Kuwait on 16-17 October. The Council adopted the report and its recommendations for implementation. An Inter-Agency meeting in Geneva last December looked at steps to carry out the next stage of the Plan of Action, leading to the environmental restoration of the ROPME region.

"We are now moving forward," said Peter Schröder, Director of OCA/PAC, who provides the overall guidance to the Plan of Action.

"Based on amounts recovered in Saudi Arabia from all possible sources in the northern ROPME region, the total amount of oil spilled is estimated between six and eight million barrels," the United Nations specialists observed. This compares with two million barrels spilled during 8-10 months at the Nowruz oil field in 1983 as a result of the Iran-Iraq conflict and about two million barrels normally escaping into the same ROPME region from oil production and transport each year.

"Air pollution was the most crucial issue at the time and is expected to have local/regional effects," the report concluded. With regard to the impact of air pollution on human health, the report indicated that according to measurements taken by various teams, the concentrations of irritant gases such as sulphur dioxide and nitrogen oxides in the lower atmosphere did not exceed international air quality guidelines. But the particulate matter and associated organic compounds need to be monitored to identify hazardous substances.

"Now, with the capping of the last burning oil wells on 6 November 1991, and the recoverable portion of the spilled oil removed from the marine environment, efforts should be concentrated on the rehabilitation of the desert from the massive terrestrial

Oops!

In the last issue, the editors mistakenly described the Siren as 43 instead of 44. In fact, she is now 45 and proud of it.

If we need to refer to either of the editions numbered 43, we'll do so by the date (4th Quarter 1989 and December 1991).

destruction caused by escaped oil from the damaged oil wells forming extensive oil lakes, and on the impacted coastal ecosystem along the Saudi coastline," says Makram Gerges, Deputy Director of OCA/PAC, who co-ordinates the activities of the U.N. Inter-agency Plan of Action and its follow-up. "A feasibility study will be needed to select the appropriate technology." The report expressed fears that pollutants accumulating in the top soil layer can affect vegetation, particularly agriculture, and the groundwater aquifer. Some oil pools in the desert are 5 ha large, currently posing grave environmental threats.

On the marine and coastal environment the report added: "Marine surveys are still preliminary and the extent of damage in the subtidal marine ecosystem is yet to be determined. Survey and assessment should be continued for a complete year to include seasonal effects." It cautions: "The functions of critical habitats and special ecosystems in the ROPME Sea Area are poorly understood. Research efforts are needed to address the questions of: (a) the terrestrial interaction with nearshore ecosystems, the interaction of the intertidal/nearshore systems with the offshore areas, fisheries, fish/shrimp nurseries, etc.; (b) the biological and chemical breakdown processes acting on waterborne and airborne pollutants in the intertidal, nearshore areas; and (c) the restoration practices for selected ecosystem segments after the clean-up."

The report set out actions for the national and international partners in the Plan of Action. ROPME is to publish and distribute information bulletins on the environmental effects of the war on the basis of information collected and

stored in its computerized database, established by the Plan of Action at ROPME Secretariat.

The International Atomic Energy Agency (IAEA) and its Marine Environment Laboratory (MEL) will continue to help in marine pollution surveys and assessment. The laboratory will also provide reference samples, analytical methodologies and training, and organize inter-calibration exercises to ensure data quality control and comparability. "Assistance will also be required for the establishment of a sample bank," the report added.

The Food and Agriculture Organization of the United Nations (FAO) is to monitor food production (fisheries and land crops). UNEP is now proceeding with the development of the Environmental Rehabilitation Programme for the ROPME Region which includes several targeted and costed projects dealing with the marine and terrestrial ecosystems as well as the long-term effects of the atmospheric pollution on human health.

"One of the most important lessons learned from this conflict relates to the preparedness of the U.N. system to respond to environmental emergen-

cies," concludes Mr Gerges. "There is an obvious need to develop an effective international mechanism to guide and co-ordinate the response to future large-scale environmental crises. What we really need is a predetermined procedure to initiate immediate action and criteria to be used to trigger an international response. Once this is agreed upon, regular exercises need to be conducted to test response readiness."

Mr Gerges added: "Our experience from dealing with the Kuwait crisis, with the complexity of its environmental consequences, showed that the U.N. family of agencies can work together effectively if the objectives of the joint action are established, the distribution of responsibilities is clearly defined, and a strategy for co-ordination, communication and data management is developed and implemented from the outset of any response to an environmental crisis."

OCA/PAC seeks two Programme Officers

UNEP has issued Vacancy Announcements for two P-4 level Programme Officers to start duty at OCA/PAC in Nairobi in September 1992 with an initial contract for two years.

Vacancy NA-92-13 is for a Programme Officer (Coastal Resource Management) with a closing date for applications of 1 July 1992. Vacancy NA-92-14 is for a Programme Officer (Coastal Land-use) with a closing date for applications of 3 July 1992.

Qualifications sought are an advanced university degree in environmental sciences or technical sciences relevant to OCA/PAC activities; at least 10 years post-graduate professional experience in co-ordination of multidisciplinary inter-country projects; fluency in English or French and a good working knowledge of the other. Knowledge of other UN languages is an asset. Qualified women candidates are encouraged to apply.

The grade P-4/1 salary (net per annum) in US dollars is $37,101 + $6,678.18 post adjustment at the single rate, $39,952 plus $7,191.36 post adjustment at dependency rate. Post adjustment is subject to change because of cost of living fluctuations. Conditions include 60 days paid leave every two years, an education grant of up to $8,250 per child per academic year for expatriate candidates and duty-free importation of personal car.

Candidates are requested to provide fax/telex numbers and to quote the vacancy number attaching an updated United Nations Personal History form available from the nearest UN Office or on request from UNEP. If the UN form is unavailable, a detailed curriculum vitae including birth date, nationality and working knowledge of United Nations official languages should be submitted.

Applications should be sent to The Chief, Recruitment Unit, UNEP, P.O. Box 30552, Nairobi, Kenya. Fax numbers are for UNEP (2542) 228890 or 226886 and Personnel Section (2542) 217839.

Global 500

Several friends of OCA/PAC and marine science were named for the Global 500 awards announced on World Environment Day 1991 (5 June). The awards were launched in 1984 to pay tribute to successes on the front lines of global environmental action. The 1991 recipients included:

Don Henry of World Wildlife Fund, Australia. As director of the Wildlife Preservation Society of Queensland and editor of *Wildlife Australia*, he has succeeded in generating grassroots support for conservation among rural people. He is also President of the Moreton Island Protection Committee.

Claude Michel of Mauritius taught biology for over 20 years then directed the Mauritius Institute of Education for 10 years. He has played a major role in promoting environmental awareness throughout Mauritius by his weekly newspaper articles over the past 20 years on plants, animals, marine life and environment of the country and the south west Indian Ocean. After early retirement, he has continued to work for the Institute as a curriculum developer and lecturer in science, biology and environment.

Geoffrey Palmer, who has been Prime Minister and Minister for the Environment of the New Zealand Government, was instrumental in the production of the Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific. The announcement of his award stated: "Palmer was the driving force behind the New Zealand Ozone Layer Protection Action, and he also established the New Zealand policies to mitigate global climate change. His leadership made New Zealand one of the first countries in the world to introduce comprehensive resource management legislation."

Roger Payne, President of the Whale and Dolphin Conservation Society in Lincoln, Massachusetts, USA, discovered in 1968 that the humpback whales sing songs. His studies resulted in the 1970 record album *Songs of the Humpback Whale*, a major stimulus to the Save the Whales movement among the general public. "Dr Payne's current research includes a 21-year behavioural study of the whales of Argentina, demonstrating that it is possible to study free-swimming whales in the wild without injuring them," the award announcement said. "Past research from his Society includes studies of the potential disturbance to whales of sounds generated by offshore industrial development."

It's the only way she can hear whale songs

Starkist Seafood Company of Long Beach, California, USA, announced in 1990 that it would no longer sell tuna captured with methods that kill dolphins. The decision by the world's largest tuna fish canner made 75% of the US canned tuna market "dolphin safe" almost immediately. Asian and European canners followed this example shortly afterwards.

Previously, Pacific tuna fishing fleets often dropped their nets on dolphins because the tuna are known to swim under the schools. The practice caused an estimated 100,000 dolphin deaths each year.

Starkist is now encouraging foreign nations to use only "dolphin safe" fishing methods, and supports the United Nations call for a global ban on driftnet fishing.

The next *Siren* will announce the 1992 awards.

Bon voyage, Margaret!

Anyone who has passed through OCA/PAC during the past three years will no doubt have encountered Margaret Roberts. Margaret was the one to whom all those with any sort of problem turned. With her infinite patience – together with her persuasive powers and negotiating skills – she would do her utmost to set things to right. Margaret joined OCA/PAC as Senior Administrative Assistant (Programme) in October 1998, having previously worked for many years in UNEP's INFOTERRA/PAC. During her three years in OCA/PAC, its staff, consultants and visitors have enjoyed the best service to be found anywhere, thanks to Margaret's management skills and her admirable execution of administrative and personnel tasks which she tackled with great enthusiasm.

In November Margaret took leave of OCA/PAC after 15 years with UNEP and returned with her husband Stewart and daughter Pippa to their homeland of Wales. She will be missed by all who knew her and well remembered for her good humour, kindness and wonderful hospitality.

Welcome back, Maria!

Margaret's replacement, Maria Cunningham, is no stranger to OCA/PAC. Maria, who comes from Sligo, Ireland, joined OCA/PAC in March 1987 and in May 1988 became Senior Secretary to the Director. Maria left OCA/PAC in June 1991 and spent five months with UNEP's Conferences and Governing Council Service before returning to OCA/PAC in November to take up the post vacated by her good friend and colleague, with whom she had worked closely for almost three years.

Climate change update

UNEP's Governing Council has urged Governments to increase support for activities related to sea-level rise. At its meeting on 23 May 1991 UNEP's highest policy-making body asked the Regional Seas Programme to help developing countries to build their own capability to assess vulnerability to sea-level rise, identify appropriate response strategies, and develop integrated coastal management plans. The Governing Council resolution also called on international and non-governmental organizations to participate fully in the work of the Intergovernmental Panel on Climate Change (IPCC) and the Regional Seas Programme on these issues.

In parallel with the Governing Council, OCA/PAC held talks with IPCC and the Intergovernmental Oceanographic Commission. A meeting of experts on methodology for assessment of vulnerability to climate change and sea-level rise took place in Geneva last August to further coordinate work by IPCC and OCA/PAC in this field. Three international workshops are being organized to produce a report on assessment of vulnerability. OCA/PAC has been asked to help in the studies, workshops and report drafting.

By John Pernetta

Since 1987 UNEP has set up 10 regional task teams through OCA/PAC to consider the impact of climate change. The teams, covering 109 countries with contributions from 200 specialists in a wide range of disciplines, presented interim reports to a joint meeting in Singapore on 12-16 November 1990. Almost all have now completed their regional surveys and have moved on to theme- and site-specific studies (see *The Siren* 43 for a report on Mediterranean activities).

The Singapore meeting concluded that "environmental problems are already critical in many parts of the world, and the potential impacts of climate change will exacerbate current problems."

The meeting warned: "A failure to address problems now will make future responses to climate change and sea-level rise more difficult and in some cases impossible."

A global rise in mean sea-level of up to 20 cm would not, in itself, make a significant impact except locally, the joint meeting noted. "However, relative changes could be as much as five times this value due to factors such as subsidence, groundwater extraction and sediment compaction. The rise in sea-level will inundate lowland areas, erode beaches, exacerbate flooding and increase the salinity of soils and groundwater, rivers, estuaries, lagoons and aquifers," the task teams reported. But the scientists offered this hope:

"Some of the most adverse consequences can be diminished or mitigated if society takes timely anticipatory action."

They also assessed the effect of their work and public awareness of the problems.

"The potential loss of lowlands due to sea-level rise, now perceived by the lay public and some managers and policy-makers as the main problem facing the coastal terrestrial environment, can be considered in most cases only as the most obvious and visible expected change," the experts concluded. "The secondary effects of the expected sea-level rise (such as intrusion of saltwater in coastal and island freshwater reservoirs) may be of far greater importance and should be identified as such. The expected temperature elevations may also have, in some regions, secondary effects on systems and processes far exceeding the magnitude of the direct effects. Increased precipitation caused by increased evaporation, changes in oceanic regimes due to changes in current and tidal regimes, and increased frequency and severity of episodic events are a few examples. The adaptability of coral and mangrove ecosystems to the expected changes will largely depend on the rate of these changes. There are indications that some of these ecosystems may be unable to adapt to the originally assumed rates of change (1.5°C and a sea-level rise of 20 cm by the year 2025, with increases to 4.5°C and 140 cm possible before the end of the 21st century)."

South-East Pacific

This region of five Latin American countries is already affected by the sporadic appearance of unusually warm water that produces dramatic alterations in local meteorological, oceanic and biological regimes (the el Niño phenomenon). There is concern that the frequency of el Niño, which has a major impact on coastal areas and their fishing harvests, might increase.

By Jairo Escobar, Co-ordinator of the Regional Task Team

As we reported earlier, el Niño's impact on a short-term basis simulates the effects that might result from gradual increases in the temperature and sea-level as a consequence of global warming.

Generally climate change will alter the composition of catches and require adaptation in the fishing effort. Traditional species will disappear and other rare or scarce species will increase in biomass. Catches that often reached 6-8 million tons a year dropped to 1.5 tons during 1982-3, following el Niño. The economic losses associated with this downturn were put at US$100 million. Common species vanished almost completely from commercial fish catches, among them the anchovy. This affected guano-producing birds and resulted in starvation for marine predators.

The warming produced during el Niño reduced the numbers of benthic species because of the migration of

species associated with warmer waters. Polychaetes and Nemertines increased in density and biomass to depths of 50–100m.

El Niño affected the distribution of demersal species and their behaviour. Some disappeared totally. Tropical fish invaded the subtropical waters. These changes could be observed even 150 km offshore.

To judge by available palaeobiological evidence from before the last Ice Age, an increase of 20 cm in sea-level may have no adverse effect on coral reefs but any increase in temperature over 1.5°C would produce serious disturbance. The record from el Niño in 1982-3 shows that coral bleaching and expulsion of zooanthellae from corals resulted when sea surface temperatures rose to 30°C.

As a result of el Niño, saline wedges of water penetrated estuaries. The effects were particularly seen in the composition of mangroves. Sea-level rise led to inundation of the coastal zones and changes in patterns of sedimentation. In severe cases there was massive mortality of estuarine fauna. The predicted changes in climate and sea-level are likely to mean a regression of the coastline and increased erosion at the same time.

As a result of el Niño in 1982-3 malaria reached epidemic proportions. Coastal roads and structures were destroyed or seriously damaged. The Economic Commission for Latin America (ECLA) estimated that US$2667 million was lost in production, damage to physical infrastructure totalled US$634 million (18%) and losses in the social sector stood at US$179 million (5%).

The Task Team, which completed its overview last March, has proposed a case study to assess the socio-economic effects of climate change in the South East Pacific. This would involve an integrated study of the geographic, social, economic and legal status of the coastal areas. The information could be integrated with the conclusions of basic climate change studies. We expect to be able to identify sensitive areas and characterize each of the identified sub-regions.

South Pacific

Environmental changes which increase the stress on islands' subsistence or commercial economic bases are commonly extremely damaging. In addition, rising sea-levels threaten coastlines and groundwater resources of islands that are entirely low-lying and coral-based. Pacific islands have large ratios of coastline to landmass, and are often low-lying, making them highly vulnerable to the impact of climate change. A rise of more than one metre, or a more stormy wave climate, could spell total destruction for several islands.

By Marjorie Sullivan, Co-ordinator

The Task Team found that even low and medium levels of global climate change would have severe or profound impact on 14 Pacific island States. Isolated small island States are economically vulnerable, and the Pacific region has more than 3000 small isolated islands.

As a result of projected climate changes, all equatorial and sub-equatorial locations in the Pacific will suffer year-round or periodic conditions of severe discomfort and thermal stress by 2050. Patterns of work will need to change, especially for outdoor workers. There will be an increasing need for atmospheric management in urban areas: changes need to be made in commercial or office building design to encourage air circulation and avoid the need for energy-consuming air conditioning.

We expect an increase in storm surges and higher energy waves generated by intensified cyclonic activity in latitudes of about 10° North and South. A direct change on surface water temperatures of 1–2°C may cause coral dieback, which could also lead to an increase in the energy of coastal wave climates. Under warmer conditions, crop potential will change and replacements may not be available. A large number of cultures and traditions face extinction if sea-level rise forces migration — cultural identity, an extremely important concern in the Pacific islands, is difficult to maintain in migrant communities. The social, political and economic integrity as well as the physical and biological environments of more than 800 separate human cultures will be threatened by projected climate changes in the region of five million people.

Lobbying at an international level is unlikely to bring a satisfactory solution, the Task Team concluded. Interim measures need to be taken to maintain an acceptable quality of life in the next 30-50 years before response strategies to rising sea-levels become imperative.

It has become apparent that there are major gaps in our knowledge, especially of the ocean-atmosphere system. Careful monitoring and continued research are therefore essential if workable strategies are to be found. If remedial strategies are to be successful, Pacific islanders must be involved in the monitoring and in the strategies themselves. Reliance on outside experts is not seen as a viable option.

Careful monitoring of reef systems is necessary. Coastal defence structures are not a practical option for most Pacific islands. This means that options such as massive reforestation or migration must be considered. Their consequences need to be examined carefully.

The South Pacific Task Team has proposed five national in-depth studies, based on requests made by Governments during an intergovernmental meeting held in Majuro in 1989. In addition, it is proposed to put together a compendium of educational materials for school children of primary to intermediate level and to publish a fourth volume of topic reviews.

East Asian Seas

The five countries of the region have numerous islands and extensive coastlines. There is high species and habitat diversity. Rapid population growth, concentrated along the coast, has degraded living resources and led to over-exploitation. The region depends heavily on the seas, and fish are a major source of protein in human diets.

By Chou Loke Ming, Co-ordinator

The impacts of a 20 cm sea-level rise by the year 2025 are likely to be insignificant compared with anthropogenic factors operating in the coastal environment. Certain beneficial impacts could result from climate change: for example, use of better irrigation systems to offset the loss of water and measures to take advantage of the higher CO_2, which increases plant growth rates.

Past records show that agricultural practice in East Asia is very adaptable to extreme climate events such as droughts and floods, and that it is possible to arrange mitigation measures in advance. The agricultural sector will stand to benefit from climate change through CO_2 fertilization, which may increase yields by 10-50%, provided that moisture is adequate.

Adverse impacts on agriculture and forestry from sea-level rise will result more from salinity intrusions inland than from loss of land itself. The effect of climate change on tropical forests will be severe, adding stress to existing situations such as nutrient-poor soil and the alarming rate of deforestation in the region.

Coastal erosion may cause large changes in nearshore current patterns. This, coupled with salt water intrusion into estuarine areas, can have adverse effects on the breeding and nursery grounds and migratory patterns of some economically important fish and crustacean species. Fisheries production will be affected and mariculture techniques now in operation along coastlines may change. Theoretically, mangroves can migrate landward in response to sea-level rise so long as freshwater supply remains adequate. The change in salinity patterns through increased rainfall will affect non-tolerant species, leading to deaths in affected zones. Mangrove species are also expected to be stressed by elevated temperatures.

With the projected rise in air temperature by 2025, rainfall is expected to increase. Present sea surface temperatures are likely to increase slightly. Enhanced evaporation and precipitation will affect salinity. Vertical stability of the already stable surface waters of the tropics will increase further, inhibiting vertical mixing. This has implications for the biological productivity of the marine environment.

Sea-level rise may provide the environmental conditions for coral reefs to optimize structure and orientation. A sea-level rise will reduce the frequency of aerial exposure of reef flats and may promote growth in this zone. Depressed

salinity will be detrimental to species unable to tolerate large salinity fluctuations. A sudden increase in water temperature may also cause corals to bleach, resulting in mass mortality.

The projected climate change and sea-level rise will probably exacerbate socio-economic problems that already exist in these areas. Coastal dikes and protective devices will have to be raised or modified to prevent increased wave overtopping.

The incorporation of climatic risk factors into coastal zone management plans should enable responses to be envisaged against the impacts of climatic change and sea-level rise. But these have not been considered in national development plans of the East Asian Seas countries so far. Policy makers are not truly convinced of the projected climatic change in the next century or of the need to incorporate such factors into development plans, because of the lack of concrete evidence.

The task team has proposed three site-specific studies:

i) assessment of the socio-economic impact of saltwater intrusion into the major river basins of Brunei Darussalam;

ii) assessment of the impact of saltwater intrusion on coastal aquifers in Cebu, Philippines; and

iii) evaluation of potential impacts of sea-level rise on reclaimed land in Singapore.

Six subject proposals have also been presented: studies of interannual variability of monsoons and typhoons, numerical modelling of Southeast Asian seas, research into the severity of beach erosion, long-term monitoring of coral reefs, a study of the impact of coastal erosion on traditional mariculture, and assessment of the impact of sea-level rise on seagrass beds. It was suggested that the work carried out under the ASEAN-USAID Coastal Resources Management Project could be expanded to include the impacts of sea-level rise and climate change.

South Asian Seas

The five countries of the region include the Maldives and Bangladesh, considered by experts to be among the nations most vulnerable to climate change. Three of the countries are completely coastal, one is a large island (Sri Lanka) and one an archipelago (Maldives). The rise in sea-level threatens to erode the Maldives' 1200 islands. Intensive flooding, erosion, cyclones and storm surges threaten to destroy over one-third of Bangladesh. All five countries are densely populated. Their coastal areas are heavily utilized for fish and agricultural production and as centres of industry.

Adapted from the report

The outstanding feature of the South Asian Seas region when looking at the impacts of climate change and sea-level rise is its large population, over one billion. About 10% live on the coast at the moment and according to demographers, the population will probably double by the turn of the century, reaching two billion by 2025.

Coastal zones are already under great pressure from accelerating population growth, pollution and flooding. Changes induced by global warming will most

severely affect these areas. Sea-level rise is considered the single most important source of change in coastal zone processes, causing beach erosion, farmland loss, wetland loss (including mangroves and coral reefs), frequency and severity of flooding, and disturbance to hydrological systems. These impacts will be severe indeed, affecting the lives of millions of people living in the deltas and low-lying areas. They can threaten unique ecosystems and cause enormous economic damage. Sri Lanka's tourism, for example, is largely linked to its beautiful beaches. Coastal erosion will affect these revenues. Both mangroves and coral reefs will be damaged by rise in sea-level.

Various phenomena in the South Asian Seas region are likely to be intensified by climatic changes. These include: variability in southwest monsoon and associated precipitation patterns; intensification of cyclones and changes in their frequency and path; intensification of storm surges with the rise in sea-level; and changes in air-sea interaction, causing changes in circulation and in marine productivity.

They said the storms would intensify, but this is ridiculous!

The main concern is the increase in intensity of tropical cyclones. As the sea-surface temperature rises from 26 to 30°C, the saturation vapour pressure increases by 26%. This makes considerably more water vapour and latent heat available for conversion to kinetic energy.

The region's deltas, particularly mangrove swamps, which serve as breeding grounds for fish, are already threatened by construction of dams and river diversion, decreasing the sediment flux to the sea and producing a relative rise in sea-level. A global rise in sea-level will add to the problems.

The maximum elevation of Male (the capital island of Maldives) is no more than 2-3 metres above sea-level. Given the high porosity of coral and coral sand, the construction of dikes may not be enough to counter sea-level rise since the continuous flow of water underground would demand expenditure of an immense amount of energy for drainage.

We expect the intensity of the monsoon circulation to increase. The atmospheric low pressure generally known as Heat Low that develops over the sub-continent during summer is likely to drive monsoon winds even more strongly. At the same time, a warmer ocean could supply more moisture to these winds. The present interannual variability of the monsoon system will probably smooth out, giving place to almost steady monsoons each year. The periodic droughts known in the region can be expected to gradually wane.

The sea's new thermal field created as a result of increased temperatures is liable to trigger large fish migration. Undoubtedly the temperature increases will also influence evaporation and precipitation patterns, species composition and plankton blooms. Upwelling will be intensified off Somalia and the Arabian Peninsula.

Three main projects have been proposed: a case study for Bangladesh on the impact of sea-level rise; a case study of the Indus Delta, which has seen a progressive reduction in freshwater discharge over many years; and a study of storm surges in the region.

The Wider Caribbean

This region's diverse landscapes and habitats include low-lying coral islands, volcanic islands, coastal plains, deltas, coral reefs and wetlands. These characteristics, combined with the region's racial and cultural diversity, make many countries important recreation and tourist centres. If climate change and sea level rise of the predicted magnitude were to take place, then the economic structures of many of these countries would be significantly disrupted.

From the Task Team report

The record of the past 5000 years shows that many wetlands in the region have kept pace with rising sea levels, but in subsiding regions they would be in danger of becoming inundated. There could be significant loss of wetland economic activities, such as shellfish industries, with a 20 cm rise in relative sea-level.

If reefs continue to grow at currently estimated rates of 1-20 cm a year, they could keep pace with such a sea-level rise by the year 2025. However, not all species develop at the same rate; and those affected by other kinds of environmental stress such as storms, sedimentation, pollution, turbidity and so on, would be unable to cope with a sea-level rise of this magnitude. Mangroves are generally expected to cope favourably with predicted sea-level rise, provided other stress factors do not become critical.

Seagrass beds are important for stabilizing bottom sediments and are critical habitats for juveniles of many fish species. The predicted sea-level rise is not expected to have a widely distributed detrimental impact, provided that wave energy, light penetration, substrate conditions and the influence of herbivores do not change significantly.

The major deltas of the Wider Caribbean — especially the Mississippi in the United States, Magdalena in Colombia and the Rio Grande between the USA and Mexico — would be likely to experience thousands of hectares of shoreline retreat. Benthic systems in these deltas would be most vulnerable.

Among estuaries, areas suffering from downwarping or subsidence would be worst hit, for example, the Maracaibo region of Venezuela, the northern Gulf of Mexico from Texas to Florida, and the western Gulf of Honduras.

The greatest impact of sea-level rise on fisheries would be expected where there is a simultaneous increase in turbidity. Estuarine-dependent species could suf-

fer badly if there is a change in salinity. The most vulnerable areas would include the Mississippi, Everglades, Guyana and the Orinoco Delta region. The loss of agricultural land through saline water intrusion would vary with the character of the coast but continental margins are not likely to be widely affected. For most of the region, the impact on forestry should be negligible.

Tourism is the single most important industry in the Wider Caribbean. On islands like Bahamas, Barbados and Antigua, this is the number one foreign exchange earner and employs large numbers of people. The most significant impact of climate change on tourism is likely to come from beach erosion. While shoreline migration may lead to the creation of new beaches, the protection and stabilization of existing ones could be burdensome on national economies. When the effects of climate change are coupled with other stress factors (among them sand mining and mortality of reefs), the region's beaches would be highly vulnerable.

Where seawalls, bridges, revetments and other engineering structures become necessary, severe stress could be placed on the economies of many States. Municipal water supplies, sewerage systems and drainage will have to be modified substantially in vulnerable, low-lying areas where large populations would be at risk. Again this will have financial implications for the region.

It is also expected, as elsewhere in the tropics, that both a temperature rise and a sea-level rise will affect human health, because certain disease-carrying organisms and pathogens could find more favourable habitats, thereby creating additional health problems.

After the completion of the overview of the Caribbean in the second half of 1991, the Task Team has proposed an evaluation of the impact of climate change and sea-level rise on extreme events in the Wider Caribbean. The

objectives are to identify possible changes in their frequency and severity as well as the cost and social/economic implications of such changes.

Eastern Africa

Some 14% of the region's population lives on the coast, and on its islands the proportion is even higher. Its four continental states, one large island state, three smaller archipelagic states and the Eastern African territories of France in the S.W. Indian Ocean have an estimated 62 million population, with a high average growth rate, vulnerable economies, and areas subject to environmental stress. To a significant extent the region depends on coastal resources.

By Vijaya Lakshmi Saha, Co-ordinator

Rapid urbanization has led to inadequate water supply, overcrowding and unsatisfactory waste disposal (much discharged directly and untreated into rivers and to the sea). The economies of East African countries are dominated by agriculture, but fishing is an important source of food, contributing to the economies of the majority of its countries, and tourism is a major activity. The coastal impact of climate change and rising sea-level will affect coral reefs, lagoons and mangroves, with perhaps further coastal erosion. Changes in precipitation will affect the quality and quantity of water available from the three dominant regional sources (rainfall, rivers and groundwater). Increased flooding risks, rising sea-level and recurrence of storms would also lead to a decline in water quality. Increased dry conditions would put inordinate pressure on water resources.

On islands, with latitudinal and altitudinal shifts in plant and animal species, biodiversity will be reduced. Increased aridity along the dry coastal areas would in the long run affect the current ecological balance while extreme events could be destructive to coastal forests and to mangroves. Agriculture and fisheries will be affected as elsewhere. Socio-economic infrastructures such as port facilities, waste disposal systems and roads are already under stress, which climate change would increase.

The wide variations in the region will mean extreme variability in the impacts. Fuel efficiency should be encouraged at all levels, and priority given to the use of clean, renewable, local resources such as hydro, solar, tidal, thermal and biogas power in preference to imported fossil fuels.

There will be a greater need for water storage, both for domestic use and irrigation. Hydrogeological research should be encouraged with the aim of exploiting the region's huge underground aquifers. The investment should be less costly than surface water projects. Recycling and multiple use of water should be encouraged. Conservation of forests should be improved, national forestry services should be given the resources to carry out their tasks, and agro-forestry projects provid-

ing wood for domestic purposes should be encouraged in the vicinity of settlements.

National strategies should aim to minimize journeys to work, promote the use of bicycles, and favour efficient mass transit systems.

In the past, lack of planning in development of coastal areas has contributed to haphazard location of buildings, creating greater vulnerability to sea-level rise. Governments should now favour the adoption of an integrated planning approach, and adopt a coastal management strategy that will identify all vulnerable areas, ban new developments if necessary, and start protection measures for heavily built-up areas.

There are considerable gaps in research, and an inventory of such gaps needs to be made.

As national awareness of climate change grows, the need to collaborate more closely on issues will be felt at the regional level. The need for a regional climate scenario is critical for accurate forecasting of the impact of temperature increases and sea-level rise. This is unlikely to be available for some time. A co-ordination programme between the various national climate change units should be encouraged at regional level. The Task Team has proposed two preliminary studies: on the Kenyan Coast and within the territorial zone of Mauritius. With assistance from OCA/PAC, a vulnerability assessment of both coasts to sea-level rise and climate change has started as of this year (1992), and will last for several months. Multidisciplinary teams are involved in both countries and the outputs of the preliminary research will be discussed at national seminars scheduled for later this year.

West and Central Africa

Ten areas have been identified for detailed study in the West and Central African region. The three highest priority areas are the Niger, Volta and Senegal deltas. In addition, detailed socio-economic appraisal is proposed on the implications of climate changes and sea-level rise for the coastal population and human settlements of the region.

From the report of Oyediran Ojo, a member of the Task Team

West and Central Africa, with its 21 coastal countries from Mauritania in the north to Angola in the south, faces severe consequences from any significant changes in weather or climate, which are of considerable importance to the economies of its countries. Coastal populations are growing rapidly, putting increased pressure on natural resources. High-value capital infrastructures can be found in large low-lying urban centres. The region has diverse marine and coastal ecosystems, while renewable and non-renewable coastal resources of West and Central Africa are subject to degradation. These are all topics that require special attention in any assessment of the impacts of predicted climate change on the region. Erosion and flooding are currently twin scourges along the West and Central African coasts. Lives and property are already at risk. These environmental hazards would increase with climate change and sea-level rise. Many barrier islands are vulnerable to flooding, while many industries and oil-handling facilities would be affected. Sea-level

rise would also cause flooding and disruption of natural ecosystems

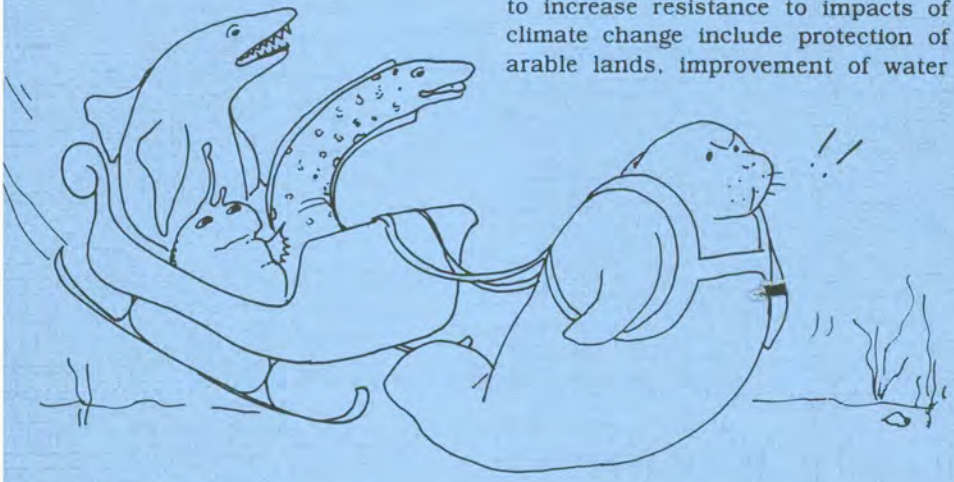
In general both atmospheric and oceanic circulation would be affected as the wind patterns would be modified. Higher sea-surface temperature and increased wind force may lead to further increases in thunderstorms. There would be a greater tendency to droughts and desertification in some parts. Climate change affecting water supply systems would lead to greater water stress and economic loss, particularly in the savanna and semi-arid zones.

There would also be problems in maintaining water in reservoirs and lakes, with famine and drought as the result. The stress on forests for fuel would increase, though the extent of woodlands would diminish. Hydro-electric production would be adversely affected, again influencing water demand. Most of the current coastal and low-lying floodplain vegetation and ecosystems would be lost to flooding and permanent inundation.

Fisheries would be affected by the changes in coastal ecosystems and by the greater salinity stress inland with the invasion of sea water.

This factor and the change in agro-ecological zones will affect farming. Transport, commerce, industry, tourism and recreation will also be affected. In West and Central Africa, movement of goods could become chaotic. Many of the current transport routes would be inundated, while many industrial and commercial institutions would have to close – particularly oil wells – as the coast is swamped. Heat and water-related diseases would increase.

Strategies for averting or reducing climatic change include reducing demand for fossil fuel by use of alternative energy sources, technical solutions to control emissions, and increasing biomass production such as reforestation of denuded areas. Strategies for minimizing the effects should involve low-cost simple technology. Measures to increase resistance to impacts of climate change include protection of arable lands, improvement of water



I am NOT an alternative energy source !!

management, application of agricultural technology, improvements in land-use policies and practices, and introduction of disaster-relief measures. The West and Central African Task Team concluded that it is necessary to evolve and implement measures both regionally and locally, to stop haphazard urbanization, to preserve the ecological characteristics of coastal areas, and to promote sustainable development of the coastal zone.

Kuwait Action Plan Region

About 10 million people and some of the area's most important cities are on the coast area. It is also estimated that more than 10 million barrels of oil were extracted daily from the region in 1990.

By Elsayed Hassan, Task Team Co-ordinator

The ROPME Sea Area can best be looked at as consisting of three distinct but freely connected regions. The first is the northern part of the Arabian Sea to the south of the southern coast of Oman and Iran. The second is the Gulf of Oman, a broad roughly triangular arm of the Indian Ocean, its base being the northern boundary of the first region and its apex at the shallow Strait of Hormuz which has a maximum depth of about 100m. The third is the semi-enclosed sea area between Kuwait and the Strait of Hormuz, fed by freshwater from the Shatt Al Arab River and other intermittent streams. It has the highest evaporation rates in the world. Its salinity reaches the maximum for any body of water freely in contact with the ocean, higher than the Red Sea and Mediterranean. Its shallowness produces swift and large responses to atmospheric variations. Important fisheries exist in the first and third areas mentioned.

A rise in the sea-surface temperature of a few degrees will have an immediate impact. As condensing water vapour in the atmosphere is the main source of energy for the wind, storms are expected to become more frequent and violent, especially in the summer. A permanent rise in sea-level could affect the tides in the inner sea. It would increase the area suitable for mangrove development, especially on the Arabian side. If minimum winter temperatures increase, this would extend the northern limit of mangroves beyond Tarot Bay. Coral reefs, an important ecosystem in the inner sea area that once supported a significant population of pearl divers, would be adversely affected by an increase in the summer temperature, although milder winter conditions might offset that. The population of the ROPME countries is increasing fast, and the coastal population even faster because of the coast's economic and recreation attractions and official settlement policies. The trends expose an increasing number of people to the consequences of climatic changes. Reasonable alternative strategies for coping with expected problems in the region need to be investigated.

Mediterranean

Climatic changes as a result of global warming will occur gradually. They will not manifest themselves for another 3-4 decades. This does not mean we can wait 40 years to think about the problems and take action.

by Ljubomir Jeftic, Senior Marine Scientist, Mediterranean Action Plan

Between now and 2025 hot dry summers could increase in frequency, as could exceptional droughts, rainfall and floods, marine storms, tidal surges, bouts of water stagnation, and eutrophication. Increase in temperature would lead to an increase in land degradation, deterioration of water resources, decline in agricultural production and damage to natural terrestrial and aquatic ecosystems.

Salinization of irrigation water would reduce yields of sensitive grains. New varieties of crops have to be introduced, adapted to the new natural setting and yield standards. Marine circulation could be altered both in the Mediterranean and the Atlantic, thus affecting marine productivity and the pattern of pollutant dispersal.

Generally, marine and land weeds are expected to benefit from a warmer, CO_2 richer atmosphere. Flora and fauna of wetlands will be forced to adapt to the new conditions or die out. The effects might be critical for species that possess reduced tolerance to high salinities. Several species will migrate north with the shifting bioclimatic zonation, and insect populations might increase. Conditions will be favourable for agricultural pests, bacteria and diseases, especially in the swamps.

Though the degree of sea-level rise is difficult to foresee, the effects are predictable: 1) direct wave impact on exposed coasts (e.g. the Venice lagoon coastal barrier and beach resorts); 2) direct wave impact on harbours (Alexandria, Port Said, La Goletta-Tunis, etc.); 3) flooding of estuaries, canals, lagoons, which should be more serious for agriculture than for lagoonal fishing (degradation of lagoons such as Venice's, however, could seriously affect wildlife and fish resources); and 4) aggravation of existing shore erosion problems by a rise of only 10-20 cm.

A global mean eustatic rise in sea level of about 20 cm by 2025 would not, in itself, have a significant impact in the Mediterranean, except locally (e.g. lagoons). However, local sea-level changes could be up to five times this, because of natural land subsidence. This could be increased by excessive groundwater withdrawal. Particularly negative effects will be felt in low-lying areas, deltas and coastal cities.

Non-climatic factors such as population increases and present development plans may far exceed the direct impacts of climate change on Mediterranean society. Nevertheless, society will become ever more vulnerable to climatic stress, particularly in the south. Together, these demographic and climatic changes would increase the probability of catastrophic events and hasten their occurrence.

Most of the deltaic lowlands of the Mediterranean are experiencing serious environmental problems already because of agricultural, industrial, urban and tourism development over the past two decades. Problems range from water pollution and salinization to land subsidence, shoreline erosion, and restriction or deterioration of wildlife habitats.

This vulnerability is increased by adverse socio-economic conditions, the effects of which will be superimposed on those of climatic change.

The physical impact of sea-level rise on the Mediterranean lowland coasts can be predicted, even modelled quantitatively, on the basis of the present parameters of morphology, hydrodynamics, sediment budgets, land subsidence and the effects of artificial structures. Equally, the impacts of altered rainfall distribution on surface and groundwater could be modelled quantitatively, and the effects of increased air temperatures and changed soil-water parameters on biosystems can be estimated, at least qualitatively.

Together they can give us some idea of impacts on agriculture and fisheries. What is more difficult to estimate, is the impact of these physical and biological changes on the future socio-economic framework of the threatened lowlands.

Coastal zone management must be based on "cost effectiveness", which means we have to make an assessment of the "value" of the threatened land uses. Our estimations, however, must take account not only of their present functions, in the context of local needs, but also of the importance of the lowland to its hinterland and further – and especially their functions and importance in the decades ahead.

Regarding sea-level change, actions can be either preventive or reactive. For example, entire coasts and lagoon margins can be walled in. Choices must be made between irreplaceable harbours, towns of historical-artistic value, lagoonal resources, agriculture, and adaptations. Examples of adaptation would be: a) shifting land uses; b) a different approach to beach recreation (i.e. making them less urbanized); and c) replacement of extensive, uneconomical crops in sub-zero lands with lagoons devoted to aquaculture and nature reserves. The lagoons would act as a buffer belt, since their inner margins can be more easily protected than the exposed coast.

Close attention needs to be paid to the conservation of soil, groundwater and wetlands resources in the Mediterranean, because they contribute substantially to environmental stability. The adverse effects on downstream human settlements and ecosystems of large dam schemes have not been considered sufficiently in past planning. Future water management plans must be scrutinized more closely in relation to climate change.

Of particular importance is the need to initiate research on all climatically-induced changes and to control and plan coastal development well in advance of the postulated sea-level rise in order to minimize the negative effects and make future protection cost-effective. ❑

Mediterranean

United for a safer sea

Fifteen Mediterranean countries and the European Community, meeting in Cairo in October 1991, agreed on common measures against pollution by solid litter, disease-causing micro-organisms, pesticides, and radioactive substances.

The 7th Ordinary Meeting of the 19 Contracting Parties to the 1975 Barcelona treaty for the Protection of the Mediterranean Sea against Pollution also recorded progress towards new international agreements on offshore exploration and on hazardous wastes.

"This is another step in the 16-year programme to make Mediterranean beaches and coastal waters cleaner and safer for swimming and eating seafood," said William H. Mansfield III, Deputy Executive Director of UNEP.

Control measures approved by the meeting call for educational programmes, aimed mainly at young people, but also to increase general public awareness of the vital importance of keeping beaches, coastal wastes, the open seas and rivers free of litter. One measure says use of biodegradable synthetic substances should be encouraged. Another urges "national and local authorities to carry out beach-cleaning operations".

The Mediterranean Governments and the EC agreed that "more care should be devoted to the maintenance of proper hygienic quality in public beaches, in particular the assurance of public participation in such maintenance (...)

Serious consideration should be accorded to possible solutions to the problem of beach overcrowding."

They proposed that future epidemiological studies correlating recreational and sand quality with health should be more closely linked to other large-scale studies, while recommending a "precautionary approach" to pesticide levels allowed in the marine environment. The Mediterranean States and the EC therefore agreed "to promote measures to reduce inputs into the marine environment and to facilitate the progressive elimination by the year 2005 of organophosphorus compounds" and to immediately monitor "hot-spot" areas, taking steps to reduce pollution levels if warranted.

On radiation, a resolution concluded that "methods and reporting of monitoring operations on releases of radionuclides into the Mediterranean marine environment should be harmonized internationally as much as possible so as to facilitate the assessment (...) at a regional level."

The meeting passed on to the Bureau (executive committee) a draft protocol on offshore exploration and exploitation of petroleum, gas and minerals. The offshore protocol was drawn up by the Rome-based International Juridical Organization. It was reviewed by experts at two meetings and completed at a third session on the eve of the Cairo conference. The next step would be a Plenipotentiary Conference for its formal adoption, which could take place this year. Amendments to the Mediterranean anti-dumping protocol are likely to be submitted to the Plenipotentiaries at the same time, to ban incineration of wastes at sea and marine dumping of industrial wastes.

The approximately 50 participants, including five Ministers, approved creation of a working group of experts on a protocol to control transboundary movements and disposal of hazardous wastes.

"These decisions are encouraging," said the meeting chair, Dr Atef Mohamed Ebeid, Egypt's Minister of the Environment. "As for the budget, the meeting fell $200,000 short of the Secretariat proposal of about $13.2 million for 1992 and 1993. That's not too bad, when you think of the global economic recession."

A decision on an Action Plan to protect cetaceans in the Mediterranean was postponed to allow the focal points in the 18 countries, meeting in the first half of this year, to consider the text in more detail.

The Contracting Parties named Egypt as the Bureau President, Monaco and Tunisia as vice-presidents, and Israel as rapporteur in electing a new Bureau for the coming two years.

In his opening statement to the meeting, UNEP Executive Director Dr Mostafa K. Tolba described the Mediterranean Action Plan as "a great success". All States except Syria and Lebanon have ratified the Protocol to control land-based sources of pollution. Sixteen have also ratified the Specially Protected Areas Protocol. "There were 116 on-going research projects during 1990," he recalled, "covering topics of interest for understanding the problems of pollution in the Mediterranean. National monitoring programmes were implemented and data submitted by 13 countries [for 1990]."

UNEP's senior marine scientist at the Mediterranean Action Plan (MAP) headquarters in Athens, Dr Ljubomir Jeftic, reported: "When we started, probably 80-85% of Mediterranean beaches and their coastal waters were dirty and unsafe for swimming. Today I think we have pretty well reversed the percentages. Around 80% of Mediterranean bathing waters are much cleaner and much safer. I mean safe in terms of health, that is, safety from microbiological contamination."

Dr Tolba warned the Government delegates that delays in payments of contributions "are persistently crippling the implementation of the programme". Noting that as of 31 July 1991 unpaid pledges amounted to almost US$4.5 million, he urged States to send their contributions by April of each year. "If the 18 Mediterranean countries that have all ratified the Barcelona Convention sincerely wish to protect their environment, the sum required – less than $6.7 million a year – is extremely low. It is less than the price of three combat tanks. Is that too much to ask for the protection of the Mediterranean environment?"

New MEDU Chief

Professor Salvino Busuttil of Malta has been appointed Co-ordinator of UNEP's Mediterranean Action Plan, based in Athens.

He is a member of the Board of Trustees of the International Ocean Institute (IOI) and Director General of the Foundation for International Studies at the University of Malta.

His international activities include the Vice-Presidency of both ICSEM (the International Commission for the Scientific Study of the Mediterranean) and ICAMAS (the International Centre for Advanced Studies in Mediterranean Agronomy), as well as membership of the Governing Board of the Man and the Biosphere (MAB) Programme (UNESCO), the Commonwealth Human Ecology Council (CHEC), the UN Institute on Aging, the *Fédération Internationale des Associations des Personnes Agées* (FIAPA) and of the Vienna Centre for the Social Sciences.

Professor Busuttil, who is 55, also represented Malta on the Intergovernmental Oceanographic Commission and is Chairman of the Mediterranean Joint IOC/ICSEM Group on Ocean Studies of Non-Living Resources (SNLR).

He is also Executive Chairman of the Euro-Mediterranean Centre for Marine Contamination Hazards and of the International Environment Institute (both based in Malta) and Permanent Correspondent of Malta to the Council of Europe's Open Partial Agreement on natural and Technological Hazards in the Mediterranean.

Holding two Ph Ds, he was Professor of Economics at the University of Malta during 1965-75. For the next two years, Professor Busuttil was U.N. Adviser to the Prime Minister of the Bahamas. In 1977 he became Director of the Division of Human Settlements and Socio-Cultural Environment at UNESCO in Paris. In 1986 he was appointed UNESCO Adviser to the Prime Minister of Malta and was instrumental in the creation of the Foundation for International Studies in Malta. He is the author of many publications including the Malta article in the *Encyclopaedia Britannica*.

Wider Caribbean

Corals, mangroves and turtles protected

The Wider Caribbean now has a second Protocol to its Convention on the Marine Environment, one covering Specially Protected Areas and Wildlife (SPAW).

The Protocol was adopted in two stages. Its text was approved on 18 January 1990, and initial versions of its three Annexes at a Plenipotentiaries meeting on 11 June 1991 in Kingston, Jamaica. "The Conference was an astounding success," reported Sálvano Briceño, outgoing Co-ordinator of the Caribbean Environment Programme (CEP). "The draft Annexes, which had been prepared by an *ad hoc* Meeting of Experts in Martinique on 5-8 November 1990, were adopted in their entirety. The region showed its commitment to a strong Protocol by listing entire groups of species, such as most corals, all

mangroves, all sea turtles and major groups of sea mammals for protection."

The Annexes list protected marine and coastal flora (Annex I), fauna (Annex II) and species to be maintained at a sustainable level (Annex III). The Protocol enters into force following ratification by nine Contracting Parties. It has already been signed by that number.

Annex I lists 56 species of vascular plants, Annex II has all species in the orders of Cetacea (whales and dolphins) and Sirenia (manatees), all species of the family Phocidae (monk seals) and all six species of sea turtles, as well as 109 other species.

Annex III has all species of Gorgonacea and Sylasteridae (soft corals), Antipatharia (black corals), Scleractinia (stony corals) and Milleporidae (fire corals). Apart from mangroves, the Annex lists 36 species of vascular plants including several sea grasses and 36 other fauna species.

The Conference recognized the possibility of States entering reservations with respect to initial listings. At the same time, it stressed the importance of protecting habitat as an effective way of maintaining the listed species, reaffirmed support of U.N. Resolution 44/225 of 22 December 1989 on large-scale driftnet fishing, and called for full-scale implementation of the resolution in the Wider Caribbean.

Antigua and Barbuda, Colombia, Cuba, France, Jamaica, Mexico, United Kingdom, U.S.A. and Venezuela have signed the full Protocol. The text alone has been signed additionally by Guatemala, Netherlands, Panama, St Lucia, St Vincent and the Grenadines, and Trinidad and Tobago.

Workplans expanded

The CEP's workplans and budgets for 1990-93 have now expanded to more than US$5 million a year, thanks to increased funding and a stronger Regional Co-ordinating Unit (RCU). The Ninth Monitoring Committee and Bureau Meeting, held in Kingston on 12-14 June 1991, approved ten extra posts to strengthen the RCU's competence in additional technical fields.

With the completion of the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) and the initial listings for its Annexes, the meeting decided to give high priority to developing the technical basis for a protocol on land-based sources of pollution. A meeting of experts is to take place in 1992.

The meeting received a detailed report on transboundary movement of hazardous and nuclear wastes in the Wider Caribbean, prepared by Greenpeace International in co-operation with the RCU, and recognized the need to decide on appropriate strategies to mitigate and avoid the negative impact of transboundary hazardous waste movements. It renewed a request to the RCU for suggestions on a mechanism to monitor movements of hazardous wastes in and through the region.

Some 80 representatives attended the meeting, among them representatives of 20 organizations. The meeting expressed satisfaction with the sound progress maintained in the development of CEP. It noted that the programme is now attracting substantive funding.

France, Jamaica, Netherlands, Sweden and the U.S.A. have offered major contributions. The CEP may also receive important counterpart funding for 1991-93 from the Inter-American Development Bank (IDB), the European Economic Community (EEC) and several other organizations.

Change of climate for Sálvano

Sálvano Briceño, a Venezuelan environmental lawyer who has headed the Caribbean Environment Programme (CEP) since the Regional Co-ordinating Unit (RCU) began work in 1987, left last summer to take up a post with the UN's Climate Convention Secretariat in Geneva.

"Under his leadership the programme has developed immensely and demonstrated continuous growth," the RCU's newsletter *CEPNEWS* reported in its September issue. "Sálvano Briceño brought a strong sense of team work and participatory leadership to CEP. There was hardly anyone that could more convincingly communicate the message that in order to achieve sustainable development at any one place in the region, governments, institutions and citizens need to respect each other and to work together, regardless of political, socio-economic or linguistic backgrounds."

Eastern Africa

Planning for the future

The second meeting of the Bureau of the Action Plan for the Eastern African Region took place in Nairobi on 5-7 November 1991. The participants, who included representatives of the European Community (EC) and international organizations as well as member States, unanimously approved 12 recommendations, including adoption of a workplan.

The projects on assessment and control of pollution in the marine environment (EAF/6) and protection and management of marine and coastal areas (EAF/5) were given highest priority.

The Executive Director's report described the launching of EAF/6 through the IOC/FAO/UNEP workshop on regional aspects of marine pollution as a significant achievement considering the scope of the project and variety of agencies involved (see the previous *Siren*). "The countries now have the means available to assess marine pollution on a national and regional basis," the report observed. Allocating any available funds first to this project and EAF/5 will enable them to be completed.

EAF/5, being operated in co-operation with IOC and FAO, will identify pilot management areas along the coast of the region and management plans will be developed within the project.

Contingency planning for marine pollution emergencies, a project on coastal erosion and siltation, and another on environmental impact assessment, will receive the next highest priority.

The Governments at the Bureau meeting supported the convening of a Panafrican Conference on Environment and Development related to the marine and coastal environment. The conference forms part of the workplan adopted by the African Ministerial Conference on the Environment (AMCEN) Committee on Seas. The Bureau also recommended that regional membership of the Committee rotate in future and recommended that the next EAF Intergovernmental Meeting designate Madagascar and Kenya to replace Seychelles and Somalia.

Finances and ratifications remained major problems. Two more ratifications or accessions (for a total of six) are needed for the Nairobi Convention to come into force. The Bureau urged States to ratify the Convention and its two Protocols as soon as possible.

Noting the difficulties facing Governments of the region, the Bureau urged them to honour their pledges of US$831,000 to the Trust Fund, which so far has received US$292,730. France, Madagascar, Seychelles and Somalia have all given cash. "Even under unfavourable economic conditions, some States have made a considerable effort to support the Eastern African Action Plan," the Executive Director's report noted. "The size of contributions from some of the smaller States of the region is particularly indicative."

In other business, the Bureau made provision for the Bureau Chair to visit countries that have not yet ratified the

She said the EC gave her money to clean the beach

Convention, funds permitting, and recommended Governments of the region to encourage the establishment of an association of marine scientists of the region.

The EC, which is in process of ratification, has pledged ECU 40,000 to the EAF Trust Fund when the process is completed.

An informal Interagency Consultation on oceans and coastal areas activities in the Eastern African Region followed on 8 November. "Although a limited number of participants attended the consultation, it was felt that the consultation was most productive and it was encouraging to see that the UN, non-UN organizations and donor agencies who attended showed every willingness to co-operate with each other," notes Paul Akiwumi, OCA/PAC's Programme Officer for the region. "It is quite evident that there are numerous activities being undertaken within the region. It is important, therefore, that

these be co-ordinated and a co-operative mechanism be established to avoid duplication of effort and to provide the countries concerned with appropriate and long-lasting assistance."

With this in mind, the agencies agreed to convene a similar meeting at the end of 1992.

South-East Pacific

Plan now covers Central America

UNEP's Governing Council approved a proposal at its 16th Session (May, 1991) to extend the South-East Pacific Action Plan to Central America.

As Coordinator of the regional Action Plan, the Permanent Commission for the South Pacific (CPPS) submitted the draft decision through the region's Government representatives with the support of the Latin American Group.

South Pacific foreign ministers had first instructed CPPS "to develop speedily a process of increasing linkage to the other Latin American countries of the Pacific on sea-related matters" in their Declaration of Viña del Mar, Chile, in February 1984.

In 1990 Costa Rica spoke of "the possibility of participating fully in the Action Plan for the South-East Pacific and of joining as a full member in the near future". Experts from Nicaragua, El Salvador, Guatemala, Costa Rica and Honduras expressed a similar interest at a meeting of the Operational Network on Maritime Affairs in Central America (ROCRAM-CA) held in San José, Costa Rica, late that year.

"With the support of UNEP, this area of the Pacific will now be integrated into the Regional Seas Programme and the South-East Pacific," said J. Jairo Escobar Ramírez, CPPS/UNEP Advisor for the South-East Pacific Action Plan. "One of the longest coastlines in the world will receive a regional focus for the protection of the marine environment and coastal area. The capacity of Central American countries to prevent marine and coastal pollution is very limited and, in some cases, non-existent. Hence, there is a need for an international programme to be put promptly in place to promote, on a regional basis, the development and protection of the marine and coastal environment of the Pacific, as is being done with the Caribbean Action Plan."

CPPS has been the regional coordination body for the Action Plan since 1981. In addition to the four CPPS member

countries (Chile, Colombia, Ecuador and Peru), the Plan includes Panama.

The Central American Pacific coast runs along 3,750 km of Costa Rica, Guatemala, El Salvador, Honduras and Nicaragua. Mainland cultivation, particularly agriculture, has been the mainstay of the local culture. But despite this tradition, a high percentage of the Central America population lives around the coast, mainly on the Pacific side of the isthmus.

"According to the Central American experts of ROCRAM-CA, the sea is not mentioned as a resource in development planning, the possibilities of studying marine science and technology are limited if not non-existent and there is a shortage of data centres and specialized bookshops and libraries," observed Escobar. "In addition, authority for marine administration is split among a number of public bodies, resulting in duplication of efforts and dispersal of resources."

The region faces marine and coastal degradation from inland erosion and run-off by agricultural pollutants. Water used in the coffee and sugar-cane industries is an important fact in the pollution of surface water draining into the Pacific. In Nicaragua, as in other countries of the isthmus, cotton-growing leads to concentrations of agrochemical residues in underground water and in the brackish water of the mangroves. In the León and Chinandega area of Nicaragua, it has been estimated that 50-100 tons per hectare of the most fertile soil layers are being lost and deposited in the Pacific coastal areas.

Untreated or inadequately treated domestic and industrial wastes from the hinterland, together with direct discharges, have resulted in high coliform indices and a tendency to local eutrophication. In Guatemala, more than 20% of the 140-km Chiquimulilla Canal is contaminated and a source of infectious diseases.

Unsound management of mangrove forests for housing, construction, fuel, tanning and mariculture has caused their drastic depletion, especially in El Salvador and Guatemala. It has been estimated that half the region's mangrove forests have been lost over the past decade.

South Pacific

Treaty Parties meet for the first time in Noumea

Contracting Parties to the Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, also known as the SPREP Convention, and its related protocols, reaffirmed their commitment to the principles of this important treaty at their first meeting in Noumea (10-11 July, 1991).

Contracting Parties agreed to continue to develop co-operative activities, giving particular emphasis to building up the region's emergency response capability – in view of the potential danger of oil spills in particular and the need for contingency planning for the entire region.

Parties will co-operate through contact points, co-ordinated through SPREP and drawing on a range of expert sources, in an overall assessment of the region's state of the environment. Parties also agreed on the importance of keeping in

touch with global and regional initiatives related to the environment. In recognition of the importance of demonstrating a strong regional commitment to the Convention's principles, the meeting adopted a resolution urging other governments to join it without delay.

Apia Convention

Following this meeting, Parties to another important regional Treaty, the Convention on Conservation of Nature in the South Pacific (also known as the Apia Convention) held their first meeting. The Convention had entered into force in June 1990 once five SPREP member governments ratified and acceded to it.

The Apia Convention was adopted in 1976. As the only regional treaty dealing with the land environment, it is a critical document for protection of nature and the natural environment, and deals explicitly with protection of terrestrial ecosystems and species, providing an important framework for the conservation of nature, flora and fauna in the South Pacific. Delegates strongly urged other countries to join the Convention as quickly as possible.

New home and Action Plan for SPREP

The Fourth Intergovernmental Meeting of the South Pacific Environment Programme, held in Noumea, New Caledonia, on 3-9 July, unanimously decided to move SPREP from its present location at the South Pacific Commission in Noumea to Apia, Western Samoa.

Ministers and senior officials from the 27 member countries met to discuss new legal and financial arrangements to give the region's environment programme its own legal identity almost 10 years after SPREP's inception.

Formal links with the South Pacific Commission will be phased out as member countries negotiate an independent treaty to make the programme autonomous. A new Action Plan was adopted to guide the Programme for the next five years. The Plan stresses the need to link environmental management with economic and social development.

Delegates emphasized the increasing need for environmental management planning and education. Issues highlighted included the potential threat of climate change, particularly in relation to the low lying islands, the need to protect sensitive coastal and marine areas from the adverse effects of development and the need for the protection of biological diversity in the region.

Ministerial Declaration and UNCED statement

The meeting strongly endorsed presentation of a statement by the Pacific countries at the United Nations Conference on Environment and Development (UNCED). The Intergovernmental Meeting also issued a Ministerial Declaration on the Environment declaring the commitment of all parties to work together to achieve sustainable development in the region. In a main part of the seven action points, the Ministers and representatives of the 27 countries call on the international community to:

– respect the right of the people of the South Pacific, as custodians of our fragile environment, to protect our region for present and future generations

– adopt additional measures to protect the environment, particularly in the areas of climate change, sustainable fishing practices and technologies, conservation of biological diversity and protection of marine areas from pollution from all sources

– support activities in the region to understand the global climate system

– co-operate in and assist regional and national efforts to implement sustainable development in the South Pacific, and

– recognize SPREP as the regional organization responsible for environmental co-ordination, protection and management for the South Pacific.

Announcement

Oil symposium

The Second International Oil Pollution Symposium (2IOPS) is to take place in Beijing, China, on 4-8 October 1993. Professor Iver W. Duedall, IOPS Committee Co-Chair of the International Ocean Pollution Symposia Series at Florida Institute of Technology, has asked us to pass on this first announcement and call for papers. The symposium aims to provide a forum for the exchange of ideas and information among scientists involved in marine pollution and ocean disposal research.

Inquiries should be addressed to: Professor Jiayi Zhou, 2IOPS Symposium Chairman, Institute of Marine Environmental Protection, State Oceanic Administration, Box 303, Dalian, People's Republic of China (Fax: 86 411 472 396), or to: Prof Duedall, Department of Oceanography, Ocean Engineering and Environmental Science, Florida Institute of Technology, Melbourne, Florida 32901, USA (Fax: 1 407 984 8461).

contents

the regional seas

THE SIREN is issued four times a year in English, French and Spanish, as an informal presentation of news from OCA/PAC, the Oceans and Coastal Areas Programme of the United Nations Environment Programme (UNEP), and does not necessarily reflect the official opinion of UNEP or its staff.

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Produced by Maximedia. Editorial: Peter Hulm; design and layout: Nikki Meith. OCA/PAC Editor: Paul Akiwumi. OCA/PAC Liaison: Maria Cunningham. IPA Liaison: Shane Cave.

ISSN No. 0379-2463.

The Siren

Number 46 June 1992

NEWS FROM UNEP'S OCEANS AND COASTAL AREAS PROGRAMME

Strategy against land-based pollution

Experts from 52 countries, meeting in Nairobi on 9-13 December 1991, approved six objectives for a global strategy on curbing environmental degradation from land-based sources of pollution and activities in coastal areas.

The draft was sent on to the Executive Director for transmission to the Secretary-General of the United Nations Conference on Environment and Development (UNCED) to be used in connection with Agenda 21, the set of principles adopted by UNCED's Earth Summit in Rio de Janeiro this June.

The agreed objectives state that nations should agree to:

- reduce "as far as practicable" the risk that human activities will cause irreversible or long-term damage to the marine environment;
- ensure prior assessment of potentially threatening activities;
- develop integrated programmes in understanding and management of the coastal zone, ecosystems and associated watersheds, including restoration of degraded environments;
- integrate marine protection into overall development policies;
- develop economic incentives to limit industrial and agricultural activities producing emissions or residues; and
- "adopt policies consistent with internalization of environmental costs, such as the polluter pays principle, and with an anticipated and precautionary approach".

The experts drew up a list of major pollution issues and priority substances

in the coastal marine environment, shown in Table 1, below. They also set out a table of globally significant contaminants with details of international action that could control them, shown in Table 2, opposite.

Table 1. Status of science and management targets for nine classes of pollutants.

Substances	Status of science and management targets
Sewage	Science adequate/management deficient
Nutrients	Science limited/conservation management possible
Synthetic organic compounds	Science limited/conservation management possible
Sediment	Science limited/conservation management possible
Litter	Science adequate/management deficient
Metals	Science adequate/management deficient
Radionuclides	Science adequate/management deficient
Oil/hydrocarbons	Science limited/management deficient
PAHs (combustion processes, industry,diffuse sources)	Science limited/management deficient

Note: The original table also summarizes effects (not shown here). The experts note that the first four substances cause the greatest concern on a global scale and that regionally and locally, inorganic compounds, thermal outfalls, tar balls and other issues may be more important.

Global 500

Two marine and coastal conservation campaigners were named to the 1992 Global 500 Roll of Honour for Environmental Achievement announced on 5 June.

CODDEFFAGOLF, the Honduran Committee for the Defence and Development of the Flora and Fauna of the gulf of Fonseca, was named. In 1987, the Committee worked to prevent the conversion of El Jicarito, a 1000-ha lagoon located along the southern coast of Honduras, into a shrimp farm that would have threatened wildlife, birds, marine life, and dislocated 2000 families. Thanks to their efforts, the Ministry of Natural Resources has designated the lagoon as a reserve area for wildlife and artisanal fishing.

Hasna J. Moudud, a member of the Bangladesh Parliament, created a committee of non-partisan parliamentarians representing coastal constituencies to highlight the problems facing coastal ecosystems in Bangladesh. She has campaigned for acceptance of environmental standards modelled on the 1982 U.N. Convention on the Law of the Sea and is editor of *Environmental Weekly Bulletin*.

Table 2.

Contaminant	Recommendations	Financial and economic implications	Action
Sewage	Treatment; proper outfalls; integrated sanitation; water recycling	Water prices; user fees; national and private budgets; loans and grants; regional and national plans	Land-use planning; technology transfer, scientific and technical assistance; international fund
Nutrients (nitrate, phosphate)	Change education and management practices, regulatory and pricing policies; investments	Food and fertilizer price changes; subsidies; economic incentives; loans and grants; national budget implications	Adjustment of agricultural practices and policies; sewage control
Synthetic organics, pesticides	Substitutes; selected bans; clean production; new processes and technologies	User fees and charges; violation charges; industrial closings; health care costs	Review practices and education; waste reduction (minimization)
Sediment	Review of land-use practices; dredging and disposal regulations; afforestation	User fees; aid and loans; national budget changes	Change land-use practices and patterns; land production; integrated coastal zone management
Litter	Treatment systems; regulatory activities	Fines/producer fee/consumer fee; improved collection and disposal costs	Prohibition/ public awareness campaigns; reduction in litter production
Metals	Substitutions; discharge limit; selected bans; clean production; clean-up of mining sites; sewage treatment	User fees and charges, violation charges, industry closings	Discharge permits; clean technology; waste minimization; waste segregation
Radionuclides	Application of best available technology; international controls	User fees, waste fees	Strict controls
Oil/ hydrocarbons	Effluent treatment; application of technology	Increased oil prices	Review practices; waste reduction; discharge permits
PAH	Effluent treatment; research	Investments by industry	Clean technology; effluent treatment; selected bans

Note: This table also includes sources, effects, and life quality results as well as lost opportunities. The Report is UNEP (OCA)WG.14/4

Monaco meeting agrees reef monitoring plan

by John C. Pernetta

What are the biological and environmental parameters we need to measure to detect the impact of climate change and sea-level rise on mangrove and coral reef ecosystems?

An expert meeting co-sponsored by OCA/PAC in Monaco last December of 18 research scientists specializing in this field has agreed on the set of parameters. The Intergovernmental Oceanographic Commission (IOC) and IUCN – The World Conservation Union are convening a June workshop in Guam in conjunction with the 7th International Coral Reef Symposium to assess a programme for coral reef monitoring.

These activities follow an expert meeting, held in Paris in December 1990, which developed a framework proposal for a Long-term. Global Monitoring System of Coastal and Near-shore Phenomena Related to Climate Change. This was subsequently approved by the Governing bodies of the co-sponsoring agencies in the first half of 1991.

The framework proposal foresees six monitoring activities in its pilot phase: studying sea-level and coastal flooding, coastal circulation, carbon burial in coastal sediments, changes in plankton community structure, changes in benthic coral reef communities; and changes in mangrove ecosystems. This monitoring system is intended to form the coastal component of the Global Ocean Observing System (GOOS), which itself forms part of the Global Climate Observing System (GCOS).

The scientists meeting at Monaco agreed that the basic methodologies tested and used by the ASEAN-Australia Coastal Resources project over the past seven years would be adopted for wider use. This will enable data sets to be collected that for the first time are regionally and globally comparable. At present the most extensive databases for reefs and mangroves have been collected at isolated sites, for varying purposes and using totally individual methodologies. The data so collected are not comparable – as a result no region-wide or even sub-regional quantitative assessment of the state of coral reefs or mangroves has been undertaken to date.

IOC, the World Meteorological Organization and IUCN-The World Conservation Union also sponsored the meeting, hosted by the Musée Océanographique of Monaco.

The coral reef and mangrove scientists recognised that as an integral component of system development, mechanisms for handling, storing and quality control of data need to be established early in the programme and that such databases will need to be organized on a regional basis. It is hoped that the UNEP/IUCN/WWF World Conservation Monitoring Centre in Cambridge will be actively involved in developing the global databank needed to underpin this system.

As an initial step in development of the programme, IOC and UNEP propose to publish the manuals for the approved

methodologies this year. The IOC/IUCN workshop in Guam gave an opportunity to assess the interest and possible contributions of the wider scientific community in the proposed programme for coral reef monitoring.

Participants at the Monaco meeting identified a number of representative sites for mangrove and coral reef monitoring which cover the geographic range and conditions under which such ecosystems are now found. These suggested sites cannot be considered fully comprehensive. Many other sites will be substituted or added, depending on the interest of governments and institutions in participating in this programme.

Climate change could increase reef and mangrove decline and degradation – or it could benefit some reefs if sea-level rise introduces water over reef flats which are at their present limit of upward coral growth.

Planning for and mitigating such impacts is only possible when the scale and extent of the changes can be accurately assessed. The proposed monitoring system represents a starting point. The pilot projects are planned to commence in late 1992. Initial site descriptions would be prepared during 1992 and 1993. Depending on the results and the degree of successful collaboration, the programme could be extended to cover a wider number of countries and sites.

Despite its ambitious long-term aims, the monitoring programme is pitched deliberately to need little expenditure in the beginning. The initial proposals are modest, requiring little in the way of additional financial and manpower resources than those already devoted to various national and regional programmes in the coastal zone. Building a global monitoring network will require patience, co-operation between research scientists and governments, and substantial commitments both financial and personal. The basis for such collaboration was established in Monaco. It is to be hoped that the co-sponsoring agencies will be able to further develop the proposed system in the immediate future.

For further information, contact Dr J.C. Pernetta, IOC/IUCN Consultant, The Smithy, Blacksmith's Row, Gayton, Norfolk PE32 1QJ, UK. Fax/tel: 44 553 636 832.

The threat of bleaching

The international community is finally taking steps to persuade countries to watch over the world's coral reefs, those valuable and threatened resources (see page 4). One person who has campaigned for years to make others aware of the importance of long-term and comprehensive monitoring is Dr Tom Goreau, President of the Global Coral Reef Alliance. In this interview he speaks of his latest concern: evidence of widespread coral bleaching across the world.

Q: Why should we care about coral reefs particularly?

A: Everyone knows that coral reefs are the rainforests of the ocean. They are probably the most species-rich marine ecosystem. The only other ecosystem that might compare in terms of species numbers are the communities right at the base of continental slopes. However, coral reefs occupy only a few tenths of percent of the surface area of the ocean. In terms of the density of species they are far greater. Coral reefs are also largely coastal ecosystems, near to shore, near to people and near to perturbations of various sorts. In contrast, the deep sea ecosytems would be among the last to be affected by human activities.

Reefs play a crucial economic role through fisheries, tourism and shore protection. Coral reefs are probably among the most biomass-rich marine ecosystems per unit of area. They are like ocean oases in terms of productivity. They differ from open ocean ecosystems in holding on to their carbon for a longer time, recycling it many times before it leaves the system. In the long run the major removal mechanism of carbon from the ocean is the burial of limestone (calcium carbonate), accounting for about 80% of the long-term removal of carbon from the oceans, and about half of that burial appears to be accomplished in coral reefs. Very much more limestone is produced in the open ocean but almost all dissolves when it hits the ocean floor: calcium carbonate that is hidden in reef systems may remain buried forever. In this way, reefs have an important role in the global biochemical cycle.

You have also spoken of coral reefs as information sources for scientists and planners concerned with climate issues? How does this operate?

Coral reefs can tell us many things. They are the only marine organism that grow continuously for long periods of time. Some have annual bands that can be read like tree rings, and some corals are thousands of years old. They can give evidence on a time scale that deep-sea sediments don't capture – sediments are mixed by the organisms that are in them so we do not get an accurate

chronology. Reefs offer probably our only hope of reconstructing long-term climate changes in tropical ecosystems.

My colleagues and I have worked on a coral gathered in Florida in 1983 that has almost a century of information recorded in its growth bands. You can barely see the impact of the 1926 and 1929 hurricanes which flooded the Everglades and caused thousands of deaths. During the Depression, the Roosevelt Administration enacted a massive public works programme to employ people and they erected dikes to control flooding and began pumping down the water table. Around 1948 there was a very rapid change in the land tenure situation: the small farmers growing beans, tomatoes and peppers, sold their land or left and they were replaced entirely by sugar monoculture. A handful of big sugar producers installed massive pumps. At that point they dredged dikes into canals from the Everglades reaching straight out to sea. One dumped all the muddy swamp water onto this coral. At this point you can see the coral slowed down its growth tremendously, the growth bands become much closer together, and the coral barely survived.

You can also identify the years that the coral did well, such as 1958 and 1963 – the drought years in South Florida – when the canals dried up completely and there was no drinking water. By 1969 or 1970 the water table in the Everglades had dropped so much from pumping that there was no drinking water available in the dry season. At that point people blocked the canals and began backpumping urban and agricultural waste water into the Everglades to infiltrate and provide drinking water. At that point this coral recovered. This coral was faithfully recording the hydrology of the Everglades even though that is quite far inland from where the coral grew.

This relates to recent and short-term history. Can coral reefs give us information too about long-term phenomena?

Absolutely. For the longer-term environmental history I have photos from Jamaica, for example, where the modern reef began growing about 6000 years ago when sea-level reached its present level after the end of the last Ice Age. At sea level itself you find a well-defined "wave-cut" notch (it is actually made by molluscs scraping away at the algae with their teeth).

On land in Jamaica the modern sea-level notch is cut into a fossil reef that is 130,000 years old. It formed during the last Inter-Glacial, the last time conditions were as warm as today. In fact average temperatures were around 1-2 degrees warmer. It looks as if Greenland then was melted and parts of the West Antarctic ice sheet as well. At that time a well-defined sea-level notch was cut seven metres above today's sea-level.

This gives us, I think, some very important clues about what we might expect from long-term climate change. It takes up to 1000 years for the carbon dioxide levels and temperature rise to come into equilibrium. But it does suggest that the sea-level rise will eventually be much greater than presently predicted. It is worth pointing out that the fossil record shows that hippopotamuses and crocodiles were living in London, England. At that time, CO_2 in the atmosphere was 27% less than it is right now.

Though not as well preserved as in Jamaica, exactly the same evidence is

found as far apart as Australia, the Seychelles, Florida and other places that have been geologically stable over the last 100,000 years. It is another bit of unique information we are able to obtain from coral reefs.

And you have become alarmed by large-scale bleaching of coral reefs in recent years. What exactly is taking place?

First, it has nothing to do with bleach. Bleach is sometimes used in reef fishing these days, and that does kill corals, but the bleaching we have been studying is the result of the expulsion by the corals of their symbiotic algae. This is always a last-resort reaction to stress – sometimes the coral dies anyway and sometimes it recovers. But the bleaching is always an indicator of severe, life-threatening stress. The question is: what is causing the stress, and the explanation is the reason for controversy.

We have discovered, in the Caribbean at least, that bleaching occurs under predictable conditions. People today even speak of bleaching weather: water temperatures above 30° Centigrade, with weeks of no wind, clear skies and bright sunshine.

In 1989 I found bleaching in 80% of the corals along the north coast of Jamaica. When we examined the satellite records of water temperatures we found a 'hot spot' there in the Caribbean at that time, affecting Jamaica, the Caymans and the Bahamas, while Puerto Rico was not affected and Belize only marginally. But in 1990 bleaching was severe all across the Caribbean, with serious mortality, and 1990 recorded the hottest sea temperatures ever.

Part of Cuba's shallow waters record temperatures of up to 32 degrees. Cuba reported bleaching for the first time in 1990, not only on the shelf region but

also on the southern side, just north of Jamaica. It seems that the shelf reefs had previously developed an adaptation to higher temperatures, which makes them very interesting. But there was also bleaching off Santiago de Cuba, where the fringing reef drops straight down. Between 1951 and 1987 there was no bleaching in the Caribbean. It has now bleached in four of the past five years.

You are convinced that sea temperature plays a key role in bleaching. What are the other factors?

Curiously Jamaica was spared widespread bleaching in 1990. Water temperatures, as normal, reached their maximum in September. But in October 1990 it rained every day for a month. In contrast, mortality was serious in the lower-lying Cayman Islands and Florida.

Sunlight is playing some sort of role. Some people say it may be UV-light which is responsible. This is a very attractive hypothesis because it links up with the destruction of the ozone layer, which we know is taking place. But UV-light does not penetrate far into sea water, certainly not as far as 50m where we have found bleaching, and we have no idea whether UV has increased because no long-term monitoring is taking place.

The weather has to be warm – just being sunny alone does not do the trick. In Jamaica in 1990, where reefs were affected by temperature *and* sediments, it seems that the bleached corals simply did not have the energy to clean themselves of sediment and were dying.

Last year the whole Central Pacific area was 1-2 degrees above normal, with heavy bleaching in every one of the Society Islands, with almost none in the Tuamotus of French Polynesia. If solar radiation had been the deciding factor, we would have expected the opposite – the Society Islands are high and always have a cloud sitting on them, while the Tuamotus are low islands.

Some people have argued that pollution may be responsible for bleaching. Chronically polluted sites, however, have less coral bleaching than unpolluted reefs. Perhaps this is because the corals in polluted regions have been selected for stress tolerance.

What's the evidence from other regions?

Although local bleaching had been reported before 1980, it was limited to small areas and places where there was restricted water circulation such as lagoons. Since then, incidents have increased in frequency in the Pacific, Atlantic and Indian Oceans. Regional mass bleaching has been reported by divers from all these areas. In 1991 bleaching began in the Society Islands early in the year. By the middle of the year bleaching began in Samoa, Okinawa, the Indian Ocean coast of Thailand, the Caribbean and Bermuda.

Can we make any generalization about the findings?

All the sites where mass bleaching has been reported since 1983 are located within "hot spots", regions of the ocean 1°C above long-term average temperatures when they impinge on reef areas in the hottest months.

In fact, it now seems possible to predict quite well where the bleaching is going to appear, simply by following these "hot spots" from satellite charts. If we tracked them much as we follow hurricanes, we could warn people of bleaching events ahead of time.

I am convinced that reefs around the world are now under high-temperature stress. Whether the stress is due to global warming is another matter. But whether it is due to local or global warming, further stress is only going to make the situation worse.

Last year you spent a lot of time campaigning to raise awareness about a crisis in coral reef monitoring, pointing to the difficulties of building up an accurate picture of bleaching. What is the situation?

One of the problems for scientists about recording coral bleaching is that most of the reports come in from sport divers, who are often unable to identify what species they see. People can confuse dead coral with bleached coral. Unless they look closely for the living tissue it is easy to make a mistake. Many bleached corals become pale or assume unusual colours other than white, so that it is not always easy to recognize when a reef is suffering bleaching.

Most coral studies are carried out by irregular visitors and we rarely find regular systematic monitoring like that carried out in the Caribbean by Philippe Bush of the Cayman Government Natural Resources Laboratory and Ray Hayes, Chairman of the Anatomy Dept, Howard University, Washington, D.C. I have had to stop my work in Jamaica for lack of funds. Other parts of the Caribbean are even hotter than Jamaica – the southern part of Haiti, for example – but we don't have reports because there are no marine scientists or labs working there. No funding agency, it seems, is willing to underwrite long-term coral monitoring of the kind that is needed.

What we do have is an informal network. Ernest "Bert" Williams of the

Marine Science Department at University of Puerto Rico is the person to whom we all send our reports and encourage others to do so. A pathologist whose speciality is exotic diseases in marine organisms, he became alarmed in recent years at mass mortalities of marine organisms. He has been recording widescale incidence of black band and white band diseases in corals and many other unexpected mass mortalities and diseases of marine organisms. In the past two years marine turtles captured in the Caribbean have regularly shown cancerous tumours, for example. These mortalities may have nothing to do with coral bleaching, water temperatures, UV levels or pollution, but we at least have a centre to disseminate information about our work. I would advise anyone who knows of bleaching or mortalities and diseases of this kind to contact Dr Williams at: Caribbean Aquatic Animal Health Project, Department of Marine Sciences, University of Puerto Rico, PO Box 908, Lajas PR 00667-0908. Fax: 001 809 899 5500.

Sedimentation and coral reefs

by Paul F. Holthus, Project Officer (Scientist), South Pacific Regional Environment Programme

Page/Githinji

Human activities in coastal watersheds are the cause of the most widespread increase in sediment discharge onto coral reefs. Dredging to create ports, harbours or channels or to extract construction materials can also create major sources of sedimentation and result in long-term degradation of the living resources and the economic value of the reef ecosystem. For this reason it is wise to ensure we know as much as possible about the nature and effects of sedimentation. At SPREP, I have made it part of my job to try arouse an awareness among non-biologists such as coastal geologists of the importance of the problems. This article is extracted from an address I gave recently to such an audience.

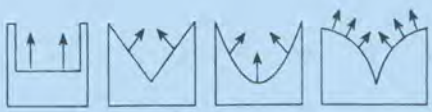
There is tremendous variation in the shape and size of coral species, and even within species. As light decreases with water depth, coral colonies tend to grow plate-like horizontal surfaces to increase the possibility of intercepting the light. But when heavy sediment loads reduce sunlight, this growth form easily intercepts the particles.

Branching colonies accumulate the least sediment. Hemispherical colonies allow particles to be easily rolled or sloughed off. Plate-like colonies, however, intercept the full rain of sediment; and vase-like colonies effectively trap the sediment that falls on them.

Colony surface design also affects the efficiency of sediment transport. Colonies with valley-like convolutions (meandroid colonies) move sediment most easily, those with corallites separated by open spaces (plocoid) less efficiently, and those with a ridged honeycombed surface (ceriod) move sediment least well.

At the individual level, the shape of calices (the skeletal structure housing each individual polyp) affect its ability to reject sediment. Polyps in calices with V-shaped sides reject sediment most efficiently. Polypos in U-shaped calices do less well. Those in convex-sided or flat-bottomed calices reject particles least easily (see figure below).

Once a particle of sediment has lodged on a coral colony, the animal invokes some behavioural responses to clear itself – and this response may be more important than morphology in controlling accumulation. Scientists have



*(Redrawn from: Hubbard and Pocock, 1972, **Geol. Rundsch. 61:** 598-626.)*

identified four mechanisms by which corals move sediment particles:

1) polyp distension by water uptake, to push the particle out of the way;

2) tentacular movements, to brush particles aside;

3) ciliary action, to transport fine particles on minute, waving hairs; and

4) mucus production, to entrap particles on a layer of mucus which is carried off by water movement.

The transport of sediment off the colony by the first three methods is random, that is, not coordinated to get rid of the particles by the shortest possible route. Thus we find that small corals reject sediment more efficiently than large colonies. The bulk of the transport is limited to the removal of relatively fine materials by tentacular movements, ciliary action and mucus production. Thanks to experimental studies, we can rank several coral species according to their relative sensitivity to sedimentation (see table below).

What are the effects of increased sedimentation? We have records of the impact on coral communities, other reef organisms, and resource use.

Smothering can affect just part of a colony, from the top down or from the bottom up, killing the corals. But increased sedimentation also leads to decreased coral growth. Usually this results from the blockage or reduction in available solar radiation which corals require for photosynthesis and skeletal growth. The diversion of coral energy resources to sediment rejection processes means that less energy is

Sensitivity of some common coral species to sedimentation.

Species	Sensitivity		
	Low	Moderate	High
Montastrea cavernosa	x		
Siderastrea radians	x		
Siderastrea siderea	x		
Manicina areolata	x		
Fungia spp.	x		
Agaricia agaricites		x	
Acropora hyacinthus			x
Acropora corymbosa			x
Acropora cervicornis			x
Other *Acropora* spp.		x	
Porites astreoides			x
Other *Porites* spp.	x	x	
Pocillopora spp.	x	x	

Source: Pastorok, R. A. and G. R. Bilyard, 1983: Review of the effects of sewage pollution on coral reefs. Mar. Eco. Prog. Ser. 21: 175-189.

available for colony growth. In addition, if polyps are preoccupied with sediment removal they are unable to catch food. This further reduces the energy for available for growth. Also, a constant rain of suspended sediments may actually reduce the abundance of zooplankton prey available to corals. Dredging which alters circulation patterns is a further drain on coral energy supplies if it diverts distribution of the zooplankton away from corals.

The movement of increased sediment loads can have an abrasive effect on the colony surface, thus directly reducing coral growth and diverting energy to repair and maintenance activities. Abrasion may especially affect recently settled corals and very small colonies.

Temporary coverage by sediments can cause coral colonies to expel their symbiotic algae ('bleaching'). This is a response that may be symptomatic of a broader shock syndrome, which can result in a coral's death long after the event or leave the coral weakened and susceptible to – or unable to recover from – other injury or stress.

Bacterial attack on coral colonies has been associated with temporary burial by sediments or surface coverage by the mucus produced to entrap sediments. Such disease can lead to reduced coral growth or mortality.

When the sediments include toxic substances, the potential for harmful effects on corals is obvious. Sediments transported to reef areas from agricultural lands may include fertilizer or pesticide chemicals. Runoff from urban areas may contain petroleum hydrocarbons or industrial chemicals that damage corals. Dredging of sediment layers can stir these harmful substances up onto coral communities again, or lead to major chemical or biological oxygen depletion of reef waters and die-off among reef organisms.

At the community level, species commonly found in inshore reef areas are generally more tolerant of high sediment loads than species occurring on the seaward edges or reefs. Communities with naturally high levels of sedimentation have less coral cover, fewer numbers of colonies, reduced species diversity and a dominance of branching growth forms compared to similar areas that enjoy less turbidity and lower sediment loads.

Planktonic coral planula will not colonize silt-covered reef substrate or sediment accumulations. Large colonies dominate areas of increased sedimentation, indicating a lack of new settlements.

When runoff includes nutrients, algae may be able to outcompete corals for available reef substrate and overgrow existing colonies. Some research indicates that the input of nutrient loaded sediments onto coral reefs played a role in outbreaks of the coral-eating "Crown of Thorns" starfish *Acanthaster planci*, which has devastated large areas of live coral across the Pacific and the Great Barrier Reef.

Reef-dredging and blasting can create fresh reef substrate which is colonized by fine filimentous algae. If these include the toxic dinoflaggelate *Gamierdiscus toxicus*, people who eat reef fish can later fall ill with Ciguatera poisoning, as grazing fish accumulate the toxin and it is concentrated in "higher levels" of the food chain.

Increases in suspended sediments can reduce plankton abundance, while algae suffer like corals from increased sedimentation. Filter-feeding animals attached to the bottom can die if their

incurrent openings are clogged. Seagrasses die if sediments increase beyond the ability of currents to remove them.

Many reef fish will leave areas subjected to large increases in suspended sediments, either for lack of food or because the substrates are made unsuitable for fish spawning or other reproductive functions. If reef structures such as holes or false passes are altered by reef dredging and sand mining, the fish will not return to the site for seasonal fish spawning. Dredging and filling can change fish migration routes.

For coral reef resource use, the effects are clear. A reduction in harvestable resources such as clams and lobsters has a direct impact on subsistence and commercial fisheries. Apart from creating barriers to boats or fish migration, dredge and fill activities can also deepen reef areas that formerly sustained shallow reef fishing techniques such as throw-netting or gill-net fishing.

Degradation and destruction of coral reef ecosystems by sedimentation reduces the reef's values for human use and economic development. Tourists, scientists and students are unlikely to be attracted by brown, turbid water and coral reefs buried in gooey sediment.

Urban and industrial development can add major new sources of sediment to coastal waters, particularly sewage and storm water discharges, sugar mill wastes and drilling muds from offshore oil platforms.

What can we do to control sedimentation damage?

Human activities can be managed. Land-use, watershed and coastal area planning, with an emphasis on erosion and sedimentation control, can do much to reduce the impact. The type of land-use (swidden agriculture, road construction, clear-cut forestry, plantation agriculture, mining) have an important influence on the levels of sedimentation, as does the presence or absence of erosion control measures.

Dredging and mining damage can be avoided or mitigated with proper planning and management of reef extraction operations. But this will mean proper site selection, the use of appropriate extraction techniques, and the use of methods to contain suspended sediments.

Carnage among the reefs

This letter to a tour operator from two coral reef visitors will strike a chord of recognition in many conservationists. For this reason we have disguised the scene of the crime. But we think their proposals we think worth consideration by many marine area managers, and pass them on for consideration.

"We recently went on one of your trips to . . . Marine Park (19.4.92). Aside from the matter described below, we had a lovely day – the restaurant was terrific, the boat prompt, staff were friendly, and the reef extraordinary.

We are writing, however, to express our great concern about the behaviour of a number of the tourists on the reef, and the lack of supervision provided by your staff and the park service rangers. When we arrived at the reef, one of your staff gave only a brief warning not to stand on coral or collect shells. Aside from its brevity, the warning missed at least half of the tourists, as they spoke only Italian and French. The group was then allowed in the water, and several people immediately made their way to the coral, where they began standing and literally stomping on the coral. In several cases, we independently witnessed individuals breaking off pieces of coral of at least six inches in length! The scene can only be described as carnage; it was truly horrifying.

Where's the reef ?

The staff and rangers seemed unaware, or if aware, unperturbed. We attempt to tell several people to get off the coral; they stared blankly back, either not comprehending (hard to believe, since we gestured quite clearly), or not caring.

It is clear to us that if this kind of unsupervised unleashing of ignorant tourists on the reef continues, there will be literally nothing left in a short time. Apart from the obvious moral issues involved here – the need for respect of species other than our own, the responsibility to preserve the environment for future generations, and other issues you must certainly be aware of – we imagine that it is simply bad business to allow this destruction to continue.

We suggest the following possible remedies:

1. Issue to each tourist a list of rules for visiting the reef, and print it in at least French, German, Italian, English, and (the native language).

2. Have an appropriately stern and imposing-looking ranger give a serious speech on these rules; then have your

staff translate it into the languages of the non-English speaking tourists.

3. The park service should find individuals for collecting shells, and each tourist returning to the boat should be requested to demonstrate that his or her pockets are not hiding shells. We witnessed one fellow who brought a shell on board; the Italian-speaking staff member told him to throw it back, and the fellow resisted until the park ranger came over.

4. You must provide guides to the reef, who swim along with the tourists. Or at least, post a few *attentive* staff, with fins, snorkels and masks at certain points around the reef to act as observers and reef guards. Guests who stand on or break off coral should be warned; on the second occasion they should be asked to return to the boat.

5. Fins should be provided to all guests, and a 10-15 minute training in use of snorkel and fins should precede movement to the reef. Our impression was that in some cases individuals stood on or leaned against coral because they lost their balance, panicked, and did not know how to float or move away from the coral.

We will be leaving – soon, but hope to return in a few years. We would like to take our tour once again to visit the reef – but we fear that without immediate preventive measures being taken, there will be nothing left to visit."

New hopes for Kenya's reefs

*by Mike Bess**

Kenya's coast attracts some 400,000 tourists a year, more than any other area of the country. But in many ways this business is a mixed blessing, resulting in severe damage to fragile coral reefs and lagoon systems. The newly-formed Kenya Wildlife Service (KWS) under Dr Richard Leakey has adopted a new approach to marine conservation to get the co-operation of local industry, offering fresh hope for the protection of Kenya's reefs. Mike Bess reports:

Though Kenya's coastal system can be likened to the world's tropical rainforests in productivity, its reefs – like the rainforests – are relatively poor in minerals and nutrients and depend on a complex series of relationships to recycle and reuse scarce nutrients. The explosions of colour and attractive variety of Kenya's reefs should not blind us to their fragility. Their balance is

** Mike Bess, who has lived in Kenya for many years, is a resource economist who works throughout Eastern and Southern Africa. He is also an Advanced Diving Instructor with the Kenya Sub-Aqua Club.*

easily upset, and an entire reef can suffer if only one species of fish is overharvested. This has already happened at many places on Kenya's coast. The reefs and associated lagoons and estuaries provide a temporary home to a number of spawning fishes from the deep sea and shelter large numbers of their young, but most fish after reaching a certain size migrate back to the ocean because the waters do not contain enough food to sustain great numbers of large adults.

Local fishermen have often been blamed for reef damage. But traditional fishing usually has less impact on a coral reef than the thoughtless destruction resulting from tourist activities. Unsustainable fishing practices have grown up – to serve tourist centres. The tourist appetite for seafood, particularly lobster, crabs and prawns, have put unsustainable burdens on reefs and associated marine ecosystems.

Over the years, hundreds of anchors from tourist boats have been dropped on the fragile reef corals, arresting thousands of years of growth – a hard tropical coral can take a decade to grow five centimetres. Numerous unschooled visitors have walked on live corals, killing untold numbers of live polyps and changing the balance between various fish species.

Fish feeding has altered the behaviour of shallow water reef and lagoon fishes in several areas, at least temporarily. Unthinking scuba divers have decimated whole areas of the middle reefs.

Hotels and concessions have expanded into marine parks and reserves. Effluent and waste from boats and tourist centres are often discharged into the sea, causing significant damage to the reef and marine estuaries. Noise pollution from speedboats and jetskis disturb

When you swim, be careful of the coral!

local bird life both within and outside parks and reserves.

Many private operators are aware that once a an area of coral is killed, destruction can spread before the reef can recover. Different, more aggressive species may colonize the reef, destroying its rich diversity. But tropical coastal tourism is a highly competitive international activity. Net profit margins on package tours can be as low as three to five per cent per client. Many tour operators fear that any additional rules and regulations with price Kenya out of the market and complain that they are being unfairly penalized for the misbehaviour of a few individuals.

Kenya led Africa in establishing marine parks and reserves. Malindi and Wattamu were declared in 1968. Today Kenya has four parks and five reserves. Mombasa Marine Park and Reserve, containing Kenya's most important tourist area, was officially demarcated in 1986. Since the mid-1980s Kenya has joined several international conventions affecting coastal resources, including the International Convention on Migra-

tory Bird Species and the International Convention on the Conservation of Wetlands of International Importance (the Ramsar Convention).

A series of farsighted laws and regulations were introduced in the 1970s and 1980s to govern coastal fisheries, shell collection and park/reserve activities. Unfortunately, lack of resources and personnel have made enforcement often impossible. Spearfishing within the reserves has long been illegal but the practice continues. Limits on shell collection, sales and export have rarely been enforced. Boats still drop anchors on corals despite a long-standing prohibition. Laws proscribe beachfront development within park boundaries, yet walls, fences and concessions are erected there.

On any day during peak season (from December to Easter) as many as 5,000 tourists can be found along Kenya's coasts. Studies conducted since the 1970s show that more than 90% of all beach tourists never enter the ocean's waters on any given day. Most come to stretch out in the sun, minimizing the impact on fragile tropical reefs and lagoons. Today the situation is changing: the number of scuba divers in Watamu and Mombasa Parks doubled over 1990-1, virtually all diving the same spots with little or no schooling on how to visit and view the reef. Few things can do more damage to a reef than a diver with wetsuit and gloves floundering on the corals, oblivious to the impact. Whole areas around diver moorings have been severely damaged in the past four years. Once untouched areas have been opened up to scores of divers. Over 200 divers can be found daily on Kenya's reefs during high season. This abuse of the coral reef is also taking place outside reserves, especially between Tiwi and Chale Island south of Mombasa.

At the same time, the KWS has moved rapidly to stimulate once more the atmosphere of concern for Kenya's marine resources. It has provided all private operators with a set of guidelines on

I love coral reefs so much I'm taking one home, bit by bit.

what should and should not be done within the parks. Many in the tourist industry, the donor community and Kenyan citizens and residents have offered their services to assist the KWS.

Two hotels fronting the Watamu Marine Park, working with KWS staff, provided material and labour to install a set of permanent moorings for tourist glass-bottom boats in the coral gardens. A major hotel along Mombasa's North Coast provided boat transport and staff accommodation to allow KWS to establish a more permanent base.

Private operators in Kisite/Mpunguti Park and Reserve educate tourists on proper behaviour on the reef and the in the local area. They teach visitors to respect local Muslim customs. They will not provide fins for clients who want to go goggling or snorkeling, to discourage stepping on corals.

Private citizens support the KWS along the coast by volunteering use of their boats, fixing moorings and monitoring activities within the parks and reserves. A local diving club is training KWS park staff to dive, helping them develop materials to educate the public on the reef system, and locating and placing park boundary markers and moorings.

The Netherlands Government hosted a workshop on the environmental impact of coastal tourism, bringing together Kenya policy makers, nature conservationists, scientists and representatives of the tourist industry.

There are encouraging signs that the tropical reef system can recover and play host to many visitors with proper management and use. The numbers and variety of "parrotfish" *Scaridae* spp and "surgeonfish" *Ancanthuridae* spp appear to have increased substantially in the inner reef areas of Watamu Marine Park over the past four years. These algae feeders are essential for maintaining the balance on the inner reefs and flats.

Stocks of groupers/rock cods *Serranidae* spp, easy prey to both spear and line fishing, also appear to have recovered inside the Watamu reef. Mombasa Park shows similar improvements though to a lesser extent. Mpunguti/Shimoni Park and Reserve remain in fairly good condition: they have not been subjected to the same pressures as Kenya's other marine parks.

When we look at the outer reefs, the situation is discouraging, with signs of rapid deterioration. KWS, with its limited mobility and policing powers, rarely visits them. Spear-fishing, overfishing by both locals and visitors, and thoughtless destruction by scuba divers are noticeable in several reserves and in many areas outside the parks.

The Kenyan Government has virtually no means at present to ensure proper use of the outlying reefs or to enforce existing laws in these areas. Some operators do their best to educate and control their clients. Most do not. The more people they take into the water, the better the business.

It is imperative that operators set a good example of proper reef use, and start regulating one another. Visitors simply do not understand what damage they can inflict on a reef. Hotels, operators and dive shops need, at a minimum, to instruct their clients on proper behaviour on the reef. Kenya's coast provides some of the most delightful diving sites to be found anywhere. But if tourists continue to abuse the reef, there will be nothing to attract other visitors in the future. Kenya – for which tourism is the major foreign exchange earner – will have loss the resource, possibly for ever.

Mediterranean

Co-operation takes a step forward

On the initiative of the European Community, the second Ministerial meeting for Euro-Mediterranean co-operation on the environment, provided for by the 1990 Nicosia Charter, took place in Cairo on 28-30 April. The Meeting was organized in co-operation with the Mediterranean Action Plan (MAP).

The Ministers for the environment of 14 Mediterranean countries and the European Communities' Environment Commissioner approved a declaration, adopted a two-phase programme, and set up "a follow-up mechanism" for the implementation of the Nicosia Charter activities.

At the same time, they reaffirmed their will to achieve sustainable development in the Mediterranean basin by 2025 at the latest.

As its long-term objective, the programme aims at "effective and practical integration of economic and environment policies, through the preparation and implementation of (...) economic and social measures and the development of co-operation and partnership between all the Mediterranean countries". In other words, the implementation of the Nicosia Charter will substantially strengthen the MAP and its basic objectives.

The Charter, as well as requiring reports to evaluate Euro-Mediterranean cooperation every two years, had also said States should prepare the draft of a long-term strategy in consultation with the Mediterranean Action Plan (MAP).

"The follow-up mechanism will be composed of the EEC, MAP and the donor organizations – mainly World Bank, European Investment Bank and United Nations Development Programme – which will be in charge of the implementation and follow-up of all the activities generated by the Nicosia Charter," explained Francesco Saverio Civili, a marine scientist for MAP. "The Mediterranean countries made a unanimous acknowledgement of the very important role and experience of MAP, and considered it as the basis for the present and future regional co-operation. As a result, there was general agreement that no new structures should be created, in view of the existence of the Barcelona Convention and of MAP."

The four-page Declaration observed: "The state of the environment in the Mediterranean represents a global challenge for which it is appropriate that all countries mobilize the appropriate euro-Mediterranean facilities for environmental programmes and, to this end, make the other financial donors outside that area aware of the necessity of granting a major role to environmental questions when they implement their financial assistance programmes."

West and Central Africa

Towards the conservation of marine mammals

*by Javier Corcuera**

Marine mammal conservation is a large but poorly studied issue in West and Central Africa. To provide fisheries and wildlife researchers and managers of the WACAF region with the basic technical information to start research, UNEP's OCA/PAC organized a training workshop in Ghana on 20 April-2 May.

Hosted by the Institute of Aquatic Biology in Achimota-Accra, the workshop was prepared within the framework of UNEP's Marine Mammals Action Plan and attended by 25 participants from nine countries: Cameroon, Congo, Ghana, Côte d'Ivoire, Mauritania, Nigeria, Senegal, Sierra Leone and The Gambia.

The workshop focused particularly on the potentially threatened species of the WACAF coasts – the inshore small cetaceans and the West African manatee.

Trainees learned about marine mammals biology and ecology.

They also looked at problems such as the incidental mortality of small cetaceans in fishing nets. Several discussions clarified ideas on how to start research to assess the importance of this issue at the local and regional level.

The trainees also learned how to assess growth and reproductive parameters of marine mammal populations using simple and inexpensive methods. A "hands-on" approach included laboratory work to determine the age of toothed cetaceans and perform reproductive studies of marine mammals.

The importance was emphasized of starting small, local projects based on the development of a personal knowledge of artisanal fishermen and manatee hunters. Four of the trainees had some previous experience in marine mammalogy. One, Richard Kapindi, gave a lecture on the present status of the West African manatee in Sierra Leone. Working with Randall Reeves and Daphne Tuboku-Metzger, Mr Kapindi has become involved with several village chiefs along the rivers in the inner country to obtain data about the distribution of manatee traps. The abundance of these animals seems to be related to the trap distribution – useful information, since the manatees' shyness and slow swimming motions usually make them difficult to detect.

* *Javier Corcuera, from Argentina, has been with OCA/PAC as a consultant for the past few months.*

The workshop allowed participants to discuss other regional topics, such as the importance of preserving the "co-operative behaviour" between the Imraguen people and the bottlenose and Atlantic hump-backed dolphins in Northern Mauritania, the study of apparently frequent mass strandings of cetaceans on the coasts of Senegal, and the coastal habitat destruction that could be isolating several populations of West African manatees, weakening them genetically. Participants were encouraged to start research on these issues as soon as possible, as well as to strengthen public awareness of the potential use of marine mammal populations as tourist income. To help marine mammal science in the WACAF region, OCA/PAC is planning to give small grants to selected research projects.

Red Sea/Gulf of Aden

Climate change team meets in Egypt

The Task Team on Implications of Climate Change for the Red Sea and Gulf of Aden Region held its first meeting at Ismailia, Egypt, on 25-27 February.

Twelve experts, invited by UNEP in their personal capacity, took part as well as representatives of the Intergovernmental Oceanographic Commission (IOC), UNESCO, and the Programme for the Environment of the Red Sea and Gulf of Aden (PERSGA).

The meeting was organized in co-operation with Suez Canal University, whose

She wants to become a tourist attraction

Vice-President Dr Abdel Fattah Abdel Wahab gave the opening address.

The meeting heard nine presentations from Task Team members and agreed a workplan with the aim of meeting again around mid-November to review the draft regional overview. Dr Makram Gerges, OCA/PAC's Deputy Director and Technical Secretary of the meeting, noted that the overview is to be brought to the attention of the governments of the region to prompt their involvement in the development of policy options and response measures suitable for the elimination or mitigation of the possible negative effects of climate change.

Suez Canal University offered to host the session in Sinai, an invitation that was gratefully accepted.

South Pacific

New headquarters now open

The Prime Minister of Western Samoa, Tofilau Eti Alesana, officially opened the new headquarters of the South Pacific Regional Environment Programme (SPREP) at Vaitele on 27 March.

SPREP Director Dr Vili Fuavao thanked the Prime Minister for assistance in establishing the office, which had been particularly difficult because of the ravages of Cyclone Val in Western Samoa in December 1991.

Dr Fuavao commented that with the opening, SPREP had come of age as an autonomous insitution. It was formerly housed and connected with the South Pacific Commission (SPC) in Noumea, New Caledonia. "With our move from Noumeau, (SPREP) is fulfilling the wishes of member governments (...) to have a strong, lean an independent environmental organization for the whole region.

"Now more than ever, we need such an organization," he declared. "As (Pacific) island nations struggle for economic development amid a world recession, many development projects are being contemplated to help fight growing trade deficits: tourist development, mining, port development, logging, and factories. Many of these also affect the fragile natural balance of our islands, especially along our coasts. They may pollute our lagoons, destroy reefs and mangroves, or make extinct plants and animals so necessary for our forests."

Pacific islands must be able to improve their standards of living, provide wider education and give their children health care, he agreed. "But we must also make sure we have islands to pass on to our children, lagoons fit to fish in, and with fish to catch, with the birds and trees that we knew in our childhoods."

'Make nuclear test halt permanent'

SPREP joined countries of the South Pacific in welcoming France's decision to temporarily halt nuclear testing at Mururoa and Fangataufa Atolls in French Polynesia.

The Director of SPREP acclaimed the decision in March as a timely decision in view of the Earth Summit in June. Nuclear testing "has been a potential environmental threat to the South Pacific region, and it is good it has stopped before a major catastrophe occurs," Dr Fuavao said. "Though it is only a temporary halt, we hope it will become permanent."

Protecting turtles

The Steering Committee of the South Pacific Regional Marine Turtle Conservation Programme passed six resolutions on protection issues and recognized the work of two conservationists at its Second Meeting.

The Committee, meeting on 12-14 August 1991 in Noumea, New Caledonia, adopted a resolution on regional co-operation, turtle exploitation in Indonesia, the Japanese bekko (hawksbill turtle scale) trade, Arnarvon wildlife sanctuary in the Solomon Islands, turtle conservation in New Caledonia and Fiji turtle conservation.

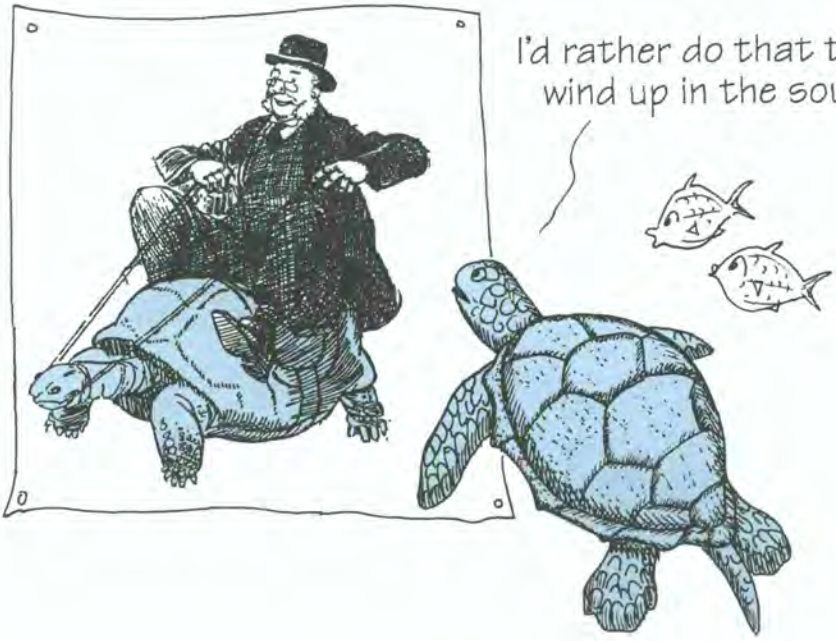
The Steering Committee noted with regret that Mr Peter Thomas is leaving the Programme and recalled that he had played "a significant and fundamental role in successfully initiating and implementing the Regional Marine Turtle Conservation Programme". He has joined the Nature Conservancy, based in Hawaii, USA.

Another resolution recognized the work of Mr Alan Banner, killed by a shark while working on turtle conservation at Nuutele Island in Western Samoa.

New protocol urged

The regional resolution suggested negotiating an agreement on conservation of threatened migratory marine species, particularly marine turtles, as a protocol to the SPREP Convention.

The resolution on Indonesia noted that the Bali Turtle Market is one of the largest in South-East Asia and that very heavy levels of turtle harvesting and exploitation occur in the waters surround-



ing Indonesia. The Steering Committee urged the Indonesian Government to join regional talks to develop co-operative arrangements for the management and conservation of green turtles, a highly migratory species that apparently moves between the South Pacific and South-East Asia.

The Committee congratulated Japan for its decision to end imports of bekko (hawksbill turtle scales) at the end of this year, saying the ban "will greatly assist the conservation of hawksbill turtles in the South Pacific region". At the same time it urged the Government of Japan to remove its reservations to the Appendix I listing of sea turtles under CITES.

Help the Solomons

The Steering Committee called on international and regional conservation and development agencies to help the Solomon Islands "as an urgent priority" to re-establish the Arnarvon Wildlife Sanctuary, one of the largest and most important nesting sites for the hawksbill turtle in the Solomon Islands and a significant rookery for this species in the South Pacific. With the support of SPREP, the Solomon Islands Government has recently carried out turtle population surveys, education programmes and drafted new legislation to control turtle exploitation.

Support for ASNNC

The New Caledonia resolution "supports all action taken by ASNNC (l'Association pour la sauvegarde de la nature néo-calédonienne) with the territorial authorities and the research bodies present in New Caledonia to combat poaching and secure the strict enforcement of statutory provisions relating to marine turtle conservation." The Steering Committee observed that New Caledonia and Dependencies provide an important breeding ground for green, hawksbill and loggerhead turtles.

Michael Guinea praised

Its resolution on Fiji turtle conservation paid tribute to Michael Guinea, for surveying the distribution of marine turtles in Fiji in the late 1970s using his own resources

North-West Pacific

Historic start for NOWPAP

The North-West Pacific programme (NOWPAP) held its first consultative meeting of experts and National Focal Points in Vladivostok (ex-USSR) on 28-31 October.

Shinichi Isashiki, Representative of the Japanese Focal Point, hailed the gathering as "a historic starting point for mutual understanding and co-operation" while Rae Kwon Chung, his Republic of Korea counterpart, described it as "a special occasion for celebration".

In all 29 participants, including representatives of China, Japan, the Republic of Korea and ex-USSR attended. An informal meeting of the NOWPAP States, including Democratic People's Republic of Korea, took place during the 1991 UNEP Governing Council (see the December 1991 issue of *The Siren*).

"It was envisaged that the first meeting of National Focal Points and experts would be convened after a mission of a UNEP consultant to all countries of the

region. However, the broad spectrum of suggestions for geographical coverage and scope of the Action Plan indicated that consultation among countries was necessary at an early stage of development of the Action Plan," explained Ivan Zrajevskij, OCA/PAC Senior Programme Officer for the region.

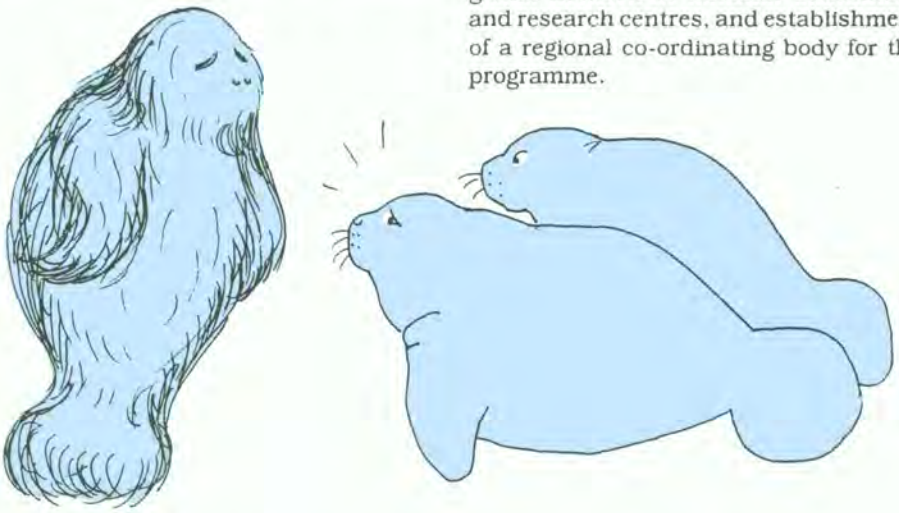
UNEP convened this consultative meeting in co-operation with the Centre for International Projects and the Pacific Oceanological Institute.

Japan presented two reports, ex-USSR scientists put in four reports, and one study each came from the delegation of China and the experts from the Republic of Korea. The workplan foresees preparation of a draft Action Plan as appropriate on the basis of a regional overview so that a second meeting of National Focal Points can take place in September-October this year.

"All countries were very positive and constructive," reported Zrajevskij. "Participants easily agreed on the workplan and timetable for the development of the Action Plan and on the content of national reports which should be submitted to UNEP. The only controversial issue was the geographic coverage of the Action Plan."

The majority considered the Action Plan should initially cover the marine environment and the coastal areas of the Sea of Japan (Tong Hae) and the Yellow Sea. "On the other hand, a view was expressed that the geographic coverage should be considered and defined on the basis of further deliberations on, *inter alia*, the possible content of the Action Plan," Zrajevskij noted. "Many participants, noting that the DPRK did not take part, requested UNEP to send the report of the meeting to the DPRK and to invite its UNEP Focal Point to participate fully in the development of NOWPAP."

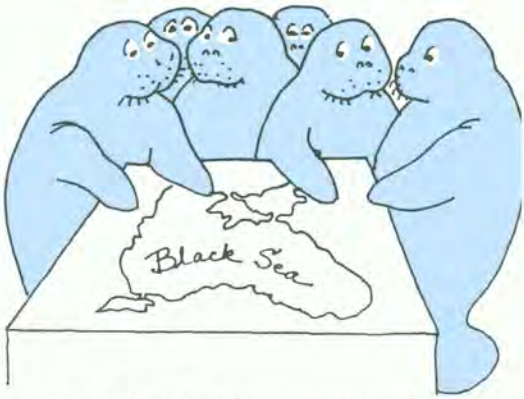
At the next meeting, to be held in October 1992 in Beijing, the representatives agreed to consider Republic of Korea suggestions for a joint survey, regional network of national institutions and research centres, and establishment of a regional co-ordinating body for the programme.



She's already adapting to higher latitudes

Black Sea

Now it's signed!



The Governments of Bulgaria, Georgia, Romania, Russian Federation, Ukraine and Turkey have signed a Convention and three Protocols to protect the Black Sea marine environment.

The signing took place at a Diplomatic Conference on the Protection of the Black Sea against Pollution, held in Bucharest on 21-22 April 1992.

The agreement covers:

- a Convention on the Protection of the Black Sea against Pollution;
- a Protocol on Protection of the Black Sea Against Pollution from Land Based Sources;
- a Protocol on Cooperation in Combating Pollution of the Black Sea Marine Environment by Oil and other Harmful Substances in Emergency Situations; and
- a Protocol on the Protection of the Black Sea Marine Environment Against Pollution by Dumping.

At the same time the Governments decided to establish closer collaboration with UNEP-OCA/PAC's Regional Seas Programme and called for UNEP assistance in implementing their agreements.

Ivan Zrajevskij, OCA/PAC Senior Programme Officer for the region, had visited several countries of the Black Sea during three weeks from mid-November as part of a UNDP/UNEP/World Bank mission to explore the interest of Black Sea border countries for the development of the Global Environmental Facility (GEF) Programme on the Environmental Management and Protection of the Black Sea.

"Ministers agreed that the Convention for the protection of the Black Sea environment against pollution should be signed as soon as possible," Zrajevskij reported. "However, they also agreed that the signature of the Convention should not be considered a prerequisite for the preparation and approval of the GEF Project. In fact, its development and execution could accelerate the signing and enhance implementation of the Convention."

As a result, the GEF Project "Environment Management and Protection of the Black Sea" was prepared and recommended for GEF funding. It was approved by the GEF Participants' Meeting in Washington on 29-30 April.

"An idea to rapidly develop and adopt a Declaration of Environmental Quality Objectives for the Black Sea was supported by most of the government officials who met with the mission," he said. "The Declaration is seen as a first step in the Black Sea Action Plan and will provide environmental goals and a time frame to guide management regimes and associated investments."

A Mediterranean Perspective

by Aldo Manos

Sixteen years of involvement in the Mediterranean Action Plan, the last ten as its Co-ordinator, give me a long-term perspective on this unique example of international co-operation. As I leave the programme to pursue other interests, I welcome the opportunity offered to me to share some thoughts with the readers of *The Siren*.

In selecting the Mediterranean for its first experiment in regional seas management, UNEP took a calculated risk that has paid off handsomely. No other region of equivalent size combines so much history and problems so much potential and opportunities as the 18 countries bordering our sea. My advice to anyone approaching it is: Handle with care.

Here, every century has added its layers of winners and losers, of new arrivals; of lingering resentments and stereotypes. Old maps and history books should be required reading even for dealing with today's environmental problems.

Yet, the global perspective in which we live today offers unparalleled opportunities precisely to the Mediterranean countries.

MAP has lived through, as I see it, three main phases. Phase one saw the setting of common goals, the drafting of the Barcelona Convention and its protocols, and the establishment of its small and active secretariat. Phase two built the MEDPOL, an international scientific and monitoring network that had no model or precedent anywhere.

Phase three, strongly endorsed by Dr Tolba, saw the adoption of common emission standards and environmental quality criteria. They were based on the data previously collected and analyzed through a unique form of co-operation involving the WHO, FAO, UNESCO (IOC), WMO and IAEA. This is where we are now.

Phase four should see the visible curbing of pollution through the application of the agreed standards assisted by increased regional solidarity. Phase five should reverse the degradation of many coastal areas, protect natural habitats and endangered species. The Coastal Area Management Programmes (CAMPs) are the forerunners of this approach.

Phase six – and this is as far as I dare look into the future – should see real co-operation in building a prosperous Mediterranean community by working "with the grain" of the Mediterranean environment and the traditions of its peoples.

Judging by the experience of the past, the road is not going to be easy. Co-ordination of efforts and optimum use of resources is more readily practiced by

the international organizations than by their masters, the Governments. The latter multiply their initiatives in favour of the Mediterranean and rarely combine, at the national level, the contributions of the various international programmes they have established. Worse still, national ministries tend to duplicate the skills such as monitoring, research and training that are required for the truly inter-disciplinary job of dealing with the environment.

This has led, among other things, to an obsession with measuring levels of pollution. Predictably, different results are obtained at different spots and different times. While this reveals a deplorable lack of understanding of marine pollution data and the information they convey, it has produced a war of figures that confuses the public and delays getting down to the serious business of curbing pollution at the source.

Most of the Mediterranean's illnesses have by now been identified. They are localized and can be cured, often in a surprisingly short time. However, this is not only the job of filters and treatment plants. Some bad habits have to be given up from the good old days when use of chemicals in agriculture was a mere fraction of what it is today and when coastal regions had a population of 212 million compared with the 433 million projected for the year 2000.

Environmental control measures and investments will have to be seen as providing a 'development infrastructure' especially in the fragile ecosystems common to most Mediterranean coastal States. Environmental protection in this sense can release scarce resources (e.g. water) or protect rare ones (e.g. soils, forest cover). The threat of irreversible change is unfortunately a very real one, and will be compounded by climatic changes.

For this to be done, a new generation of long-term strategic planners will have to build on the pioneering work of the Blue Plan (see "Futures for the Mediterranean Basin", Oxford University Press, 1989).

Environmental protection, no longer seen as an end in itself, will then be part of development and co-operation projects. For this to happen, the tools that exist today are not enough. Greater economic integration, large-scale joint ventures in things that matter such as tourism, fisheries or energy will make environmental protection something important for all the partners concerned. When common profits are at stake, who can doubt that the transfer of technology – so often proclaimed, so seldom practiced – will become a reality.

New tools to meet existing needs are easy to imagine:

A **Technology Bank** (at present, local authorities have as their only guidance the competing claims of equipment supplies);

A **Mediterranean Investment Bank** (the 500 million Mediterraneans are the only major grouping in the world that does not have one);

A **Permanent Training Academy** (considered a necessity by most civil services and many trans-national corporations).

To cap it all, a **political framework** has already been suggested, through a permanent Conference on Security and Co-operation in the Mediterranean (CSCM). Under its umbrella, cultural exchanges and dialogue would no doubt promote the search for that Mediterranean identity that is so obvious to specialists in sociology, the languages or the arts. The common identity, once recognized and accepted, will provide the best foundation and cement for co-operation among neighbours who discover themselves to be friends.

OCA/PAC has now issued the eighth edition of its *Catalogue of Publications*, 39 pages of regional seas studies and technical reports, with an order form for individual items, a catalogue of stickers and posters, and an index by region and topic.

Some additions since the seventh edition in March 1991 are:

Regional Seas Reports and Studies

RSRS 122	**A,E,F,S**	**UNEP**: An approach to environmental impact assessment for projects affecting the coastal and marine environment. UNEP, 1990. (35 pp.)
RSRS 135	**E**	**UNEP**: UNEP-sponsored programme for the protection of oceans and coastal areas. UNEP, 1991. (58 pp.)
RSRS 136	**E**	**S. NAIDU, et al**: Water quality studies on selected South Pacific lagoons. UNEP, 1991. (99 pp.) (also published as SPREP Reports and Studies No. 49)
RSRS 137	**F**	**A. INTES (ed.)**: Écosystèmes de lagons de la Polynésie française. UNEP, 1991. (298 pp.) (also published as SPREP Reports and Studies No. 51)
RSRS 138	**S**	**H.L. CAPOZZO y M. JUNIN (eds.)**: Estado de conservación de los mamiferos marinos del Atlántico Sudoccidental. UNEP, 1991. (250 pp.)

Regional Seas Conventions and Protocols

RSC 10	**E,F,S**	Status of regional agreements negotiated in the framework of the Regional Seas Programme, Rev. 3. UNEP, 1991. (28 pp.)

Regional Seas Directories and Bibliographies

RSDB 35	**E**	**DAHL, A.L.**: Island Directory. Preliminary editon. UNEP, 1991. (273 pp.)

Reports and Studies of GESAMP

(IMO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Pollution)

GESAMP 34	**E**	**GESAMP**: Review of potentially harmful substances. Nutrients. UNESCO, 1990. (40 pp.)
GESAMP 43	**E**	**GESAMP**: Coastal modelling. IAEA, 1991. (191 pp.)
GESAMP 45	**E**	**GESAMP**: Global strategies for marine environmental protection. IMO, 1991. (36 pp.)

25-29 May	Kuwait	Meeting of Experts for the Assessment of the Atmospheric Effects of the Kuwait Oil Fires (WMO/UNEP-OCA/PAC)
1-2 June	Trieste	Experts meeting to draft Terms of Reference for integrated coastal zone management guidelines for developing countries (UNEP-OCA/PAC)
22-26 June	Guam	UNEP/IOC First Meeting of the Global Task Team on Implications of Climate Change on Coral Reefs, and UNEP-sponsored Session on global climate changes and reef responses (monitoring of coral reefs) (UNEP-OCA/PAC/IOC)
6-10 July	Veracruz, Mexico	UNEP/US/EPA/Govt. of Mexico Meeting of Experts on Land-based Sources of Pollution (UNEP-OCA/PAC)
22-24 July	Paris	IOC/UNEP Intergov. Panel for GIPME – Officers' Meeting (IOC/UNEP)
14-16 Sept	Dakar	Seventh meeting of the WACAF Steering Committee (UNEP-OCA/PAC)
17-18 Sept	Dakar	Second meeting of the Contracting Parties to the Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the WACAF Region (UNEP-OCA/PAC)
21-23 Sept	Rome	FAO/IOC/IAEA/WHO/UNEP Interagency Meeting on WACAF/2 and EAF/6 Projects on the Assessment and Control of Pollution to the Coastal and Marine Environment of WACAF and EAF Regions (FAO/IOC/IAEA/WHO/UNEP)
24-25 Sept	Geneva	VII Interagency consultation on oceans and coastal areas programmes (UNEP(OCA/PAC)
September	Buenos Aires Argentina	Fifth Technical Meeting of Aquatic Mammals Specialists from Latin America (UNEP-OCA/PAC)
September	Istanbul	First meeting of the Task Team on the Implications of Climate Change on the Black Sea (UNEP-OCA/PAC)
September	Sevastopol	Training workshop on the monitoring of the emission of greenhouse gases from the surface waters of the Black Sea (UNEP-OCA/PAC)
September	Nairobi	Meeting of EAF National Focal Points UNEP(OCA/PAC)
October	Woods Hole, USA	Workshop on the legal and socio-economic aspects related to climate change and sea-level rise (UNEP-OCA/PAC)
October	Nairobi	Third Meeting of the Bureau of the Action Plan for the Eastern African Region (UNEP-OCA/PAC)
October	Nairobi	Second Intergovernmental meeting on the Action Plan for the Eastern African Region (UNEP-OCA/PAC)
October	China	Second meeting of experts and National Focal Points on development of the North-West Pacific Action Plan (NOWPAP) (UNEP-OCA/PAC)

MEDU

29-30 May	Trieste	Expert Meeting on economic instruments for environental planning and management (PAP/RAC/UNEP-MEDU)
12-14 June	Thessaloniki, Greece	Second meeting of experts on 100 Historic Sites (Marseille Centre for Historic Sites/Municipality of Thessaloniki/UNEP-MEDU)
20-21 Oct	Athens	Meeting of the Bureau of the Contracting parties (UNEP-MEDU_

CAR/RCU

6-10 July	Veracruz, Mexico	Meeting of Experts on Land-based Sources of Pollution (UNEP/CAR/RCU)
9-10 Nov	Kingston	Meeting of Experts on the Caribbean Environment Programme (UNEP/CAR/RCU)
11-13 Nov	Kingston	Tenth Meeting of the Monitoring Commitee of the Bureau of Contracting Parties (UNEP/CAR/RCU)
16-18 Nov	Kingston	Sixth Intergov. and 3rd Contracting Parties Meeting (UNEP/CAR/RCU)

contents

the regional seas

THE SIREN is issued four times a year in English, French and Spanish, as an informal presentation of news from OCA/PAC, the Oceans and Coastal Areas Programme of the United Nations Environment Programme (UNEP), and does not necessarily reflect the official opinion of UNEP or its staff.

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Produced by Maximedia Ltd. Editor: Peter Hulm; design and layout: Nikki Meith. OCA/PAC Editor: Paul Akiwumi. OCA/PAC Liaison: Maria Cunningham. IPA Liaison: Shane Cave. French version: Danièle Devitre. Spanish version: Eduardo Laureiro.

ISSN No. 0379-2463.

The Siren

Number 47 Sept/Dec 1992

NEWS FROM UNEP'S OCEANS AND COASTAL AREAS PROGRAMME

Coral reefers back first monitoring network

Sixty marine laboratories and individual scientists have announced their participation in the first international coral reef monitoring network. The new network is established as part of the UNEP-IOC-WMO "Long-Term Global Monitoring System for Coastal and Near-Shore Phenomena Related to Climate Change" and also brings in IUCN – The World Conservation Union.

The unanimous agreement and the strong signal of support in the establishment of the network expressed by the world coral reef specialists — participants in a workshop organized in conjunction with the 7th International Coral Reef Symposium, held in Guam on 22-26 June — have given the "green light" for a three-to-five-year pilot programme to monitor some 50 representative coral sites for threats and changes.

"The 50 sites will be selected in four tropical seas and ocean areas where coral reefs constitute an important element of the ecosystem, for example, in the Caribbean, Southeast Asian Seas, the South Pacific, and the Indian Ocean and adjacent water bodies such as the Red Sea," says Dr Makram Gerges, OCA/PAC Deputy Director, who represented UNEP at the workshop.

The pilot phase of the coral reef monitoring activity is expected to get under way in early 1993, together with some other pilot activities of the Long-Term Global Monitoring System which will also include studies on coastal vegetation

(mangroves), sea-level changes and coastal flooding; on coastal water circulation and changes in plankton community structure; and on coastal sedimentation as a sink for carbon.

"The first results of the System's pilot activities including the coral reef monitoring activity will be evaluated after three years," explains Dr Gerges. "If results are significant, the network will expand rapidly to cover other important sites and become a long-term monitoring programme."

The organizers stressed that the activity will not subsume or replace existing programmes. "It merely provides a framework within which closer inter-regional co-operation may become possible," noted Dr John Pernetta, who represented the IOC and acted as workshop Rapporteur. "The proposed monitoring protocols have been deliberately kept simple. Nevertheless, they provide a mechanism through which comparison of the results from more sophisticated monitoring programmes based on differing methodologies applied in different areas at different times could be made."

Dr Gerges adds: "Obviously the long-term functioning of the monitoring network will be the responsibility of the participating laboratories in the respective countries. To initiate the momentum and facilitate the establishment of the network, however, the sponsoring agencies — UNEP, IOC, WMO and IUCN — will provide the mechanism to stimulate support at national level. Furthermore, an important role of the international agencies will be to facilitate the transfer and exchange of the know-how and expertise between the developed and developing country partners in the activity."

UNEP, for example, through its Regional Seas Programme, is preparing a methods manual including reporting formats which, as soon as completed, will be dispatched to all individuals, institutions and organizations expressing an interest in taking part in the pilot phase, to enable them to collect data and start their monitoring activity as soon as possible.

On the other hand, the IOC — which the sponsoring agencies gave technical operational responsibility for the pilot activity — will implement the monitoring programme and co-ordinate participating laboratories. The IOC programme also covers support for training, education and mutual assistance to countries whose capacity to participate is limited.

Dr Danny Elder, Co-ordinator of IUCN's Marine Conservation Programme, expressed his organization's keen interest in co-sponsoring the coral reef monitoring activity and indicated the possibility of using marine parks and protected areas as long-term monitoring

sites. Hence, the current work of IUCN in developing management guidelines for such areas might include consideration of long-term monitoring as a management objective. It was emphasized by Dr R. Harger, who represented UNESCO at the workshop, that monitoring the status of coral reefs is needed not merely in pristine areas but also where systems were subject to other forms of stress or degradation.

Among those who expressed strong support for the establishment of the network and interest in participating in the pilot activity of coral reef monitoring were the representatives of SPREP, CARICOMP and the ASEAN-Australia Living Resources Project.

The workshop's main conclusion, Dr Gerges reports, was that there is an obvious need for a co-ordinated network for coral reef monitoring in relation to climate change, and for agreement on inter-regional co-operation between existing and planned monitoring programmes, and that the present pilot activity could be used as the vehicle for co-operation between all participating laboratories, institutions and organizations. These should be encouraged to contribute actively in the monitoring.

The monitoring hopes to achieve four main objectives, Dr Gerges notes:

– to determine whether the growth rates of coral reefs can keep up with the rise in sea-levels: a 30 cm rise is generally expected by 2050;

– to find out if coral reefs can recover from an increase in tropical storm damage that could result from climate change;

– to correlate changes in sea-water temperatures and chemistry to changes in reef composition; and

– to assemble, link and study previously isolated reports and observations on widespread bleaching of coral reefs in various areas worldwide, with a view to determining its cause and whether this is related to climate change.

In all, some 600 scientists and other reef specialists took part in the five-day meeting in Guam. The focus this year was on how to manage and protect reef ecosystems threatened by human activities, especially coastal development.

But the scientists recognized that they need to get their message out to the public to be effective. "Most (...) embraced the idea that in order to preserve coral reefs and to have their recommendations adopted by governments, they must devote more time and effort to communicating directly with the public," conference organizer Dr Charles Birkeland of the Marine Laboratory, University of Guam, reported.

To put words into action Dr Birkeland held a series of evening seminars open to the general public. Coral reef experts met with local people to show how their work might be applied to development issues in Guam.

"One pressing local issue was the question of how much tourism development and population growth Guam's reef-fringed coastline could take before this fragile ecosystem collapsed," Wesley Ward, Information and Publications Officer for SPREP, told *The Siren*.

"Another change this year was the participation of NGOs such as Greenpeace, who also arranged for national NGO representatives to attend. John Geolagani from Papua New Guinea, for example, described his organization's efforts to help villagers ban dynamite fishing, a method which is destroying reefs around the region." ❑

Assessing the impact of Kuwait oil fires

OCA/PAC's Deputy Director Makram Gerges was among more than 50 scientists from 14 countries and representatives of international agencies at an expert meeting in Geneva on 25-29 May to assess the atmospheric impact of the oil fires that burned out of control during the war over Kuwait.

"A large-scale atmospheric measurement and modelling effort was mounted under the aegis of the World Meteorological Organization (WMO) during an eight-month period as part of the United Nations Interagency Plan of Action for the ROPME* Region coordinated by UNEP," reports Dr Gerges. "At the end of the war in March 1991 over 700 oil wells had been destroyed or damaged, with over 600 wells burning out of control. From March through summer 1991 the fires burning from more than five million barrels of oil and over 70 million cubic metres of gas per day caused a pall of thick black smoke to cover a large part of the region. We wanted to find out what were the impacts."

The expert meeting concluded that the smoke had significant effects on the air quality and weather of the Gulf region, but the fires were unlikely to have caused a global impact. The smoke was never observed to rise above six km and generally stayed about three km, forming a horizontally spread cloud confined largely to the Arabian Peninsula. Soot particles, though regionally significant, were about one-tenth of the smoke released globally by deliberate or wild biomass burning.

The meeting concluded that considerable amounts of soot and oil mist were deposited on the sea surface, but the consequences to marine life have not been established as yet. It was further indicated that intermittent reduction in solar flux caused by the plume's passage has not affected coral.

* *ROPME: Regional Organization for the Protection of the Marine Environment.*

At least we won't get sunburned

GIPME's first joint meeting

The Intergovernmental Panel for Global Investigation of Pollution in the Marine Environment (GIPME) held its first meeting as a joint body of the Intergovernmental Oceanographic Commission and UNEP in Paris on 4-7 March.

UNEP Representative Makram Gerges, Deputy Director of OCA/PAC, described it as "a landmark in the history of our co-operation".

In an address to the first session Dr Gerges said the new body was the culmination of several years' co-operation between UNEP through its Oceans and Coastal Areas Programme Activity Centre and the IOC. IOC has been the implementing agency for several projects under the Mediterranean Action Plan, the Kuwait Action Plan, the West and Central African Action Plan and the Caribbean Action plan.

"In turn, UNEP has co-sponsored most of the subsidiary activities of GIPME, including its three expert groups on methods, reference materials, and pollution effects," he points out. "Thanks to the efforts of these expert groups, we were able to harmonize analytical methodologies through development and testing of reference methods used in marine pollution research and monitoring programmes of UNEP and IOC, in order to make results comparable on a global scale. GIPME is also developing a special joint mechanism to ensure adequate quality control of data, intercalibration of methods and data management."

In all 23 delegates attended — including 16 from 11 Member States of IOC and six from participants in UNEP Regional Seas Areas. They endorsed the Second GIPME Action Plan (1991-93) and suggested a scientific seminar be organized back to back with GIPME VIII in Kingston, Jamaica, in early 1993 to help in a review of pollution monitoring and regional activities. "This will open the way for the preparation in about mid-1994 of an update to the Comprehensive Plan for GIPME," the Panel said.

Recognizing the difficulties of obtaining increased contributions from other international agencies, the meeting suggested that "alternative innovative mechanisms must be pursued by adopting practical approaches in which the Panel acts as a clearing house communicating development of activities, identifying projects to potential donors and advising Member States and regional organizations of potential funding mechanisms and sources".

Dr Mario Ruivo of Portugal was elected to the Chair. Vice-Chairs were Professor Youssef Halim of Egypt, representing the Red Seas Action Plan Region, and Dr Hassan Mohammadi of the Islamic Republic of Iran. Dr Mike Bewers of Canada was named as Liaison Officer for the Scientific Committee of GIPME.

The joint panel adopted two resolutions. One urged the Secretariats of IOC and UNEP to promote early integration among the regional bodies of both organizations in places like the Caribbean and to consult where mutual interest and geographical coverage overlap such as the Western Pacific/East Asian Seas and West and Central Indian Ocean. It

decided to undertake an in-depth review of both organization's activities to make concrete proposals on harmonizing structures and procedures, and to explore the possibilities of support through the Global Environment Facility (GEF) and the European Community.

The other resolution on the Regional Organization for the Protection of the Marine Environment (ROPME) recommends extending work beyond the two-year programme of the ROPME/IOC Integrated Project Plan (IPP) developed under the UN Interagency Plan of Action for the ROPME Region, which also constitutes the coastal/marine component of the ROPME/UNEP Consolidated Rehabilitation Programme (CRP) set up after the war over Kuwait.

The Panel endorsed proposals for a conference by IOC in the Islamic Republic of Iran scheduled for the third quarter of 1993 to evaluate progress in implementing the IPP, using data from the first 18 months.

"Co-operation between UNEP and IOC in integrating our regional pollution monitoring and research programmes is already advanced," Dr Gerges observes. "An IOC staff member, supported by funds provided by UNEP, is outposted to our Regional Co-ordinating Unit in Kingston, Jamaica, to ensure effective co-ordination and collaboration between our joint programmes and also those carried out separately by UNEP and IOC in this region.

"Co-operation with IOC was also exemplary in investigating the environmental consequences of the aftermath of the recent conflict in the Kuwait Action Plan Region," he adds. "IOC's Integrated Project Plan culminated in the launching of the first multidisciplinary research cruise in the region. When we met in Paris I was able to inform the panel that the Research Vessel *Mount Mitchell* of the National Oceanic and Atmospheric Administration of the U.S.A. was cruising the ROPME Sea Area with regional and international researchers on board — a real co-operative effort of which we all had reason to be proud."

Guide for coastal planning

Integrated planning and management of coastal areas is a major objective of OCA/PAC and the Regional Activity Centre for the Priority Actions Programme (PAP/RAC) of the Mediterranean Action Plan. Now professionals and decision-makers will have a detailed document helping them implement coastal zone management activities in all the areas covered by the Regional Seas Programme.

An expert meeting took place in Gorizia, Italy, on 1-2 June to define terms of reference for the preparation of the guidelines. OCA/PAC signed a Memorandum of Understanding in February 1992 for PAP/RAC to prepare the guidelines.

The experts agreed a workplan and a contents guide for 11 chapters, with the aim of producing the document within a year.

"The guidelines, rather than being binding, should provide suggestions as to how to prepare management plans on local and regional levels and ways of implementing the coastal zone management process in coastal areas," said Ms Margarita Astrálaga, OCA/PAC Programme Officer, who chaired the meeting.

Consultant Ferenc Juhasz presented a paper on experiences of Northern Mediterranean countries such as Spain, France, Italy, Greece and Turkey in coastal zone management, forms of planning and management, institutional structures and techniques used. He pointed out that regardless of the high level of development in these countries, they had not yet achieved the desired level of integration.

Ms Souad Krichen, an architect in the Ministry of Environment and Physical Planning, reported on Tunisia's experience. Mr Ivica Trumbic, PAP/RAC Assistant Director, presented a document on the challenges facing Croatia, while Ms Valerie Brachya, Head of Environmental Planning in Israel's Ministry of Environment, stressed the importance of plan preparation and coastal resources inventories in coastal zone management in her country.

"In the discussions participants raised a number of issues which should be taken account of in preparing guidelines," Ms Astrálaga observed. "These included institutional aspects, the need for practice-oriented guidelines, and methodological aspects such as coast-hinterland relations."

The experts decided the contents should be oriented to regional or local action, be concise and aim to offer a simple process for integrated management in coastal zones.

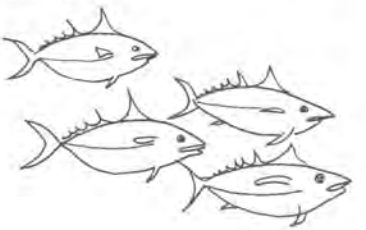
Dolphins and tuna

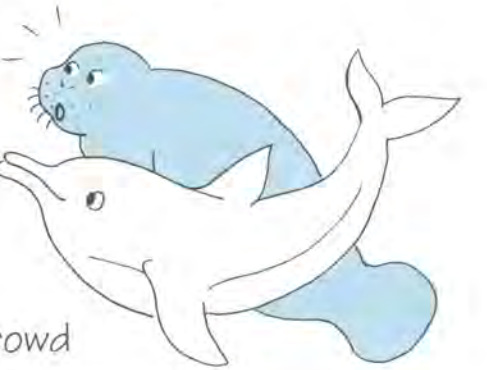
Dr Martin A. Hall, head of the Tuna-Dolphin Programme at the Inter-American Tropical Tuna Commission (IATTC), points out that we are behind the times in our statement in the March 1992 issue (in an article on UNEP's Global 500 awards) that fishing for tunas on dolphins "caused an estimated 100,000 dolphin deaths each year".

He writes: "I believe your readers deserve more updated and accurate information, particularly since UNEP supported some of the activities of the IATTC to increase awareness and reduce dolphin mortalities in this fishery. In 1986 dolphin mortality was estimated at 133,174. Your support aided the efforts of the governments and fishermen involved, and the IATTC, to reduce that mortality considerably: by 1990 the estimate was 52,531 and by 1991 it was 27,292. All of these figures are reviewed and published annually by the International Whaling Commission. Most of the decrease (80%) came from improvements in fishermen's performance and gear, programmes that UNEP helped develop.

"As the most recent estimate of abundance for the populations of this area is close to 9.6 million dolphins, the mortality level in 1991 was less than 0.3% of that abundance, a value significantly lower than the minimum estimates of annual additions to the populations (2%). Additionally, an international agreement was recently signed in La Jolla, California, where the fishing nations of the area committed themselves to reducing the mortality further to below 5000 by 1999. It is clear that this mortality level can allow the populations to recover, and the countries involved are committed to reducing mortality to levels approaching zero. UNEP's Marine Mammal Action Plan contributed to this progress and it is surprizing that your article did not indicate an awareness of the results of these contributions in reducing mortality."

The Siren comments: The article was a very brief piece explaining why an award winner had taken the action which led to nomination. We can only welcome the progress that has been made, and thank Dr Hall for providing this update.





You'd better avoid that crowd

Rio and the oceans

The 39-page Oceans Chapter of Agenda 21, adopted by the Plenary of the United Nations Conference on Environment and Development (UNCED) on 14 June, has 137 sections grouped into seven major parts. What does it say for regional seas managers and policy-makers? How will UNEP's OCA/PAC act on its proposals? The communications in this edition of *The Siren* examine the issues and responses. This article reports on the Chapter itself. It was prepared with the help of Arthur Dahl, OCA/PAC's former deputy director and an advisor on Oceans to UNCED, who is now Deputy Co-ordinator of the United Nations Earthwatch.

The full title of Agenda 21's Chapter 17 is: "Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources". Its introductory section calls for "new approaches to marine and coastal area management and development, at the national, subregional, regional and global levels — approaches that are integrated in content and are precautionary and anticipatory in ambit". Each of the seven sections deals with the implications of these new approaches in major programme areas, ranging from climate change to small-islands development.

The central theme is set out in the first programme area on **integrated management and sustainable development** of coastal and marine areas, including exclusive economic zones. This five-page component calls for 14 management-related activities for integrated development under the responsibility of an appropriate co-ordinating mechanism at the national level, such as preparation of coastal profiles, environmental impact assessment of major projects, and contingency plans for disasters.

UNEP has already drafted a programme of action in response to this challenge (see Communications). It also suggests coastal States, with the support of international organizations if needed, should undertake measures to maintain biological diversity and productivity of marine species and habitats under national jurisdiction. These measures might include surveys, inventories of endangered species and critical habitats, establishment and management of protected areas, and support for scientific research and its publication. It lists five data and information management activities, and says States should co-operate, if appropriate,

in the preparation of national guidelines for integrated coastal zone management and development, drawing on existing experience.

"A global conference to exchange experience in the field could be held before 1994," Agenda 21 proposes. Its section on implementation lists scientific and technological activities, human resource development and capacity-building. "Coastal States should promote and facilitate the organization of education and training in integrated coastal and marine management and sustainable development for scientists, technologists, managers including community-based managers and users, leaders, indigenous people, fisherfolk, women and youth, among others," it suggests. "Management development, as well as environmental protection concerns and local planning issues, should be incorporated in educational curricula and public awareness campaigns, with due regard to traditional ecological knowledge and socio-cultural values."

The outlined **marine environmental protection** programme focuses on pollution and other human activities degrading the marine environment. "The UNEP Governing Council is invited to convene, as soon as practicable, an intergovernmental meeting on protection of the marine environment from **land-based activities**," the Oceans Chapter adds, while recommending States consider "updating, strengthening and extending" the Montreal Guidelines for the Protection of the Marine Environment from Land-Based Sources. "A precautionary and anticipatory rather than a reactive approach is necessary to prevent the degradation of the marine environment," the Chapter declares. "This requires, *inter alia*, the adoption of precautionary measures, environmental impact assessments, clean production techniques, recycling, waste audits and minimization, construction and/or improvement of sewage treatment facilities, quality management criteria for the proper handling of hazardous substances, and a comprehensive approach to damaging impacts from air, land and water. Any management framework must include the improvement of coastal human settlements and the integrated management and development of coastal areas."

It has a special section with six recommendations on **sewage** and another section with ten proposals on other forms of pollution, including "new initiatives at national, subregional and regional levels for controlling the input of non-point source pollutants, which require broad changes in sewage and waste management, agricultural practices, mining, construction and transportation". The Chapter also recommends as priority actions control and prevention of **coastal erosion** and siltation particularly resulting from land-use and construction practices.

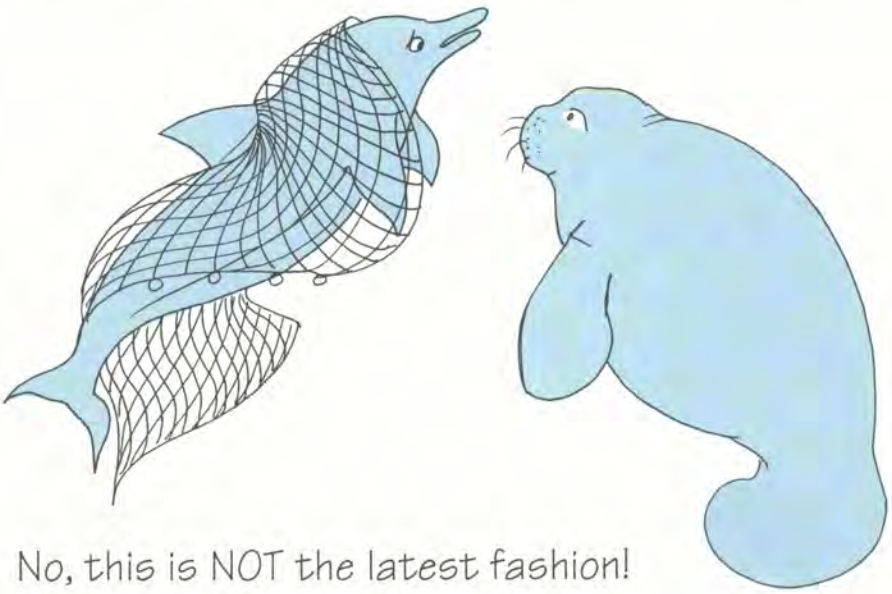
The section on **controlling environmental degradation from sea-based activities** such as shipping , dumping, offshore platforms and ports says States should intensify international co-operation to strengthen or establish regional response centres and mechanisms to deal with oil and chemical spills. It proposes establishing a clearing-house on information to control marine pollution, "including processes and technologies [...] and to support their transfer to developing countries and other countries with demonstrated needs". It also suggests establishing a global database providing information on pollutants reaching the marine environment from land-based activities in

coastal areas and from sea-based sources. "An international funding mechanism should be created for the application of appropriate sewage treatment technologies and building sewage treatment facilities," it adds.

The sub-chapter on **living resources of the high seas** says States should convene, as soon as possible, an intergovernmental conference under United Nations auspices to promote effective implementation of the provisions of the Law of the Sea on straddling fish stocks and highly migratory fish stocks. It should ""consider means of improving co-operation on fisheries among States", Agenda 21 says, urging a ban on dynamiting, poisoning and large-scale pelagic drift-net fishing, as well as efforts to minimize incidental catch. "States should co-operate for the conservation, management and study of cetaceans", and work through the appropriate international organizations, it affirms.

Marine living resources under national jurisdiction — which account for 95% of the fish and shellfish harvest — face mounting problems and will require a major commitment to achieve their conservation and sustainable use. As well as supporting the same principles as the high seas programme, this subchapter urges States to "develop and promote the use of environmentally sound technology[...] compatible with the sustainable use of marine living resources, including assessment of the environmental impact of major new fishery practices". It supports special measures to help small-scale artisanal fisheries. Among the international proposals, Agenda 21 also provides for co-operation to promote seafood quality, including national quality assurance systems.

Climate change and other critical uncertainties are covered in another programme area. "Developed countries should provide the financing for the fur-



No, this is NOT the latest fashion!

ther development and implementation of the Global Ocean Observing System." Agenda 21 states (see report on GOOS in this edition). It promotes actions such as scientific research and systematic monitoring of ozone depletion and the role of oceans as a carbon sink, systematic observation of coastal habitats and sea-level changes, inventories of marine pollution sources and reviews of fisheries statistics.

To strengthen **international co-operation and co-ordination**, Agenda 21 proposes States should further develop mechanisms such as Earthwatch and GESAMP (the Joint Group of Experts on the Scientific Aspects of Marine Pollution). They should also consider "strengthening, and extending where necessary, intergovernmental regional cooperation, the Regional Seas Programmes of UNEP, regional and subregional fisheries organizations and regional commissions".

A special programme is sketched out for **sustainable development of small islands**. Apart from national activities supported by technical co-operation agencies, the Oceans Chapter suggests, small-island developing States could develop and strengthen co-operation and information exchange, including periodic regional and global meetings. The first global conference should be held next year (see article in this edition).

"The total capacity of small island developing States will always be limited," Agenda 21 notes. "Existing capacity must therefore be restructured to meet efficiently the immediate needs for sustainable development and integrated management. At the same time, adequate and appropriate assistance from the international community must be directed at strengthening the full range of human resources needed on a continuous basis to implement sustainable development plans."

It adds: "New technologies that can increase the output and range of capability of the limited human resources should be employed to increase the capacity of very small populations to meet their needs. The development and application of traditional knowledge to improve the capacity of countries to implement sustainable development should be fostered."

At the request of the UN General Assembly, the UNCED Secretariat determined how much it would cost to implement each part of Agenda 21. For the Oceans Chapter, the Oceans Working Party provided inputs from all the concerned UN agencies, resulting in nearly 50 pages of detailed and realistic costings for all the activities listed. These totalled about $900 million a year of support from the international community on grant or concessional terms needed for oceans, coastal areas and islands. This is much more than is now available for such activities, but it is quite reasonable in relation to the economic contributions of oceans and coastal areas or to current global military expenditures.

One of the disappointments of Rio was the failure of the countries present to pledge anything near the level of funding necessary to implement the actions they adopted. It seems clear that new sources of funding that do not compete directly with national priorities will be necessary if international action of the type agreed in Agenda 21 is to be carried out effectively. The challenge now is to determine how to set priorities and to begin the most essential actions agreed in Rio with the limited resources available. ❑

OCA/PAC and the UNCED process

What does UNCED mean for the Regional Seas Programme? How will OCA/PAC carry forward the ideas from Rio into its daily work? Director Peter Schroeder here sets out some of the changes OCA/PAC has initiated to meet the new challenges in ocean management.

The problems related to the marine environment have not altered greatly in the past two decades. What has changed markedly, however, is the general perception of the main threats and the solutions, as a result of the knowledge accumulated during that period.

Although there is still an interest in levels of contamination in the open ocean, the danger that it would become severely polluted is now considered less acute. It is now evident that existing problems, and the first effects of new ones, are most likely to arise in near-shore waters.

So today attention focuses on protecting the health of coastal waters, especially in enclosed and semi-enclosed seas, and environmentally sound integrated coastal area management practices are accepted as the key to safeguarding the coastal environment and its resources. This reflects a crucial change from earlier concerns to preserve the open oceans unchanged. Management, of course, implies rational use. The problems of the high seas and of large marine ecosystems may require more attention in future, but their well-being will be served by improved coastal area management.

What are the implications for OCA/PAC? In the past our activities traditionally consisted of two separate categories: the Regional Seas Programme and global or general issues such as climate change, global monitoring, environmental impact assessment, living marine resources and marine mammals.

Recently, to respond effectively to the demands for integrated coastal area management on the basis of national priorities within a regional context, these two categories have been merged. Relevant global issues and activities have now been apportioned in each Regional Seas Programme, as appropriate.

Additionally, a mechanism has been introduced to effectively transfer experience and expertise from the more "mature" regional programmes to those established more recently.

Finally, with the need to respond to the demand for a multi-sectoral and multi-disciplinary approach, the disciplinary base within OCA/PAC has been broadened to include experts with wide experience in resource economics, civil

and environmental engineering, physical geography and land-use, and computer systems. This has significantly enhanced OCA/PAC's capability to deal with the issues encountered in coastal areas.

The UNCED process revealed three challenges facing coastal managers and decision makers. First, there is a need for immediate action on the ground. Second, the expert consensus is that integrated coastal management (ICAM) is the best approach. Third, we cannot expect large-scale financing for coastal zone management.

Apart from broadening its disciplinary base, OCA/PAC has taken several steps to apply ICAM nationally and promote optimal co-ordination between agencies and international organizations.

1) Pending large-scale financial resources indicated in Agenda 21 for ICAM, it was reasoned that States would need some help off the starting block towards integrated coastal area management. With the Food and Agriculture Organization of the United Nations (FAO) and The World Bank, OCA/PAC set in motion the development of a **framework strategy,** a 50-60 page technical document to guide senior personnel in national planning ministries. This technical strategy document will be supported by detailed and highly technical sectoral annexes dealing with specific components such as fisheries, ports and tourism and with issues like pollution, investments and sea-level rise. Drafting work has already begun. It aims to be ready before 1994.

2) Merely making this strategy available will not bring about the effect we want. We have therefore developed a **training programme** for national senior planning personnel as well as for more junior professionals concerned with implementing the strategy on the ground. Several internationally recognized non-profit institutions were asked to draft a training programme on conflict resolution, which lies at the heart of integrated coastal area management. Other institutions will scrutinize the programme critically and there will be a test run at a university in a developing country.

3) Since there has been no application of totally comprehensive integrated coastal area management ever anywhere, it was decided that this should be undertaken. But if the exercise was carried out on a continental coast, we recognized, it would suffer from outside influences. So an **island test case** was decided on.

We agreed that the island should be large enough to have most of the components of a coastal zone and its problems, to allow for easy extrapolation both to the more complex continental coasts and smaller islands. This island test case, once carried out, will feed back into the framework technical strategy programme and training programme, and lay the groundwork for on-the-spot application of ICAM.

4) We are also considering establishing the non-regional training courses at a permanent location. After reviewing several options, we are holding talks with a developing country to create a **central training centre**, though the financial aspects mean this will take time to complete. We are still open to the idea of simultaneous establishment of such centres at several universities in the developing world.

It is clear that much of the success will depend on the co-operation with a large number of agencies, both "line" agencies directly responsible for coastal components such as fisheries, agriculture, industry, ports and urban development,

and with those providing expertise on which ICAM will depend. These skills include oceanographic research, monitoring, assessments, pollution evaluation, natural disaster work, and of course UNEP's own specialized units.

As for finance, developed countries such as Canada, the Netherlands, Sweden and the United States have indicated interest in supporting aspects of the programme. Developing countries could contribute by hosting a regional workshop or permitting senior personnel and lower-level staff to attend the training programme without requiring compensation for lost professional time. Finally, the Global Environment Facility (GEF) provides another means of obtaining necessary funding.

Have you tried the GEF ?

Wider Caribbean's UNCED position

Countries and organizations of the Wider Caribbean held several meetings to formulate a common position for UNCED.

With regard to climate change, in general the region endorsed the attainment of significant reductions in emissions of greenhouse gases by the end of the decade. Regarding biodiversity, most countries supported recognition and reward for practices and innovations developed by indigenous people that contribute to the sustainable use of biological resources or conservation of biological diversity. The region also supported the recognition of ownership rights in perpetuity for countries with biological resources. In general the region supported the activities proposed in Agenda 21 for the environmentally sound management of waste.

"In recognition of the fact that financial resources will be required to integrate the environmental dimension into development policies, a significant increase in new funding is considered essential," the latest issue of UNEP's *CEPNEWS* reported in an article on the Wider Caribbean position to UNCED. "The reduction of external debt is also considered essential if environmental considerations are to be incorporated into development. Additionally, some countries of the region maintain the position that developing countries should be compensated for environmental damage generated by developed countries. These countries further support the principle that there should be no diversion of development funds from existing sources to address environment concerns and that additional funds should be provided."

Linkages with the land

Policy and legal issues

by David Munro, former Director-General, IUCN – The World Conservation Union

Among the events at Rio's Global Forum was an Oceans Day, organized by the Ocean Institute of Canada, during which Dr David Munro, head of the IUCN/UNEP/WWF project *Caring for the Earth: A Strategy for Sustainable Living*, presented a paper on land-based sources of marine pollution.

This article is extracted from his address.

Despite the obvious ecological and economic links between land and sea, these are generally not complemented by administrative links or management practices. Governmental structures most often separate the administration of fishery and ocean matters from that of land-based activities. In very few countries is the management of the marine environment and marine living resources a central priority of government. Beyond that there is a lamentably widespread failure to integrate the consideration of environmental concerns with the planning and management of development. In these circumstances the continuing decline in the quality of the marine environment and the size of fish stocks is no matter for surprise. If these trends are to be reversed, new policies must be adopted. They will need to be built on a better and broader understanding of the seas and the life they support and of the relationships between the seas and the land.

The basic policy must be to manage oceans and coastal zones with the goal of sustainable development. It is worth explaining what is meant by this phrase. "Development" is taken to mean activities which improve the quality of human life; "sustainable" means within the carrying capacity of supporting ecosystems. Here it is important to recall that the ecosystems concerned are a continuum that links the depths of the seas with the highest points of land.

In giving priority to improving the quality of human life, the objectives should be to ensure the maximum sustainable contribution of ocean and coastal waters to food supply, a level of sanitation concomitant with good health and a marine environment appropriate

for recreation and leisure. To maintain the level of use within the limits of carrying capacity, an objective must be to maintain the vitality and diversity of ecosystems.

None of these objectives can be achieved unless two more basic requirements are met. The first is that Governments will need to give a much higher priority to managing oceans and coastal zones with the goal of sustainable development than they have hitherto. The second is that planning and management of the uses of the land will need to be fully integrated with planning and management of the uses of the sea.

The essential basis for meeting the first requirement is public awareness and concern of a strength and extent sufficient to generate the political will needed to shift priorities. This suggests two things, perhaps not unrelated. One is that there is a need to incorporate information about the marine environment and its management throughout educational systems, and to augment the flow of this information to the public. The other is that there should be an enhanced and expanded role for voluntary organizations in informing students and the public and in reflecting public concerns to politicians. Unfortunately, there are not very many voluntary organizations with a focus on the marine environment and marine resources, which in itself reflects the inadequacy of public perceptions of those topics. Of such voluntary organizations that do exist, not enough give much attention to land-sea linkages.

The best way for governments to move towards the objectives defined to meet the goal of sustainable development and to give visibility to their efforts to do so is within the framework of a national policy on the coastal zone and ocean, as outlined in *Caring for the Earth*[*]. National policies and strategies should:

- establish a mechanism to co-ordinate the planning and allocation of uses of the coastal zone;
- provide a means of reviewing each sector's benefits from and impacts on the coastal zone and determining how the needs of each sector should be balanced and conservation and development combined;
- set out procedures for dealing with deliberate or inadvertent changes in shorelines, including those resulting from sea-level rise, subsidence, saltwater intrusion, settling due to extraction of groundwater or hydrocarbons, landfills, shoreline stabilization, etc.;
- reduce pollution from land-based sources;
- harmonize marine policies and laws with the Law of the Sea;
- empower coastal committees to play their proper role in managing the marine environment;
- provide for co-operative action with other States and shared use of the ocean and its resources beyond national jurisdiction. Given the "loose edges" of marine ecosystems, planning frameworks and action programmes must often run across conventional limits of jurisdiction.

Co-ordinating the planning and allocation of uses of the coastal zone should be at the centre of a national policy for oceans and coastal zones. Establishing a **system** appropriate to the needs will require care and patience

* *IUCN/UNEP/WWF. (1991). Caring for the Earth. A Strategy for Sustainable Living. Gland, Switzerland.*

and a commitment to succeed on the part of all concerned. The system should:

- be organized by drainage basin and adjacent continental shelf ecosystems;
- include comprehensive planning of waste management on the basis of pollution prevention options that cause minimum harm to the environment and human health;
- regulate agriculture and other land uses to control erosion and siltation, and prevent chemical contamination and excessive input of nutrients;
- include local and regional management plans supported by quality criteria, assessment, monitoring and research.

Comprehensive coastal zone planning and management are essential everywhere, but **priority in getting programmes under way** should be given to:

- areas with dense and increasing populations, or high levels of per capita resource use, on coasts with restricted water circulation;
- areas where conflicts are occurring or foreseen due to pressure on coastal and marine resources;
- waters where pollution, habitat loss or over-exploitation have a major impact on resource productivity.

The importance of international co-operation in combatting marine pollution is clearly reflected by the existence of 12 regional agreements with this as a major objective, but so far only five contain provisions for the control of pollution from land-based sources. Ten of the agreements were negotiated and adopted under the aegis of UNEP's Regional Seas Programme.

All the UNEP regional action plans contain a strong pollution research and monitoring component; and feature information exchange, training, technical assistance, and co-operative projects of various kinds. After 5-15 years' experience, there is a strong trend toward solution of problems through integrated coastal zone planning and management. Except for the relative lack of emphasis on land-based sources of pollution, the enabling Conventions, the action-oriented protocols and the Action Plans provide a good model for dealing with problems in areas where agreements are still to be negotiated.

In some of the areas covered by the Regional Seas programme, effective action has slowed down for various reasons. Every effort should be made to revitalize these programmes where they have slowed down or failed to proceed at a satisfactory rate. Where lack of funding is a significant impediment, development assistance agencies should consider giving higher priority to these activities.

Pollution from land-based sources is not yet the subject of a global convention, although such an instrument has been given careful consideration. The matter was, however, the subject of the 1985 Montreal Guidelines for the Protection of the Marine Environment' against Pollution from Land-based Sources. The Guidelines could be a significant input to the further development of both programmes and legal instruments aimed at reducing pollution from land-based sources.

The section on Oceans in Agenda 21 is generally very good — but it represents only a first step — there will be many more. Dealing with the impediments to good management of oceans and coastal zones does not present significant con-

ceptual difficulties. And while we lack much detailed information about marine systems, we have enough and even more than we need to take more extensive and effective action than we have so far. The lack is of public and political commitment. It is not mere rhetoric to say that this is much needed. Commitments will be made only if there are fundamental changes in attitudes and practices — based on the wide adoption of an ethic of caring and sharing: caring for the Earth and its living systems; caring for and sharing with people — those with us now and those as yet unborn.

UNCED and small islands

by Arthur Dahl, Deputy Co-ordinator, Earthwatch, UNEP

For many years the small islands have been more or less ignored by the international community apart from some scientific and conservation activities and the UNEP Regional Seas Programme, which covers almost all of the small island states and territories in the tropical developing world under one or another of its action plans. UNESCO included an island programme under MAB (Man and the Biosphere Programme). IUCN and UNEP created an island database and published the first edition of an Island Directory (Regional Seas Directories and Bibliographies No. 35, 1991). Recently, however, the island countries have joined together (for instance, through the Alliance of Small Island States in the negotiations for a Convention on climate change) and have become a significant voice in international forums, increasing their political visibility as never before.

This and the personal interest of UNCED Secretary-General Maurice Strong (an early supporter since 1974 of what became SPREP) ensured that small islands had a special place in Agenda 21.

UNEP agreed to second me for several months to the UNCED Secretariat to work, among other things, on an island input to Agenda 21. The result was a separate programme area on "Sustainable development of small islands", which drew heavily on the experience gained in the Regional Seas programmes. This was strengthened by the island countries during the negotiations on the text of Agenda 21 at the 4th UNCED Preparatory Committee.

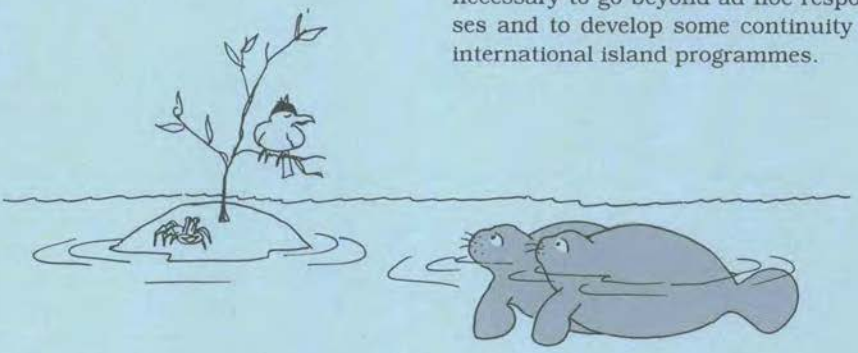
FAO also supported the island preparations for Rio by sponsoring, in co-operation with the UNCED Secretariat, a ministerial-level Inter-regional Conference of Small Island Countries on Sustainable Development and Environment in Agriculture, Forestry and Fisheries, held in Barbados on 7-10 April 1992.

While much of Agenda 21 is pertinent to small islands, the islands section of the Oceans Chapter highlights those special features that set islands apart, such as the need to respect the limited carrying capacities of small islands, the different approaches to training needed to build the human capacity for environmental management on islands, and the need to adapt technologies to island conditions, avoiding those that threaten essential island ecosystems.

Special emphasis was placed on the ways small islands can work together to solve their problems, both within regional frameworks such as the Regional Seas programmes and through increased global exchange through periodic meetings. UNCED called for the first global conference on sustainable development of small island developing States to be held in 1993, but it did not specify who should be responsible for organizing or funding such a conference. This should be discussed by the UN General Assembly when it considers the results of UNCED.

There are still some obstacles to a coherent global approach to the special problems of small islands. Islands are some of the most expensive places to travel to and from, so few island countries can afford to exchange experts or to send representatives to many international meetings without special assistance. In developing an international grouping of island countries, it will be necessary to reassure the regional groups of developing countries (Africa, Asia, Latin America) that there need not be any conflict between a country's membership in such regional groupings and their common interest as small island States. There is also a lack of leadership on behalf of islands in the international community.

No United Nations body has a specific mandate to provide special assistance to the sustainable development of small islands at the global level or to co-ordinate island activities across the UN system. Leadership of some sort will be necessary to go beyond ad hoc responses and to develop some continuity in international island programmes.



That's what I call a limited carrying capacity

The need for partnership

One address on oceans that attracted much media attention at Rio was by Dr Gunnar Kullenberg, Secretary of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the United Nations Educational, Scientific and Cultural Organization. Its joint programme with UNEP and other international bodies for an Global Ocean Observing System also receives strong support under Agenda 21, in the section on climate change and other uncertainties affecting the ocean and coastal environment. This article is adapted from his speech.

A key to resolving the uncertainties of climate change lies in the long memory of the oceans. It may soon be possible to predict many aspects of upper ocean behaviour with enough accuracy to greatly improve climate, weather and fishery forecasts — but only if ocean data are collected systematically and analyzed promptly.

While some progress is being made in understanding the role of the ocean in climate variations, more attention must be given to observations of properties and processes in the upper ocean, in the mid-depth regions and at great oceanic depths. The effect of the ocean on the atmosphere can be either to moderate or intensify change or variability in the climate. Global ocean observations will reveal the ocean's memory. They will provide, for example, a description of the global circulation of heat and water in the ocean and their exchange with the atmosphere.

Changes in the oceans on time scales of several years have recently been identified which may be related to greenhouse warming. Because of the lack of adequate historical data, we are only now recognizing the variability of climate. We need records of all parts of the climate system over decades to answer these questions with any assurance. Each year meteorologists receive over 20 million sets of data describing the atmosphere. The picture of the ocean which we are able to put together on the basis of timely and systematic observations is, by contrast, quite sparse. Huge areas of the ocean are "data free". The quarterly *IGOSS Products Bulletin* shows quite clearly the situation and imbalance in distribution of observations.

IOC is developing the basis for a **Global Ocean Observing System** in co-

operation with the World Meteorological Organization, the United Nations Environment Programme and the International Council of Scientific Unions. This system is also a contribution to the goals of the Framework Convention of Climate Change which calls for systematic observations of the climate system to reduce the remaining uncertainties regarding the causes, effects, magnitude and time of climate change. The system is also a contribution to the Convention on Biological Diversity which includes systematic observations, through sampling and other techniques.

We know enough to say that the oceans are central to both global environmental change and sustainable development, and therefore we must be able to forecast aspects of regional ocean conditions. This requires an adequate understanding of processes and of the ocean's interaction with the atmosphere, biosphere and land. The Global Ocean Observing System is based on a globally-coordinated, scientific strategy for systematic observations of ocean and coastal changes and the interaction with atmospheric and terrestrial processes. It will address needs for assessment and forecasting of climate change, the health of the ocean, changes in ocean conditions affecting living marine resources, and provide basic data for coastal zone management and development strategies. The data produced will be widely disseminated and accessible.

A well-known example of climate fluctuations is the "El Niño" phenomenon regionally or ENSO (the El Niño/ Southern Oscillation)* globally. In 1982-83 effects of the strongest ENSO event of this century were felt worldwide. Droughts and floods caused crop failures in many countries. There were huge drought-related fires in Borneo and Australia, drought-related eradication of sea-bird populations on islands in the Pacific, drought-related famines in India and east Africa, and flooding on the east coast of equatorial South America, in the Rocky Mountain region of the United States and in Brazil south of the Equator.

Under the Tropical Oceans Global Atmosphere (TOGA) Programme, part of the World Climate Research Programme and formulated through the Joint SCOR-IOC Committee on Climatic Changes and the Ocean, an extensive ocean observing system has been set up which resulted in adequate predictions of the onset of the latest El Niños. Peru, concerned with the impact of El Niño events on its economy (based on experiences of extensive losses suffered), is making crop decisions for its agricultural needs based on these climate forecasts in order to at least sustain crop yields. This national experiment is an example of the use which can be made of adequate ocean data when obtained on a permanent and systematic basis.

The joint programme of IOC and UNEP called International Mussel Watch addresses the condition of the coastal zone. It is operational with the first field phase being implemented in the Americas, including the Caribbean. Mussels are being sampled according to agreed procedures. The samples are analyzed according to established methods. The first integrated data are expected early in 1993. This programme constitutes one part of the health of the ocean module of the Glo-

* *The ENSO phenomenon is an air-sea interaction process giving rise to large-scale changes in wind patterns and ocean temperature in the Central Pacific from West to East.*

bal Ocean Observing System. Another element of this module is the Marine Pollution Monitoring System in a joint IOC/UNEP Global Investigation of Pollution in the Marine Environment Programme.

It is most important that the contents of Chapter 17 of the UNCED Agenda 21 are given appropriate attention in any new structures which are being proposed. The oceans, including enclosed and semi-enclosed seas and coastal zones, must be adequately represented within the proposed Council and Commission on Sustainable Development. Oceans are a cross-sectoral issue. In Agenda 21 a holistic package has been developed which will provide the framework we need in combination with the United Nations Convention on the Law of the Sea (UNCLOS).

IOC, as a competent organization referred to in UNCLOS, has developed a strategy and plans for the immediate follow-up to UNCED. This strategy is based on four main themes: (i) developing, promoting and facilitating oceanographic research programmes; (ii) planning a Global Ocean Observing System; (iii) providing leadership for the necessary training and technical assistance programmes; and (iv) ensuring that data is effectively handled and made widely available. The ocean is here regarded as a whole, including the open ocean, the coastal zone, and closed and semi-enclosed seas; and an integrated inter-disciplinary approach is adopted.

National capabilities in marine sciences and services need to be substantially strengthened. Such national institutions now are usually weak or even non-existent. Their influence on national development planning needs to be enhanced. Without creating adequate national and regional infrastructures, equipped with interdisciplinary scientific expertise, and without access to decision-making authorities, no effective protection and integrated management of the marine environment can take place for sustainable development.

They're doing the "southern oscillation"

Partnerships between developed and developing countries are needed to strengthen networks regionally and globally. Governments have now agreed to Agenda 21 and are signing the Conventions which have been negotiated. We then have to reiterate the obligations that Contracting Parties, Governments and international organizations have to participate in global efforts such as those described here in order to better understand and forecast climate and environmental changes for the support of sustainable development, including in our oceans and coastal zones. ❑

Mediterranean

HELMEPA's garbage and plastic campaign

This summer visitors to beaches, marinas and ports of Greece were met by two new colourful posters exhorting them in Greek and English to keep the seas and beaches free of garbage and plastics.

The 50,000 posters were produced and distributed by the Hellenic Marine Environment Protection Association (HELMEPA) with the co-operation of member companies and the Ministry of Merchant marine. "The Association," explains HELMEPA Director General Dimitris Mitsatsos, "aims at reaching each and every visitor to our coasts, at the same time reminding all of us of our obligation to protect the Mediterranean through voluntary commitment."

Complementing this public awareness campaign, HELMEPA is coordinating in Greece the 1992 International Voluntary Beach Clean-up Day. This initiative is part of the European Community HELMEPA-MEDSPA Programme for 1991-1993 aimed at motivating the public in Mediterranean coastal societies to care for their environment. Last year a similar campaign discovered that garbage on the beaches consisted of 33% plastics, 31% metal, 16% paper, 10% glass, 5% wooden items and 3% rags.

Economics in coastal management

Several tips on using economic instruments in coastal zone management came from a Mediterranean expert meeting held in Gorizia, Italy, on 29-30 May.

The conclusions:

- For a systematic application of economic instruments, countries need a market system within which economic instruments can operate effectively; a sufficient level of environmental knowledge; monitoring systems; institutional capacity and enforcement mechanism; public and decision-makers' awareness; and harmonization with other instruments and policies.
- Many countries lack knowledge and understanding of the instruments, possibilities of their application, and potential benefits for coastal zone development.
- The most widely implemented instruments are apparently effluent and user charges and economic incentives. However, the range of these instruments could be enlarged for coastal zone management, and their application made more effective.
- Since economic instruments can generate substantial revenues, these should be earmarked and used for achieving environmental and resource management objectives.

The experts, who had before them an overview paper and considered five papers from several Mediterranean countries, recommended a detailed regional review and proposed a policy document that could be developed into guidelines. A workshop was proposed for next year to look at the review and draft policy document.

"In the discussion, the participants agreed that efficient application of economic instruments in coastal zone management is possible only within a development process based on the principle of sustainability," observed meeting secretary Mr Ivica Trumbic, Assistant Director of the Regional Activity Centre for the Priority Actions Programme (PAP/RAC) of the Mediterranean Action Plan.

Professor Giuliano Fierro of Genoa University was elected to chair the meeting.

Mr Ferenc Juhasz presented the background paper. He said the most commonly employed instruments are effluent charges (for water and noise), user charges (for waste water and solid waste), resource pricing (water, land and forest), and subsidies (grants and soft loans for air, water and waste control).

He pointed out that the need for sustainable development and the continuing deterioration of the environment in coastal areas suggest that economic instruments should be much more widely used. Three features made them particularly applicable in the coastal zone:

- user charges and resource pricing work well in resource management;
- economic instruments are basically instruments of integrated management through the use of the pricing mechanism;
- they are more feasible and effective in coastal zones than in low-income areas because of the relatively high level of coastal economic activity and high incomes.

Ms Souad Krichen, in a paper on Tunisia's experience, stressed particularly the institutional aspects. Mr

Glafkos Constantinides reported that Cyprus was carrying out a study to identify appropriate economic instruments and integrating them into the planning process for both coastal and inland regions.

Presenting a paper by Mr U. Marinov, Ms Valerie Brachya of Israel's Ministry of Environment noted that apart from municipal sewage and garbage disposal charges, funds were established for specific environmental purposes: restoration of quarries, funded by fees on aggregate production; marine pollution prevention funded by a fee on ships docking at Israeli ports and used for financing the marine pollution inspectorate and cleaning beaches; clean-up projects and educational activities financed by a levy on beverage containers. Fees on industry are used to finance air pollution monitoring, and any pollution prevention or control equipment is exempt from customs duties.

Meeting vice-Chair Professor Mario Cogoy of the University of Trieste reported that Italy was considering restructuring user charges for waters, emission taxes on a regional basis, regional sewerage charges, taxes on plastics and herbicides, communal charges for non-biodegradable industrial effluent, incentives for cleaner motor-car technologies and for industrial waste reduction and recycling.

Dr Ivo Simunovic, Dean of the Faculty of Economics in Split, Croatia, presented a pilot project , prepared for part of the historic core of the town, to apply land rent as an economic instrument in coastal zone management. He stressed that all users of the urban area should pay the rent and that revenues must equal the expenses of equipment and environmental protection.

Wider Caribbean

Getting ready for the big one

In preparation for the Intergovernmental Meetings on the Caribbean Environment Programme to be convened in November, four expert meetings took place in Kingston during May to look at the regional programmes, suggest revisions for the 1992-1993 workplan and make recommendations for 1994-1995.

Alarm over threats

Action on funding, land-based pollution and pesticide contamination was recommended for the Caribbean pollution monitoring programme at the first meeting of CEPPOL's Group of Experts, held on 12-14 May. The 18 regional experts also proposed nine programme activities for 1994-1995 and spoke of "large-scale degradation" of the resources on which some islands depend to provide revenue and jobs.

The experts recommended the CEPPOL Secretariat to seek substantial additional funding from external sources to enable the programme to expand its activities and achieve its goals.

In activities to control domestic, industrial and agricultural land-based pollution, the experts suggested developing an approach to assess non-point sources of pollution, particularly agriculture, and building up a database on point sources of pollution.

They also proposed there should be a second phase of the programme for

baseline studies on pesticide contamination and formulation of control measures "to assess, as far as possible, the levels, fate and effects of second generation pesticides (including organophosphorus, carbamates, etc.)."

The nine programme activities include research on the significance of increased turbidity and eutrophication in the Wider Caribbean as a result of changing land/sea use. Endorsing the activity, the experts noted that eutrophication found in ecosystems such as coral reefs is contributing to large-scale degradation of critical natural resources which form the basis of some island economies.

Ship wastes initiative proposed

Twelve activities for 1994-1995, including a regional initiative to limit ship-generated solid waste, have been proposed by an expert meeting on IPID, Integrated Planning and Institution Development for the Management of Marine and Coastal Resources in the Wider Caribbean.

Meeting on 19-21 May, the 11 experts further recommended intensifying fund-raising efforts. For 1992-1993 they recommended that the model for climate change being built as part of a study of ecological and socio-economic implications of climate change should be developed into a tool for integrated planning.

For 1994-1995 the experts said a Caribbean initiative on ship generated solid waste should be included in the workplan, and proposed making training part of the projects on climate change and environmental impact assessment.

Call for wider involvement

Education, training and awareness (ETA) experts, meeting on 26-28 May, have urged involving a wider variety of organizations and more training efforts for the management of marine and coastal resources in the Wider Caribbean.

The 12 experts proposed drawing up a fundraising strategy, and said production of materials should be a priority in activities at primary and secondary school level. They also suggested that materials produced and collected under the activity to train media personnel in covering marine and coastal resource management issues in the region should be widely disseminated.

The meeting proposed seven project activities for 1994-1995, including development of regional media centres for awareness on marine and coastal resource management, a training and

technical co-operation programme, and ETA work with partners such as business, religious groups, youth, women, indigenous peoples, local authorities and trade unions.

Scientific group on wildlife meets

Experts serving as the Interim Scientific and Technical Advisory Committee (ISTAC) under the 1990 Protocol Concerning Specially Protected Areas and Wildlife (SPAW) held their first meeting on 4-8 May in Kingston.

In all, 32 experts from 14 States and Territories of the region and eight international and non-governmental organizations took part. They established a special group on developing criteria for establishing protected areas, to produce draft guidelines for the Intergovernmental Meetings to be convened next November.

The experts did not recommend modifications to the criteria for listing species under the Annexes. They also deferred a decision on the permanent Committee (STAC) rules of procedure, particularly regarding participation by Territories.

The meeting recommended adding a reference to terrestrial areas as they relate to coastal ecosystems in the objectives of the SPAW Regional Programme for 1992-1993. It also recommended giving a high priority to establishing a Regional Activity Centre for SPAW, and agreed on the importance of developing mechanisms for revenue generation, as well as the need to strengthen and improve the network and management of protected areas.

South-East Pacific

Looking back – and forward

Ten years of work to protect the marine and coastal areas of the South-East Pacific were reviewed at a meeting in Santiago, Chile, which also gave some pointers for the future direction of activities under the 1981 Lima Convention.

The Second International Seminar on Research and Surveillance on Marine Pollution in the South-East Pacific was held on 14 May to look at the achievements and shortcomings of the Action Plan during the first 10 years of the Convention. The representatives of Governments and other organizations that support the South-East Pacific Action Plan also stressed that the Plan has been "a valuable effort to strengthening national capacities for the benefit of regional environmental concerns — one which should be maintained and expanded".

At the national level, the Action Plan has helped particularly to increase awareness of the need to train national specialists and the Convention and its Protocols have had a multiplier effect on national legislation, they remarked.

The Plan of Action has been reviewed officially on four occasions — the last time at the end of 1991 in Santiago. "The Governments then took important decisions to guide its activities and introduced new activities to fit changing circumstances," says the Action Plan Advisor J. Jairo Escobar Ramírez. "It is possible that with the Plan's possible expansion to Central America and the results coming out of UNCED, the Plan will need more modification. This possibility was certainly foreseen in the review that took place in May."

The seminar review indicated which activities were considered priorities for the future: integrated coastal zone management, studies of the effect of climate change including sea-level rise, monitoring pollution in the marine environment, protection of marine biodiversity, information activities and public-awareness raising.

Under the Plan, training at some 94 courses and seminars has been offered to more than 1100 specialists from the region's five countries. The Lima Convention has been in force since 1986. Governments of the Region have just ratified two Protocols — on Marine and Coastal Protected Areas and on Protecting the South-East Pacific against Radioactive Contamination — signed at the 1989 first High-Level Meeting of Contracting Parties.

"New Protocols are now being prepared," notes Mr Escobar, "on environmental impact assessment in the marine and coastal areas and on the prohibition of transfrontier movement of wastes and harmful substances in the South-East Pacific.

"The region was also the first to have its own Plan of Action for Marine Mammals, adopted by the fifth Intergovernmental Meeting, held in Santiago

last December. It was one of the first to set up a regional network of coastal and marine protected areas and to draft a strategy to carry out activities in coastal zone management. As part of this activity, national groups of experts carried out five case studies. Other regional activities under the plan have concentrated on coastal zone erosion, evaluation of the effects of climate change on coastal and marine ecosystems, ocean mining, environmental impact assessment, protected areas and radioactive contamination."

The Co-ordinated Programme to Research and Monitor Pollution in the South-East Pacific (CONPACSE) has drawn up three reports on land-based sources of marine pollution. It has produced data on the levels and distribution of various contaminants of regional concern such as heavy metals and pesticides. It has gathered information also on petroleum hydrocarbons and microbiological contamination. In 1989 the Governments of the region ap-

proved the restructuring of CONPACSE to establish a Pesticide Monitoring Network and a programme to strengthen the capacity of the national institutions in carrying out pesticide analysis, including training of specialists in reference methods at the International Atomic Energy Agency laboratory in Monaco.

Several regional task teams have been set up to work with the Action Plan, the most recent on Environmental Management of the Coastal Zone, established in 1991, and the Regional Group on Coastal and Marine Protected Areas, created this year.

After the request of Costa Rica to take part in the Action Plan, and a visit to five Central American countries by the Secretary General of the Permanent Commission for the South Pacific (CPPS), the regional co-ordinating body for the Action Plan, and two senior officials of UNEP this year, plans are going ahead to expand activities in what will be the Regional Seas Programme with the most extensive coastline.

announcements

Exxon Valdez meeting

The Alaska Sea Grant College Program of University of Alaska Fairbanks is organizing an Exxon Valdez Oil Spill Symposium on 2-5 February 1993 in Anchorage. Participation is open to all scientists who conducted research related to the 24 March 1989 spill.

The symposium will be a forum for presentation of the results of the scientific studies undertaken following the oil spill in natural resource damage assessment, response, and restoration. Attendance by individuals interested in hearing the presentations and participating in general discussions is encouraged. Sponsors include members of the US Department of Agriculture, US Depart of the Interior, National Oceanic and Atmospheric Administration, and Alaskan authorities.

For further information, contact: Brenda Baxter, Symposium Co-ordinator, University of Alaska Fairbanks Alaska Sea Grant College Programme, Fairbanks, AK 99775-5040 USA; Fax: (1) 907 474 6285

Ocean pollution symposium

We misrepresented the international marine meeting taking place in Beijing next October. It is in fact the Second International Ocean Pollution Symposium (2IOPS) (not oil), being held in the Chinese capital on 4-8 October 1993.

The symposium aims to provide a forum for the exchange of ideas and information among scientists involved in marine pollution and ocean disposal research.

Inquiries should be addressed to:

Professor Jiayi Zhou, 2IOPS Symposium Chairman, Institute of Marine Environmental Protection, State Oceanic Administration, Box 303, Dalian, People's Republic of China; Fax: 86 411 472 396; or to:

Prof Iver W. Duedall, Department of Oceanography, Ocean Engineering and Environmental Science, Florida Institute of Technology, Melbourne, Florida 32901, USA; Fax: 1407 984 846.

Date	Place	Meeting
12-16 Oct	Paris	UNEP/IOC/WMO Meeting of Experts on the operational plans for the Long-term Monitoring System of Coastal and Nearshore Phenomenon related to climate change.
19-21 Oct	Nairobi	First Meeting of the National Focal Points on the EAF Action Plan
19-21 Oct	Geneva	First Meeting of Experts on the Environmental Declaration for the Black Sea
26-31 Oct	Beijing	Second Meeting of experts and National Focal Points on the development of the North-West Pacific Action Plan (NOWPAP)
23-27 Nov	Geneva	First Meeting of GESAMP Working Group 33 on indicators of marine ecosystem health
1-5 Dec	Port Louis, Mauritius	Meetings of the ACMEN Seas and Islands Ecosystems Committees
MEDU		
7-10 Oct	Chioggia, Italy	Consultation meeting on determination of pathogenic micro-organisms in coastal marine waters
22-23 Oct	Sophia Antipolis, France	Meeting of Blue Plan Focal Points
26-30 Oct	Athens	Meeting of SPA Focal Points
2-6 Nov	Athens	Training and inter-calibration exercise on determination of microbiological pollution
9-10 Nov	Cairo	Meeting of the Bureau of the Contracting Parties
23-25 Nov	Athens	Meeting of PAP Focal Points
CAR/RCU		
9-10 Nov	Kingston	Meeting of Experts on the Caribbean Environment Programme
11-13 Nov	Kingston	Tenth Meeting of the Monitoring Committee and Special Meeting of the Bureau of Contracting Parties
16-18 Nov	Kingston	Sixth Intergovernmental and Third Contracting Parties Meeting
SE/PCF		
11-13 Nov	Panama	Meeting of Co-ordinators of National Groups on Environmental Management of Marine and Coastal Zones of the South-East Pacific
Dec	Bogotá, Colombia	Meeting of legal experts to revise the draft of the Protocol on Environmental Impact Assessment in the marine and coastal areas of the South-East Pacific
Dec	Guayaquil Ecuador	Meeting of Experts of the South-East Pacific to analyze the guidelines and procedures in the environmental impact assessment on the marine and coastal environment produced by coastal aquaculture project.

contents

the regional seas

THE SIREN is issued four times a year in English, French and Spanish, as an informal presentation of news from OCA/PAC, the Oceans and Coastal Areas Programme of the United Nations Environment Programme (UNEP), and does not necessarily reflect the official opinion of UNEP or its staff.

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Produced by Maximedia Ltd. Editor: Peter Hulm; design and layout: Nikki Meith. OCA/PAC Editor: Paul Akiwumi. OCA/PAC Liaison: Maria Cunningham. IPA Liaison: Shane Cave. French version: Danièle Devitre. Spanish version: Eduardo Laureiro.

ISSN No. 0379-2463.

UNEP

The Siren

Number 48 March/September 1993

NEWS FROM UNEP'S OCEANS AND COASTAL AREAS PROGRAMME

Rehabilitating ROPME's ecosystems

By Makram Gerges, Deputy Director, OCA/PAC

In the oil pollution that blackened the ROPME* sea area during the 1991 war over Kuwait, early reports indicated that at least 30,000 marine birds died, approximately 20 percent of the mangroves on Saudi Arabia's eastern coast were oiled, and about 50 percent of the coral reefs were affected. There were also indications that hundreds of square kilometres of seagrass beds (feeding grounds for dugongs and turtles) as well as tidal mud flats might have been inundated by oil.

Two years after the end of hostilities, what do we know of the environmental situation in this shallow and vulnerable stretch of water with its valuable marine life? Where do we go next and what lessons can the United Nations system draw from what is recognized as an exemplary case of international co-operation?

A Scientific Report on the Environmental Effects of the Conflict between Iraq and Kuwait was completed for the 17th Session of UNEP's Governing Council, (Nairobi, 10-21 May). UNEP co-ordinated the United Nations Inter-agency Plan of Action to assess the

** ROPME is the Regional Organization for the Protection of the Marine Environment in the Kuwait Action Plan region.*

effects, plan mitigation measures and prepare a rehabilitation programme.

The definitive report takes into account observations after the capping of the last oil well fire on 6 November 1991 and the findings of a 100-day research cruise by the US research vessel "Mount Mitchell" of the National Oceanic and Atmospheric Administration (NOAA) one year after the war (during February-June 1992).

Information gathered during the initial surveys, conducted under the Plan of Action by a team of some 50 scientists and experts from 14 countries and 12 UN and non-UN organizations, indicated that in 10 days an estimated 6-8 million barrels of oil were spilled into the ROPME sea area (see *The Siren* Nos. 45 and 47) where several hundred thousand barrels of oil seeped from damaged Kuwaiti and Iraqi oil facilities. Several small Iraqi tankers sunk in the northern part of the sea area produced additional pollution through the spring and early summer. Early observations also showed that atmospheric fallout from Kuwait's burning wells introduced a considerable additional quantity of oil into the marine and coastal environment in the form of small droplets and oily soot.

An oil slick that reached 50km by 5km heavily contaminated most of Saudi Arabia's northern shoreline, reportedly affecting some 600km of coastline, particularly Abu Ali island and its causeway to the mainland. Lagoons, salt marshes and bays located between Ras Al-Khafji in the north and Ras Abu Ali in the south were heavily polluted.

In other parts of the ROPME Sea Area, the Iranian coast north of Bandar Khomeyni was also affected, but to a lesser extent, while the Iraqi coast was only slightly affected. The Kuwaiti coast suffered only relatively light damage, while the three coral reef islands off the Kuwaiti coast did not show any significant degree of ecological damage.

Pollution by oil in the marine environment was not limited to spills. As a result of the fallout of soot and unburned oil products emitted from the burning oil wells, slicks formed on the surface of the water, releasing polycyclic aromatic hydrocarbons (PAHs) and heavy-metal-laden soot particles into the water column. It was also observed that hundreds of small boats and dozens of military ships had been sunk in the area, many loaded with ordnance. The physical destruction of beaches by digging of trenches and laying of mines, barbed wire and other defence installations, not only damaged the intertidal zone but poses a great danger to human life as well as to turtles nesting on the islands. The destruction of sewage treatment plants in Kuwait resulted in the release of over 50,000m^3/day of raw sewage into Kuwait Bay, threatening the intertidal ecosystem, downgrading the quality of seawater used for desalination, and polluting public beaches.

To further investigate the extent of such environmental damage, the "Mount Mitchell" cruise a year later was of major importance in assessing the long-term threat. In addition to providing the scientific basis for rehabilitation efforts, "the information gained should be of considerable value, not only for the present spill, but also for dealing with future large spills throughout the world," the UNEP report points out.

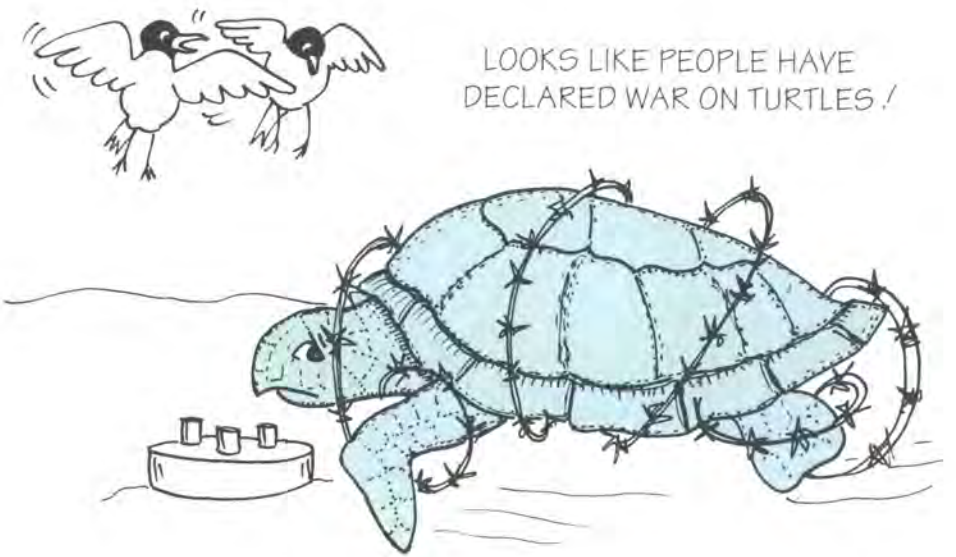
The cruise, launched with ROPME and the Intergovernmental Oceanographic Commission (IOC) of UNESCO, found that the oil had decomposed relatively quickly in the water column, helped by the fact that the rate of evaporation in the ROPME sea area in winter can be double the summer figure. But oil-

saturated intertidal waters were common in many habitats, reaching 12.1mg per litre of total hydrocarbons in the water at Ras Tanajib. In the meantime, observations at over 150 locations found oil in bottom sediments at only three sites. These were in channel bottoms where tarballs were accumulating.

The results of the analysis of trace metals in water samples, based on historical data from within and outside the region, do not indicate that the trace metal content of the water has increased as a consequence of the oil spill.

The report indicated that sheltered sand beaches, resulting from wind-blown coarse sand being added to the beach zone, present a special problem because of deep penetration of oil into the coarse sand (up to 50+ cm) and slow erosion rates. High-performance liquid chromatography screening was carried out on more than 100 sediment samples within the heavily affected area between Abu Ali and Tanajib. A number of samples had high concentrations of aromatic compounds. Oiled sand clumps were floating on the water surface. The report further pointed out that eventually these would sink, perhaps contaminating otherwise sheltered, muddy environments.

Preliminary chemical analysis found some indication of "wide-spread, low-level oil contamination of the fine-grained sediments", but no deeper than 10cm. Highest levels of contamination were found in the muddy sediments accumulating in the dredged channels at the head of Dawhat ad Dafi and relatively high concentrations were also measured in the sheltered interior bays of Dawhat al Musallamiyah. A year after the end of hostilities, areas of heavy oil remained relatively fresh and continued to be released into the marine environment as sheens, but the extensive pavement on Abu Ali Island and isolated sites in Dawhat ad Dafi were found to be contaminated by oil from previous spills.



According to the observations taken before and during the Mount Mitchell cruise, no demonstrable direct effects of the 1991 oil release on the coral reefs in most of the ROPME sea area were revealed. However, this does not indicate that oil spills have no potential for causing damage to coral reefs. Any disturbance to the reef ecosystem as a critical and extremely fragile habitat may have increased the susceptibility of reef organisms to natural stress. Three reefs examined in Kuwait showed consistent signs of such stress. At Qita't Urayfijan, Taylor Rock and Kubbar Island, numerous corals were bleached or had suffered recent partial or total mortality. At two sites several species from various families were affected. But our report notes that seawater temperatures during the 1991-1992 winter were approximately 4° to 5°C lower than normal.

To the south of Khafji the corals at surveyed sites did not show any of the stress described. Other parts of the coral reef community, including coral fishes, macroalgae and invertebrates showed no signs of unusual stress in May 1992. Another individual observation indicated that spawning of Acropor species found on reefs in the path of the oil was not impaired during 1991 or 1992. However, scientists working in Saudi Arabia reported significant mortalities of reef corals during early 1992. But these were attributable to natural stresses.

Observations also indicated that there were no significant effects on the respiration or photosynthesis of three seagrass species tested. On the contrary, the seagrass systems studied appear to be thriving. In general, damage to algal mats was concentrated in the upper intertidal zone and was only extensive in unprotected environments.

The question of a general decline in fish and shrimp stocks has yet to be settled. There were few unequivocal effects of oil pollution that were attributable solely to the 1991 releases. Natural variability between the sampling locations needs to be better understood, particularly with regard to plankton, to distinguish the natural distribution from changes caused by pollution or other stresses. More studies on the question have been recommended by the IOC/ROPME/UNEP Scientific Workshop which discussed the results of the "Mount Mitchell" cruise in Kuwait on 24-28 January 1993.

With regard to sea food safety, the study indicates that on the basis of experience in other parts of the world, the commercially caught fishery products did not constitute a health hazard to the average consumer. As a follow-up to the UN Interagency Plan of Action described above, UNEP, in cooperation with ROPME and UNDP, prepared a Consolidated Rehabilitation Programme with costed and targeted project proposals. The UN Secretary-General sent a special representative, accompanied by myself, for high-level talks at the end of March last year. The mission reported back to New York and Nairobi so that a strategy could be drawn up and applied as soon as adequate resources become available.

The scientific report, considered by Governments at the 17th Session of UNEP's Governing Council (10-21 May), concluded that in addition to mitigating the adverse effects, rehabilitating the environment and building up national response capabilities, there is an obvious need to develop an effective international mechanism to guide and co-ordinate the response to future large-scale environmental crises. ❑

Eastern Africa

Brighter outlook from Focal Points

The people responsible for the Eastern African Action Plan at a national level came together last October for their first meeting to review progress, adopted several proposals to spur effective action, and held out the hope that the Eastern African Convention could soon come into force.

National Focal Points from seven of the nine States and the European Community (EC) attended the two-day meeting in Nairobi.

Two major problems are holding back the Action Plan. The 1985 Convention for the Protection, Management and Development of the Marine and Coastal Environment has been ratified by only three of the Eastern African nations: France for La Réunion (1989), Kenya (1990) and Seychelles (1990).

These States have also signed two 1985 Protocols (the detailed obligations) that go along with the Convention: a Protocol concerning Protected Areas and Wild Fauna and Flora, and a Protocol concerning Co-operation in Combating Marine Pollution in Cases of Emergency. The Convention and Protocols need six ratifications in all to come into force.

The second problem is a shortage of payments into the Trust Fund for the Eastern African region, designed to help each Action Plan in the Regional Seas Programme become progressively self-financing.

Pledges so far total $1,240,994 but the EAF Trust Fund has received only $447,623. France, Madagascar, Seychelles and Somalia have all contributed. The EC has pledged ECU 40,000 once the Convention is in force.

The delegate of Madagascar, Marta H. Andriantsiferana, reported that her

Government had deferred ratification of the Convention because of the financial commitment entailed, while noting that Madagascar had made a substantial payment into the Trust Fund.

Ms Andriantsiferana and the Kenyan representative both underlined the advantages of the Trust Fund, pointing out that their countries had received equipment and training within the framework of the Action Plan. Kenya assured the other Focal Points that it was fully committed to paying its pledged contributions to the Trust Fund.

France, confirming it had paid its 1992 contribution to the Trust Fund, said a regional Department for Environment had been established in La Réunion to carry out activities under the Action Plan.

Mohamed Said Ahamada of Comoros told the other Focal Points that his country was taking steps to speed up the process of ratification of the Convention. Comoros faced financial constraints but his Government would pay its Fund contribution in part, he added.

Mauritius delegate Tiberman S. Ramyead said his Government would ratify the Convention and pay 30-40% of its outstanding Trust Fund contributions within 2-3 months. The Mauritius Government had passed a new Environment Protection Act and had a National Environment Action Plan, he stated.

Tanzania, represented by Godfrey L. Kamukala, assured Focal Points, too, that his Government would speed up ratification of the Convention and payment of pledged contributions to the Trust Fund.

Underlining this support, the Focal Points meeting resolved unanimously "to make every possible effort" to ratify the Convention and its Protocols as soon as possible. They also resolved to make every effort to contribute regularly to the EAF Trust Fund.

The Focal Point representatives also suggested that once this had taken place, States should still make sure that their institutions are informed of their responsibilities in implementing the plan and that high-level representation and continuity were maintained in regional meetings.

The Seychelles delegate Nichol J.R. Gabriel confirmed his Government's offer to host the Regional Coordinating Unit when the Convention becomes active.

Acting on a report prepared by consultant Manjit S. Iqbal, the meeting agreed on the importance of developing a Protocol on Liability and Compensation for marine and coastal environmental damage. "It would make the person or operator concerned fully aware of his responsibilities for pollution prevention and more conscious of the consequences of failure to discharge his responsibilities," said Mr Iqbal. "It would also recognize the rights of victims or potential victims of marine environmental damage and grant them access to judicial and administrative bodies in order to seek redress and adequate compensation."

Noting that the Convention and Protocols emphasize State obligations, the consultant proposed that the treaty should be amended to cover private or parastatal operators. The Focal Points meeting asked OCA/PAC to prepare a report on the possibility of including the private sector in the Convention.

The Second Inter-governmental Meeting of the Parties to the EAF Convention and its Protocols is due to take place on 7-8 September 1993. ❑

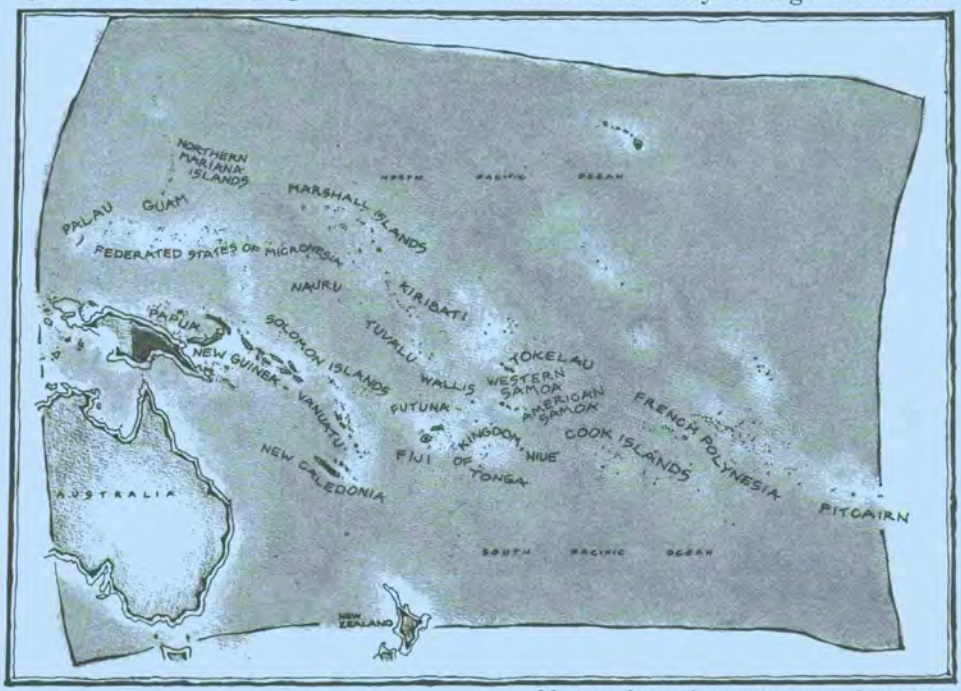
Our communications section this time breaks with the usual format and profiles activities in a particular region, the South Pacific, using texts written by people from that area to explain the Regional Programme, its objectives and its projects. Many of the articles are combined efforts rather than the work of individual authors, but we thank Wesley Ward, the Information and Publications officer of the South Pacific Regional Environment Programme (SPREP), for providing the material.

Dependent on the sea

For most Pacific islands, even the most distant or highest point of land is close to the sea, and activity on land often has significant effects on marine resources. For many islands, the terms coastal zone, rural area and urban zone are interchangeable, and all land-use planning must consider coastal planning, particularly on low-lying atoll islands.

The condition of coastal areas shows the environmental health of an island. Generally, if coastal management is deficient, the entire island is environmentally poor.

Moreover, the ocean is a major part of the resource base for Pacific island developing countries (PIDCs) – the marine areas they manage are much



Map and graphics courtesy of SPREP

larger than their land areas and the sea has been the central focus of their lives for centuries.

The rapidly growing urban population is responsible for much of the plundering of coastal resources, the destruction of mangroves and beach areas, the pollution of lagoons and harbours, the loss of some marine species and ecosystems, and the fouling of nearshore waters and reefs. PIDCs report the primary causes of their coastal problems as:

– improper disposal of sewage and domestic solid waste;

– mismanagement of non-domestic waste;

– increased sedimentation due to poorly planned construction, hillside gardens, mining, logging and other changes in land use;

– ill-conceived coastal development activities; and

– natural disasters.

Marine biodiversity

The South Pacific's marine ecosystems are fragile and are susceptible to destruction of habitat and loss of biodiversity from a multitude of impacts, both natural, such as cyclones, and human-induced. Marine degradation may be seen in the destruction of reef and coastal habitats and in the loss of species, offshore or inshore. Although these generalizations are beyond question, their implications are difficult to quantify because systematic marine surveys are lacking. Many PIDCs recognize the increasingly urgent need for such surveys and for the protection of selected and appropriate marine reserve areas where representative habitats and ecosystems have been identified.

The regional marine mammal and turtle programmes demonstrate local concern for endangered animals and represent a modest beginning. There is a similar concern in Solomon Islands for the saltwater crocodile. Throughout the SPREP membership there is now a call for a much more active and extensive marine conservation programme.

The commercial exploitation of marine resources is dominated by high-technology operations for harvesting highly migratory tuna, generally many kilometres offshore. Tuna has been harvested primarily by American or Asian-based fishing fleets but a growing number of vessels based within the region are becoming active.

While the ability of PIDCs to control and utilize fully their Exclusive Economic Zones (EEZs) is improving, resource knowledge remains inadequate. Vessels operating within the EEZs report catches to the Forum Fisheries Agency but outside the EEZs, only the American fleets have been reporting their catch. With little reliable knowledge there is an obvious potential for overfishing, and maximum sus-

tainable yield levels cannot be set with confidence. However, the general consensus is that these distant offshore deep-sea fisheries are not yet fully exploited. For some Pacific nations, particularly Kiribati, the Marshall Islands and Tuvalu, offshore marine resources represent almost the sole opportunity for substantial economic development.

Pelagic species of increasing local commercial or export potential are tuna (skipjack, yellowfin, and dogtooth), bigeyed scad, queenfish, rainbow runner, wahoo and mahimahi. The skipjack tuna resource is especially important. Marine resource officials believe that the catch of skipjack tuna can be increased significantly without great risk of depleting the resource. Deep-sea demersal species of increasing importance include snappers and jobfish.

The vital importance of the pelagic fishery to the improved economic performance by many Pacific islands and to marine biodiversity has been threatened by the use of long driftnets. This practice indiscriminately plunders the sea over large areas, tragically destroying dolphins, turtles and other marine life along with the pelagic catch. Due to the forceful initiative of SPREP members, the Wellington treaty was negotiated to end this practice.

To ensure that the offshore fishery is exploited fully but sustainably, and for the maximum benefit of Pacific island countries, close monitoring and continued surveillance of all fishing activities will be required. For this the Pacific continues to rely on the Forum Fisheries Agency and the South Pacific Commission, and on future negotiations of multilateral treaties with major fishing countries such as Japan, Taiwan and South Korea.

Sea-bed mineral resources

Cobalt-rich crusts and polymetallic manganese nodules occur on the Pacific ocean floor. For some PIDCs (Cook Islands, the Marshall Islands and to a lesser extent Kiribati), these minerals may have potential for exploitation. Oil exploration continues off the coasts of Papua New Guinea and Tonga, where there are indications of commercially exploitable deposits.

Coral reefs and lagoons

Particularly for the small islands and for the coastal people of all PIDCs, fish from the reefs and lagoons are the primary source of subsistence protein. However, most of these countries have reported continued destruction and degradation of their reefs. The potential sustainability of the reef resource is evidenced by the fact that it is still possible (albeit now far more difficult), even in densely populated areas, for families to harvest daily protein needs from the intertidal and fringing reef areas, despite many years of almost daily reef gleaning at low tide for almost anything edible and of almost any size.

Continued high yields can be reduced by a wide range of reported activities. These include:

– fishing with poisons and explosives;

– pollution from sewage, fertilizers, biocides, toxic wastes and oil spills;

– land reclamation for building sites;

– mangrove destruction through use as garbage dumps, by cutting for poles and firewood, and from improperly designed causeways, bund walls, and seawalls;

– sedimentation from soil erosion arising from poor agricultural or forestry practices, beach mining, construction (e.g. of wave-deflecting walls, wharves, and boat harbours), mine tailings, lagoon dredging, reef blasting and other activities;

– contaminated groundwater seepage; and

– tourists collecting corals and shells as souvenirs or tramping across reefs.

Predators such as the crown-of-thorns starfish may also cause spectacular damage.

The highly destructive practice of fishing with explosives on the coral reefs continues, especially in American Samoa, Fiji, Marshall Islands, the Federated States of Micronesia (FSM) and Western Samoa. The practice is illegal in all these countries, but enforcement of regulations is poor. Staff resources are limited, making it difficult to catch and prosecute fishermen for suing explosives. Penalties are often trivial and not a deterrent.

Fish poisons, including weedicides, chlorine and other toxic chemicals or plants, are commonly used in some areas. Fish poisoning is easier and less risky than dynamiting. Hence the use of poisons is believed to have increased, especially in rural areas where there is little chance of being caught. Some plant extracts, such as derris root, are also used to poison fish in rivers, lagoons and protected bays or inlets.

The deliberate destruction of coral to drive fish out after encirclement with nets is practised, especially near urban areas. Currently there is no large-scale trade in the region in ornamental coral and aquarium fish. A small coral trade has developed in Fiji and Western Samoa and the breaking or removal of coral is reported to be a serious problem in certain areas. Aquarium fish exports are a growing industry in the Solomon Islands. Shell collection is also a growing trade, particularly in Kiribati and Tuvalu, where a wide range of shell species are highly prized by collectors and used in handicraft production.

Sedimentation, resource depletion

One primary cause of erosion is the expansion of gardening activity on steep and frequently marginal soils. In Melanesia and Western Samoa, this often follows logging activities, especially where logging access roads have been incorrectly sited and poorly constructed. The sediment from such erosion generally finds its way to lagoons and reefs. Some of the worst sedimentation, however, is reported from spot sources within urban areas, involving earthworks associated with public infrastructure development. Each country reports a litany of instances of poor construction planning and practice, which have accelerated erosion and caused sedimentation of lagoons and reefs. Blasting reefs for boat passage; expanding harbours; mining beaches to obtain construction materials; building airports, roads and earth dams for town water storage; and reclaiming coastal foreshore and swamps for housing sites have all taken their environmental toll. Unfortunately, government agencies are sometimes responsible for these projects, and therefore to blame for their environmental costs.

Beach mining has been particularly damaging in the low coralline islands or atolls which have a critical shortage of suitable construction grade sand and aggregate for infrastructure develop-

ment. Beaches are mined and lagoons dredged in order to complete construction of essential public works. Occasionally beach sand is used for construction of a tourist resort, thereby destroying part of the very asset to which the tourists are attracted in the first place.

Overfishing has become a problem near most of the larger urban centres, especially where the lagoon is heavily fished and families glean the intertidal flats daily for food and for shells and other materials for handicraft manufacture.

Most PIDCs report a significant recent decline of reef fish stocks, crustacea and shellfish near major urban settlements, indicating unsustainable utilization of reef and lagoon resources. Away from the larger towns, resource depletion is reported only where there are excellent cash-earning opportunities from a particular item. Examples include a particularly desirable fish in the aquarium trade, the trochus shell for sale to button manufacturers (see page 24), colourful shells for sale to conchologists and tourists, coral, seaslugs for the Asian food and medicine trade, and lime production for consumption with betel nut. Indeed, when the cash opportunity presents itself, environmental considerations are disregarded, and even the commands of chiefs are increasingly ignored.

Some Pacific governments apply forceful controls on the harvest of lagoon and reef resources – the trochus shell harvest is strictly controlled in Aitutaki in the Cook Islands. In other situations, however, there appears to be little capacity to monitor the situation carefully or to enforce nominal limits on harvesting, even where regulations have been promulgated.

Oil pollution

The South Pacific region is not traversed by major world oil transport routes, and there are few problems with petroleum wastes except for oil discharged by vessels in harbour areas. These discharges usually arise from leaking connections when unloading petroleum products into shore storages, but some illegal discharge of oil-contaminated bilge water is also reported. The risk of a major oil spill is always present from the tankers which deliver oil supplies in the region and, though there has been a major improvement in the region's preparedness for such a dis- aster through one SPREP programme, the islands do not yet have much capacity to deal with such emergencies.

Natural disasters

Cyclones. Not all islands experience cyclones. They are rare in Kiribati, Papua New Guinea and Tuvalu. Tokelau has had only three major storms since 1846, until two cyclones

("Tusi" and "Ofa") struck in the past eight years. Ofa was so severe that waves completely covered the atolls, washing away topsoil. Residual salt prevented crops from growing for several months; and salt contaminated the freshwater lens, making it too brackish to drink.

Vanuatu is the most cyclone-prone Pacific island nation, with 29 major storms between 1970 and 1984. From 1940 to 1985 each location in Vanuatu experienced an average of one cyclone every two years. In Solomon Islands in 1986 cyclone "Namu" struck the east coast of Guadalcanal with devastating force, leaving over 100 people dead, one-third of the population homeless, and an estimated US$100 million in damage.

El Niño. Perhaps the most important long-term meteorological influence on the region is the El Niño Southern Oscillation (ENSO). In the western Pacific, the marine currents and their heat content undergo marked seasonal and inter-annual variations. The ocean circulation can reverse itself in the equatorial zone for more than one year. This phenomenon is accompanied by an eastward propagation of warm waters, variation in the sea-level, displacement of the low atmospheric pressure zones, and drought in the western areas. A further consequence of this phenomenon is the disappearance of the equatorial upwelling which is usually rich in plankton that supports marine life. Consequently, fish catches decline.

Sea-level rise. Given their heavy dependence on marine resources and fairly intensive use of coastal areas, it is easy to understand why PIDCs view the prospect of a significant rise in the sea-level with alarm. The atoll nations of Kiribati, Marshall Islands, Tokelau and Tuvalu, and low-lying islands in many other PIDCs, face the prospect that if the more pessimistic forecasts prove true, they may disappear altogether.

Even in PIDCs which need not fear extinction, major disruption of economic and social life would occur if the sea-level rises substantially. Countries like Solomon Islands, for instance, see themselves as more vulnerable to sea-level rise than is generally recognized. Apart from its inhabited low-lying atolls (for example, Ontong Java), the vast majority of Solomon Islands people live within 1-2m of sea-level and depend heavily on marine resources which could be modified dramatically by climate change, sea-level rise and changes in ocean temperatures. The population could move uphill, but much of the fertile land which is flat enough to cultivate efficiently is in the low-lying plain.

While issues of climate change should not be over-dramatized, it is clear that some increase in sea-level is probable and must therefore be included in any planning for sustainable development of atolls and coastal areas generally. Even if protective coral reefs were to continue to grow upwards at a rate greater than that at which the sea-level rises, coasts will be subject to erosion, coastal engineering structures will be threatened, and infrastructure near the shore subject to great risk.

One very serious effect of a rising sea-level would be its impact on the freshwater lens that underlies atolls. The risk of saltwater intrusion will rise as the sea-level rises. Lateral leakages will increase. Lenses will become thinner, and salt water will move within reach of pump intakes and wells. Already limited freshwater resources will be lost or at grave risk. As the sea-level rises,

salt water will also reach the roots of pit-grown taro, coconut palms, breadfruit and other tree crops.

Some observers continue to question whether any significant rise in sea-level will occur. For Tokelauans, however, the process of climate change is already evident in other ways. The prevailing winds have changed, tides have become both higher and lower, the reef is more exposed than ever, and storms are more severe. In response, Tokelauans have already embarked on a programme of seawall construction and of incorporating concrete water-storage tanks in the foundations of new houses. Kiribati and Tuvalu report feeling helpless in the face of a need well beyond their financial and technical abilities – the morale problem may prove to be more damaging than the physical threats. This concern is compounded by the realization that any threat of sea-level rise is a powerful disincentive to investment and development initiatives which demand a sense of certainty about the future.

From *Environment and Development: A Pacific island perspective*

SPREP and the coasts

Coastal land and nearshore waters are vital to Pacific island peoples, cultures and economies. Most humans live here, they are the focus of subsistence and commercial agriculture and fishing, and they are the target area for most economic development. These factors can combine to degrade and destroy coastal habitats, over-exploit natural resources and cause growing conflicts among users of coastal resources. Coastal areas now also face the threat of sea-level rise due to global warming.

Much loss of coastal areas and resources could be avoided through Integrated Coastal Zone Management (ICZM). This promotes a comprehensive and integrated approach to using, conserving and managing coast resources, and involves all sectors of the community. The Coastal and Marine Programme was developed to address coastal environment issues in a co-ordinated manner, and to promote ICZM in the region, so it complements many other SPREP programmes.

SPREP is the South Pacific centre for the UNEP Regional Seas Programme, so SPREP has a close working relationship with UNEP's Oceans and Coastal Areas Programme Activity Centre. The Coastal and Marine Programme works with other relevant international agencies, complementing related regional programmes.

In the past year, reviews were carried out to assess marine biodiversity and Marine Protected Areas in the region. They focused on coral reef, mangrove and nearshore fish habitats. This basis will be used to renew efforts in marine conservation in the region. The Programme is also actively working with the South Pacific Biodiversity Conservation Programme and other global marine biodiversity conservation efforts.

Coastal and Marine Ecosystem Classification and Conservation Criteria were developed by Pacific Island scientists and country representatives, under a joint USAID (United States Agency for International Development), SPREP and

Nature Conservancy project, to classify the kinds and status of marine habitats in the region.

SPREP is also collaborating with Pacific institutions to develop a co-ordinated coastal ecosystem monitoring programme which is compatible with global efforts to determine human impacts on coastal areas, including those created by climate change. Studies on vulnerability to sea-level rise are also co-ordinated by the Programme.

An expert group was recently convened to develop a Regional Marine Mammal Conservation Programme, and further develop the Regional Marine Turtle Conservation Programme, for which funding is now being sought.

The South Pacific sea

What South Pacific regional representatives told the United Nations Conference on Environment and Development about their ocean:

The Pacific is the world's largest ocean, covering one-third of the planet's surface. The health of the marine environment and its resources are integral to the very existence of Pacific communities.

To this end it is essential to:

- recognize and respect the absolute dependence of Pacific island countries on the ocean for their very existence;
- cease unsustainable fishing practices, particularly driftnet fishing;
- prohibit the dumping of toxic, hazardous and nuclear substances in the Pacific;
- prevent, reduce and control pollution which might result from nuclear testing, and from importing, transporting and storing or destroying toxic and hazardous wastes and weapons;
- implement and endorse existing conventions covering marine pollution, international shipping and fisheries conservation and management;
- recognize the environmental and social impacts of industrial-scale fisheries and destructive fisheries practices on local coastal communities and fisheries activities;
- use management systems based on ecosystems rather than single species approaches;
- assist Pacific island countries to prevent, minimize and control land-based sources of marine pollution;
- recognize the role of the ocean as a carbon sink;
- support efforts at international and regional levels towards management of high seas fisheries.

From the South Pacific Regional Statement to the Third Session of the UNCED Preparatory Committee.

In-country projects have focused on surveying coastal resources and on developing protected areas or coastal management plans. These use local expertise in collaboration with partner organizations. They include:

– a comprehensive reef and lagoon management plan for Bora-Bora, a first for French Polynesia;

– the first large-scale multi-disciplinary coastal resource inventory in Papua New Guinea, along the Hiri coast;

– a similar inventory of the largest estuary in Micronesia, Palau's Ngermeduu Bay; and

– a reef inventory of Oroluk Atoll and Minto Reef, Federated States of Micronesia, for potential development as a marine park.

Island governments have limited capacity to develop and implement ICZM at present. This continues to be the major constraint in properly addressing coastal and marine environment issues in the region. There are often no institutions, administrative structures, legislation, trained personnel, financial resources or information for management decisions and coastal planning. In addressing these issues, governments need to make a concerted effort to develop coastal management and planning programmes.

Pacific island fisheries

Pacific island marine resources, and the fisheries associated with them, exist on a variety of scales. At one end of the range are the industrial fisheries for tuna and bill fish that operate throughout the tropical Pacific Ocean, often far from land. Scientific survey and assessment work carried out in association with the development of these fisheries indicates that, on a regional basis, tuna resources are very large indeed.

Widespread small-scale inshore subsistence fisheries are at the other end of the range. These fisheries harvest principally for domestic consumption, and are characterized by the use of low-technology, labour-intensive fishing methods. Customary rights of resource ownership or tenure, as well as traditional regulations that control the exploitation of specific resources, often restrict fishing activities and provide a form of fisheries management based on accepted social and cultural values.

Between these two extremes lies a diverse range of low- to medium-level technology, artisanal, multi-boat based commercial or semi-commercial fishing activity which exploits localized inshore resources, and which is the current target of most fisheries development. Pacific island governments view these fisheries as having commercial development potential that is within their national capacity to realize, using locally available human and technical resources. The development approach is to upgrade existing harvesting or related

activities by introducing new or more efficient technology, and by developing the infrastructure to encourage increased commercialization. Such development is justified in terms of the economic benefits it will bring to the nation, communities or groups of individuals on the basic assumption that the resources exist and are amenable to increased exploitation.

However, serious attempts to gather information on how the resource is likely to respond to the changes in patterns of exploitation, and how this in turn may affect the economics of development have seldom if ever been made. In some ways, the optimism over tuna stocks and their development potential has spilled over into the area of national-level, small-scale inshore fisheries. This optimism may need to be tempered.

Adapted for *Environment and Development* from G. L. Preston of the South Pacific Commission, writing in the *Pacific Economic Bulletin*, June 1988.

NEMS for sustainable development

NEMS are National Environment Management Strategies. They incorporate a statement of a country's environmental principles and a detailed plan for realizing the country's long-term environmental goals. By the end of 1993 it is expected that 12 countries of the Pacific will have each adopted a NEMS.

NEMS are being prepared in two groups of Pacific countries under a Regional Environment Technical Assistance (RETA) programme funded by the Asian Development Bank and IUCN-The World Conservation Union and through the NEMS project funded by the United Nations Development Programme (UNDP). RETA started in November 1990, while NEMS began in April 1991. Each programme is scheduled to last for 30 months, and two States have already adopted their Strategies.

The strategies are co-ordinated in country by a Task Force made up of senior representatives from government departments, NGOs and the private sector. Each country is developing its own strategies unique to its economic, physical, cultural and social situation. But each strategy clearly links environmental protection to national economic development and outlines the priority environmental action programmes that are needed.

The Strategies are developed after National Workshops or Seminars for interested groups and the wider community, and are then subject to extensive review. This review process is considered vital if the Strategies are to be accepted and successful. Representatives from

NGOs, education and media are actively encouraged to take part in this review.

The environmental legislation in each country is also reviewed. In many Pacific countries, laws may be poorly developed or non-existent. Responsibilities for managing the environment are often dispersed among different government agencies, with limited co-ordination between them. The reviews aim to critically assess existing laws, recommend amendments to existing legislation and, where appropriate, recommend new legislation.

Managing the environment also needs a sound institutional base. A common constraint in Pacific countries is that relevant agencies are poorly staffed and lack the basic resources for implementing programmes. Studies are under way to review existing levels of staffing and expertise in environmental agencies and to recommend appropriate steps to strengthen agencies in each country. In some countries, the programme has helped to establish new staff positions.

Relevant environmental training activities are implemented by the NEMS and RETA programme. They include environmental impact assessment (EIA), testing water quality, and raising environment awareness. Representatives from community groups, including NGOs, are actively encouraged to attend. NGO activities are also fostered, including country-specific activities such as recycling aluminium cans, and training NGO personnel in environmental awareness and EIA.

The Republic of the Marshall Islands and Solomon Islands adopted their NEMS in 1992, the first to do so. FSM and Cook Islands followed later that year.

Tonga has developed an Action Conservation Strategy. Similar projects are under way in Fiji, assisted by the Asian

Small islands meet on NEMS

Environmental officers from four smaller Pacific island countries gathered at SPREP headquarters for a week in November 1992 to hold a practical working session on progress in NEMS and future activities. They developed a draft framework for developing their countries' NEMS and held discussions with SPREP staff on the assistance and support which the Programme could provide.

Tererei Abete came from Kiribati, Bradley Punu from Niue, Suia Gaualofa from Tokelau and Alefaio Semese from Tuvalu. They worked closely with SPREP's NEMS Team Leader Neva Wendt.

The countries in the group have only one or two-person Environment Units that are still developing. By convening the group meeting, SPREP enabled participants to share their experiences in undertaking national environmental training activities, national institution strengthening and in developing the NEMS for their country.

The group also visited the Western Samoa Division of the Environment and Conservation. Although established only in 1990, the division has already carried out much training to strengthen the capabilities of its staff. Representatives were able to pass on their experience to the small island group.

Development Bank, and in Vanuatu, with help from SPREP and the Australian International Development Assistance Bureau (AIDAB).

The other States in the RETA/NEMS programme are Kiribati, Nauru, Niue, Palau, Tokelau, Tuvalu and Western Samoa.

The Biodiversity Convention: a South Pacific view

The Pacific island region is one of the world's centres of biological diversity. The western Pacific has the highest marine diversity in the world, with up to 3,000 species to be found on a single reef. The many thousands of islands are surrounded by a rich complex of coastal ecosystems, and the evolution of island biogeography has led to a high endemism in terrestrial species, particularly on larger islands (New Caledonia, Papua New Guinea, Solomon Islands and Vanuatu). Some of the smaller islands may have extremely low diversity or little or no endemism. But they nevertheless have a high number of endangered species, and are particularly vulnerable to the impact of introduced species. A colony of feral cats or mongooses on a small island is enough to eliminate most, if not all, species of native birds and reptiles. It is estimated that 75% of the mammals and birds that have become extinct in recent history were island-dwelling species. The people of the Pacific islands, many still leading subsistence ways of life, rely heavily on biological resources for survival and for their economic, social and cultural well-being. The culture of all island societies is inextricably linked to the diversity of living species which characterize the different island environments. This

close affinity with the natural environment is indicated by the widespread use of many of the biological resources for artisanal and medicinal purposes. But for a region of such biological diversity there are few marine parks and they are often small. Coastal zone management programmes and plans which integrate sustainable resource use and conservation are virtually unknown.

A new $10 million South Pacific Biodiversity Conservation Programme started early in 1993. The Programme, whose objective is to preserve the biological diversity of the South Pacific for the benefit of the peoples of the region and for the world, has 14 countries and administrations as participants. It is supported by the Global Environment Facility (GEF) and by Australia. Pacific island states also have great hopes of the Convention on Global Biodiversity opened for signature at UNCED.

The Convention requires access to genetic resources to be on mutually agreed terms, with the aim of fair and equitable sharing of the benefits from using these resources. Technology transfer to developing countries is to be on fair and most favourable terms, consistent with the protection of intellectual property rights.

But most important, the Convention states that developed country Parties will provide new, additional financial resources for conserving biological diversity. Special consideration is to be given to the "special conditions resulting from the dependence on, distribution of, and location of, biological diversity within developing country parties, in particular small island states".

Biological resources are a capital asset, and their importance to Pacific island countries are becoming more recognized. Being a party to this Convention should allow access to new financial resources for the conservation and sustainable use of biodiversity, and allow easier access to relevant technologies, including those that use genetic material.

By the end of UNCED, 12 SPREP member countries had signed the Convention: Australia, Cook Islands, Federated States of Micronesia, France, Marshall Islands, Nauru, New Zealand, Papua New Guinea, Solomon Islands, Tuvalu, Vanuatu and Western Samoa.

Making EIAs work in the Pacific

Environmental Impact Assessments (EIAs) are much maligned in many countries around the world, including the Pacific. Some see them as a hindrance to economic development. SPREP sees EIAs as important tools for planning and managing environmental concerns in a development project, and so is promoting them to help attain sustainable development. SPREP is also encouraging Pacific island countries to develop their own EIA guidelines, suitable for their local situations and economic aspirations.

In 1992 SPREP conducted seven in-country workshops on EIA: in the

Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Solomon Islands, Vanuatu and Western Samoa. Seven more countries will host EIA workshops in 1993: Tuvalu, Tonga, Cook Islands, Palau, Niue, Nauru and Tokelau.

The workshops aim to increase awareness among government officials, NGOs, private developers and others of the potential benefits of EIAs as planning and management tools.

Each of the 1992 workshops had a one-day seminar for senior government officials – Ministers, Secretaries and Heads of Departments – which discussed policy issues for using EIAs in their countries. This was followed by a four-day technical meeting aimed at government specialists, planners, private developers, NGOs and interested individuals. This section showed participants how to conduct an EIA and reviewed existing EIAs using relevant local case studies where available. There was also a field exercise to provide some practical experience in developing an EIA.

The training is designed to improve the awareness and use of EIA by decision makers involved in economic development. It also improves the technical capacity of the countries to undertake their own EIAs, tailoring them to the local culture, values and situations. Each country now has about 35 trained practitioners for conducting EIAs.

Participants have been very positive in their evaluations of the technical training workshops to date. The one-day senior officials' seminars have had mixed reactions, however, ranging from acceptance to non-commitment. It is unfortunate that some senior officials remain doubtful of EIAs because of their drive for "economic" development of their country. Senior officials from some countries also failed to attend, missing the opportunity to further discuss the concept and importance of EIAs.

Many funding agencies in the region have supported SPREP's push to encourage the use of EIA. Australia, New Zealand's aid organization NZODA and the Asian Development Bank, among others, have made approval of development projects subject to formal EIA reports.

Environmental law's first regional meeting

The Pacific islands held their first ever regional meeting on environmental law in Apia, Western Samoa, on 23-27 November, 1992. Local and international experts on law and the environment took part in the discussions.

In his closing address, SPREP Director Dr Vili Fuavao stressed that the workshop is only the start. "It has laid the foundation for future efforts," he

said. "The only way to solve environmental degradation around the world is by people working together. People working in environment and law must come together so they understand environmental problems better, and write legislation appropriate for the local situation."

The meeting was funded by UNEP with assistance from the Australian Government. Some 30 participants from 16 Pacific countries gathered from as far as Guam, Papua New Guinea and the Cook Islands. Experts came from Australia, New Zealand, USA and Europe, while international organizations represented included the World Bank and IUCN – the World Conservation Union.

Western Samoa's Attorney-General Leaupepe U. Muliaumasealii opened the meeting. In his opening address he described environmental legislation as "a fundamental tool in ensuring the sustainable management of the environment. (Although) most Pacific countries have a considerable body of legislation relating to the management of natural resources and the protection of the environment (...) the effectiveness of these laws varies greatly from country to country."

Much environmental law in the Pacific comes from Australia, New Zealand and the USA. "The challenge facing Pacific countries is to develop environmental laws that are tailored to our unique social and economic framework, and which build wherever possible on our traditional systems of conservation and land management," said Leaupepe.

Welcoming participants, Dr Fuavao stressed the importance of recent international conventions and their future importance to the Pacific. The Biodiversity and Climate Change Conventions and the Rio Declaration and Agenda 21 were all opened for signature at the Earth Summit, with a number of Pacific island countries among the first to sign. The workshop was called to consider environmental legislation implementing these conventions in way appropriate for the culture and economies of the region.

SPREP is already carrying out some preliminary work to develop better environmental laws. These legal reviews are part of the National Environmental Management Strategies (NEMS) being developed by 14 Pacific island countries. The NEMS, featured elsewhere in this section, identify key environmental issues and the responses needed.

Two broad areas covered in the workshop were integrating local customary and traditional controls into national environmental legislations, and the implications of regional and international agreements for environmental legislation in the Pacific.

The final day was devoted especially to recommendations for future action on environmental legislation in the region.

SPREP's new legal officer

Bernard Moutou, seconded from France's Ministry of the Environment, is SPREP's new Legal Officer. He arrived in Apia in time to take part in the workshop on environmental legislation. As well as serving the needs of the SPREP Secretariat, he will deal with the region's concerns on environmental legislation and international conventions.

Participants called particularly for follow-up workshops on ways to enforce existing environmental laws and regulations in Pacific island countries.

Sam Sesega, Principal Environmental Officer for Western Samoa's Environment Division, stressed that sharing experiences was important, showing that similar problems occurred around the region and enabling participants to discuss new ideas in enforcing legislation.

Other recommendations were for short-term and long-term training in environmental management for national environmental divisions, for national and regional education and community awareness in environmental issues, for a regional collection of environmental legislation to be established at SPREP, and for SPREP to co-ordinate efforts for funding, information and training in this field.

SPACHEE – an environmental resource

The South Pacific Action Committee for Human Ecology and Environment (SPACHEE) is a regional NGO established in 1982. It was created to raise awareness about the environment and to encourage action promoting environmentally sustainable development.

SPACHEE's office and Environment Resource Centre is at the University of the South Pacific's Laucala Campus in Suva. It has an extensive collection of environment resource materials – periodicals, reports, news clippings and videos – which can be used in the Centre or borrowed. Environment Resource Centre users include teachers, students, professors, community groups and government staff.

SPACHEE

SPACHEE has access to environmental experts teaching at USP and to students from around the region. SPACHEE reaches other countries through its members, publications, training workshops and through USP Extension Centres located in the region.

SPACHEE is well-known to people in government, education, community organizations and the news media. Members have been invited to speak at many local, national, regional and international workshops and conferences.

The organization's main focus has been public education. It produces many materials promoting awareness of environmental issues. A quarterly

Care more, worry less

Isoa Korovulavula, a USP graduate in geography and economics, took over as Co-ordinator of SPACHEE in 1991. He told *USP Bulletin* that the office will concentrate on educating the community in important environmental issues with special emphasis on schools. His message: "We must care more for our world to worry less about our environment."

newsletter covers concerns on fragile island ecosystems. It also distributes news alerts, leaflets and posters widely to organizations and individuals throughout the South Pacific and around the world.

The Committee also sponsors and organizes environmental workshops on topics such as household waste management, women and forests, sustainable development in the South Pacific, environmentally sound fisheries management, and climate change and sea-level rise. In 1992 it organized Fiji's National Environment Week.

SPACHEE campaigns on regional environment concerns and encourages action to stop harmful developments. These campaigns have focused on coastal waste dumping, sea turtles and logging.

Understanding climate change

What will the "greenhouse effect" and climate change mean for South Pacific islands? What can governments and communities do about the threats of rising sea-levels and more violent weather? One of the first groups to act regionally to study scientifically the implications of increased greenhouse gases in Earth's atmosphere, the South Pacific Sea Level and Climate Monitoring Project is now tackling the longer-term challenge of this complex problem. The project aims to help the Pacific Island countries understand the scale and implications of changing sea-levels and climate. The project arose from discussions in the 1988 South Pacific Forum meeting and a commitment from the Australian Government in 1989. Through funding The National Tidal Facility at the Flinders University of South Australia in Adelaide, Australia provides technical expertise. Equipment, training and know-how is also provided by the Australian International Development Assistance Bureau (AIDAB). A Programme Co-ordinating Committee, which includes representatives from Pacific Island countries and the South Pacific Regional Environment Programme (SPREP), oversees the progress and advises on relevant training and information aspects of the project.

The project involves a series of monitoring stations that have very accurate instruments to measure sea-levels and as-

sociated weather conditions. Most sites are located near national capitals with some engineering work required to house and secure the instruments. Information is collected and sent hourly from these stations via satellite to the National Tidal Facility. The information is stored on computer and analysed for long-term trends. As sea-levels are thought to be rising only slowly, these trends will not appear in the data for some time after collection starts because the figures contain many short-term and seasonal variations.

There is also an associated information and training component in the project. This aims to develop expertise in Pacific Island countries in interpreting the collected data, for that country and for the region, to help decision-makers in their deliberations on how to deal with sea-level and climate changes in their particular situation. It also seeks to make the general public more aware of the actual extent of sea-level rise, and what they and their governments can do about it.

The task of measuring sea-level changes is made more difficult by the fact that the Earth's crust moves vertically as a result of shifts in the crustal plates, earthquakes and volcanic activity. A unique aspect of the project is that it measures the vertical movement of land near the monitoring stations to separate their effect from any sea-level rise. Surveyors from each country in the project will receive on-site training in measuring these movements very accurately, with the plan that they will take over responsibility for this work at some time in the future. Along with an analysis of local and regional sea-levels, this project should enable Pacific Island countries to make better decisions.

The case of trochus shells

Trochus shells are collected widely in Vanuatu for sale to three button-processing factories, which are jointly owned by foreign and local investors. The harvest of trochus shells in some of the remote areas of the country, such as Gaua in the Banks Islands, provides local communities and families with one of their few ways of earning much-needed cash. This good example of local resource development and in-country processing also illustrates a quandry of sustainable development. Some parts of the Government see the expansion of the trochus shell industry only as an economic opportunity. Marine resource experts see the trochus shell as a limited resource, requiring management based on accurate assessment of the resource if it is to be exploited on a sustainable basis.

There are regulations as to the minimum size of shell that should be collected, but on occasion undersized shells can be sold. (...) The power of money is also reported to have broken down local customary rules (tabu) against diving for trochus on reefs other than your own (customary ownership extending across the shoreline from land to the outer edge of the fringing reef). Local chiefs have tried in vain to limit the months open for trochus collection, but the need for money overrides the word of a chief.

The coconut crabs

Several pieces of evidence show that coconut crab stocks are declining. Once widespread throughout Vanuatu, the crab is now restricted to the Santo-

Malo and Banks-Torres regions, especially the Torres Islands. Most of the crabs now sent to Port Vila restaurants have been harvested by Torres Islanders, whose small, remote islands have few other sources of income. That they are over-exploiting the resource is clear because the crabs now being shipped are smaller than those of two years ago, a sure sign that the stocks are declining. The crab is vulnerable to overexploitation as it is a slow-growing animal, requiring 12-15 years to reach the legal minimum size of 9 cm. The Fisheries Department has attempted to control the trade but has lacked adequate legislation. This was being drawn up in 1991. Studies into farming/reseeding the crab have also been attempted.

Outboard motors

When someone in Tokelau said, "Next week my son in New Zealand is shipping me a small aluminum boat with a 25hp Johnson outboard motor", what was actually in store never entered the minds of the general public.

Literally, what was said marked the beginning of a revolution in the way of life which the people of Tokelau have led for generations past. Now every family owns one or two of these aluminum boats with either one or two outboard motors.

Modern technology is quickly being adopted by the people as they experience getting to other places and islets quickly and with very little effort. The age of technology has finally reached Tokelau. It is a wonderful experience, but it also brings about many problems.

Traditional knowledge has been passed down from fathers to their

children, generation to generation. Such knowledge is about fishing, weather, cloud movements, wind direction, periods of the moon, stars, time of the day, time of the night, plus much basic knowledge that a young man, growing up in Tokelau, must possess to become a grown man ready to assume his manhood duties.

The presence of the outboard motor has now given our young people the idea that, since they can move around faster, they can make several mistakes and still make up for the lack of traditional knowledge.

One other very basic problem we also face today is our family ties. Every young man with an outboard motor can leave the family without asking the father of the family for permission.

Very few young people learn about the weather patterns, know about fish migration on their own reef, or respect nature. They have lost respect for traditions and culture and the environment, and how to manage natural resources. Young people accept that a new technology will replace traditional cultural values.

From: *Environment and Development, A Pacific Island perspective*

Tourism: a growing sector

As an export industry, tourism is unhampered by small domestic markets or a relatively undeveloped local manufacturing sector. Its main disadvantages lie in the potential it represents for encroachment upon local cultures and degradation of environment. On average, tourism receipts are about 25 percent of export earnings in the Pacific member countries [of the World Bank], compared to over 35 percent for the Caribbean islands. Natural disasters, political instability, and inadequate tourism infrastructure [air services and hotel accommodation] are the major impediments to tourism expansion in the Pacific region. Because of the rising global demand for tourism, considerable potential exists in this sector for each Pacific Island Developing Country (PIDC).

From: *World Tourism Organization, Yearbook of Tourism Statistics.*

The SPREP Institution

In December 1991 Cyclone Val unleashed the greatest destructive forces of nature to have occurred in Western Samoa's living memory. Twelve lives were lost and hundreds of buildings and houses were destroyed or seriously damaged.

Among them was the SPREP office complex, which was considerably affected by water, though luckily structural damage was minimal. Also, telecommunications to the area were cut off for several weeks. Water and power were likewise affected. The house earmarked for the newly appointed Deputy Director (the first SPREP arrival in Apia) was destroyed and several other SPREP-designated staff homes were damaged.

Nevertheless, SPREP management and officials of the Government of Western Samoa met in Apia in early January and decided to adhere to the original timetable for SPREP's move from Noumea in the first quarter of 1992. That decision was vindicated when SPREP began operating as a separate, independent organization in its own headquarters less than three months later. In March 1992, Western Samoa's Prime Minister, Hon Tofilau Eti Alesana, formally handed over the SPREP office complex in Apia on behalf of the Government of Western Samoa.

The complex itself consists of two single-storey office blocks situated on 2.3 ha of land at Vaitele, a light-industrial area five km from the Apia town centre. The Government of Western Samoa has offered an alternative site for a permanent headquarters. SPREP now has 15 professional staff, nine of whom joined since July 1991.

What we have achieved, what remains to do

By Vili A. Fuavao, Director, SPREP

As an organization undergoing rapid expansion, I am sure we have had our fair share of failures. One such failure which comes to mind is our inability to complete the Treaty negotiations to set up SPREP as an independent legal entity. Fortunately, our achievements appear to outweigh our mistakes.

The relocation from Noumea to Apia was completed in February 1992, eight months after the Fourth Intergovernmental Meeting (IGM) accepted the Government of Western Samoa's offer to host SPREP. Our combined efforts in preparing for UNCED and at UNCED itself in Rio were successful.

The Fifth IGM in Apia was also very successful. The Treaty was further negotiated to the stage where a Plenipotentiary Meeting is required to finalise and open it for signature. The IGM approved the new Terms and Conditions for SPREP Staff incorporating the favourable cost of living in Apia, and a revolutionary format for assembling SPREP's annual work programme and budget.

With the Corporate Programme for SPREP to be endorsed at the next IGM, SPREP is on its way to playing a pivotal role in the region's development.

1993 will again be a challenging year for SPREP, with follow-up to the Rio Summit and Agenda 21, and the preparation for the Global Conference on Sustainable Development of Small Island States scheduled for April 1994 in Barbados, West Indies. It will also be a year for SPREP to consolidate its institutional arrangements.

There are many tasks ahead, and I am confident that together we can move SPREP closer to making it a "lean" and effective organization, serving the needs of our region. SPREP has also expanded its networks of donors and NGOs. The SPREP family is growing and strengthening day by day. ❑

Wider Caribbean

Broadening its scope

The Caribbean Environment Programme (CEP) is to broaden its scope with more decentralized activities and involve a wider cross section of society.

The decisions were taken at the Sixth CEP Intergovernmental and Third Contracting Parties Meetings, held in Kingston in November, 1992.

The main CEP policy-making bodies set the ball rolling for Regional Activity Centres (RACs) and Regional Activity Networks (RANs) on priority issues. This will enable CEP to decentralize leadership and promote community and national participation in the programme in addition to regional participation.

The Regional Co-ordinating Unit (RCU) is to draw up a draft legal framework arrangement for RACs and RANs which will be reviewed at a Bureau Meeting of Contracting Parties tentatively scheduled for November, 1993.

France immediately offered to host a RAC related to the Protocol concerning Specially Protected Areas and Wildlife (SPAW). The Interim Scientific and Technical Advisory Committee (ISTAC) for the SPAW Protocol is to hold its second meeting in French Guyana after a regional workshop on the Ramsar Wetlands Convention.

The CEP policy meetings last November, attended by more than 60 experts and representatives from 21 States and Territories as well as 19 organizations, approved 40 projects costing US$15 million for the 1994-1995 biennium.

To integrate CEP efforts with the targets of Agenda 21 (the long-term programme drawn up by the United Nations Conference on Environment and Development), the RCU will analyse the targets and reflect Agenda 21's relevant chapters in CEP's revised workplan.

Governments were recommended to give high priority to developing a protocol on land-based sources of pollution (LBSP). The representatives agreed to a meeting of experts this year to put

Colombia ratifies SPAW

Colombia became the first country to ratify the Wider Caribbean Protocol Concerning Specially Protected Areas and Wildlife (SPAW) on 21 October.

It also ratified the Annexes without reservation. These Annexes list protected marine and coastal flora (Annex I), fauna (Annex II), and species to be maintained at a sustainable level (Annex III).

The Protocol, whose initial annexes were adopted on 11 June 1991, comes into force when it has nine ratifications.

RCU welcomes Richard

Richard Meganck, who spent 11 years with the Organization of American States' Department of Regional Development, became the new Co-ordinator of CAR/RCU on 4 October. Richard and his family have lived in Colombia, Mexico and Trinidad & Tobago for extended periods and have travelled widely throughout the region.

Experienced particularly in protected areas and wildlife management and integrated development planning, he has worked with the Environment Protection Division of the Inter-American Development Bank, the U.S. Agency for International Development, and the U.S. Environmental Protection Agency Research Lab in his home state of Oregon.

together a pollution prevention, reduction or control strategy appropriate to the region to help in future negotiations.

Countries expressed firm support for the precautionary principle in environmental action in the Wider Caribbean, under which control steps are taken once there is a chance of damage even though the actual risks may be uncertain. The Caribbean nations agreed that CEP should continue to use the anticipatory approach in project design and implementation.

The Seventh Intergovernmental Meeting and Fourth Contracting Parties Meeting are tentatively scheduled for November 1994.

An evaluation of 1988-1991 CEP projects and a regional overview of environmental issues were prepared for the meetings and are being made available in the CEP Technical Reports series.

Red Sea and Gulf of Aden

Climate change

The Task Team on the Implications of Climate Change in the Red Sea and Gulf of Aden convened its second meeting in Sinai, Egypt, on 9-12 December 1992. The Task Team reviewed the first draft of the Regional Overview on Climate Change impacts on the Red Sea and Gulf of Aden and considered two site-specific case studies on areas most vulnerable to climate change and the expected sea-level rise along the coasts of Suez Bay and the Suez Canal, and in the low-lying coastal area of Tokav, Sudan.

Welcome to...

Mônica Borobia, who joined OCA/PAC in August 1992 as its Programme Officer responsible for the Marine Living Resources Programme and, in particular, the Marine Mammal Action Plan. Mônica is also responsible for Biological Diversity.

Mônica was born and raised in Rio de Janeiro, Brazil. She received her BSc in biological sciences from the Universidade do Estado do Rio de Janeiro in 1984. During her undergraduate studies she spent time in the Amazon where she worked with aquatic mammals. Since then she has worked on grey seals, belugas, humpback and fin whales in Canada, and on the West Indian manatee for the Brazilian Government. She has an MSC from McGill University, Montreal, on wildlife management and has begun her PhD studies on biological oceanography at the Université du Quebec.

Mônica has published research on river dolphins and other cetaceans of the Brazilian coast as well as on the West Indian manatee.

Richard Congar from France, who joined OCA/PAC as Senior Programme Officer in October 1992. Richard's responsibilities will be mainly to develop OCA/PAC's environmental economics programmes for sustainable development, and to revitalize the West and Central African Action Plan for the protection and development of the marine environment and coastal areas. Richard holds a PhD degree in the economic value of marine resources from the Faculté des Sciences Economiques de Rennes, France, and is co-author of several reports on marine fisheries and marine pollution.

Richard taught at the Université de Bretagne Occidentale in Brest, France, where he co-founded the Centre de Droit de d'Economie de la Mer.

Ian Dight, the most recent addition to OCA/PAC, joined in April 1993. Ian is responsible for the South Pacific and South Asian Seas Action Plans. He is also the UNEP Focal Point for the upcoming Global Conference on the Sustainable Development of Small Island Developing States.

Ian, who comes from Australia, has a PhD in marine ecology and brings to OCA/PAC his experience in coastal engineering and coral reef resource management. Before joining us in Nairobi he was working as a consultant and research scientist investigating the impacts of mining activities in the South Pacific and the dispersal and recruitment of coral reef invertebrates and fish. Ian has been actively involved in incorporating knowledge of habitat connectivity into management planning for coastal resources.

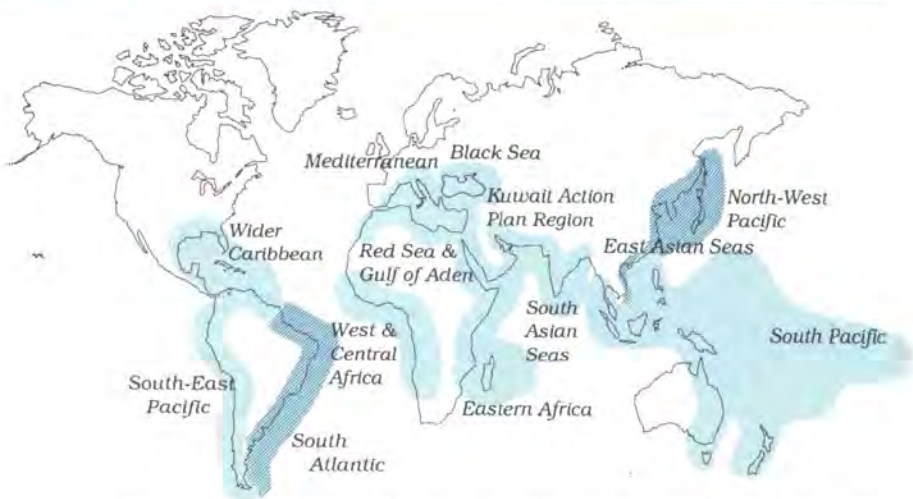
Ian has also lived and worked in Brazil, Colombia and Uruguay.

meetings

Date	Place	Meeting
1-5 Nov	Netherlands	World Coast '93
2-5 Nov	Antalya, Turkey	Med Coast 1993
23-26 Nov	Costa Rica	Eighth session of the Scientific Committee for the IOC/UNEP Global Investigation of Pollution in the Marine Environment (GIPME) and Scientific Workshop on CEPPOL
28-29 Nov	Costa Rica	Second meeting of the Bureau of the joint Intergovernmental Panel for GIPME to discuss the report of GIPME VII and the results of CEPPOL Workshop
29 Nov-3 Dec	Geneva	Second Meeting of the GESAMP Working Group on Indicators of Marine Ecosystem Health
MEDU		
8 Nov	Malta	The Environment Financial Forum
9-11 Nov	Valetta	Clean Seas 93
CAR/RCU		
1-5 Nov	San Juan, Puerto Rico	Experts Meeting on Technical Aspects on a Protocol on Land-based Sources of Pollution of the Cartagena Convention
6-10 Dec	Kingston	11th Meeting of the Monitoring Committee of the Action Plan for the Caribbean Environment Programme; Special Meeting of the Bureau of Contracting Parties to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region

contents

the regional seas



THE SIREN is issued in English, French and Spanish, as an informal presentation of news from OCA/PAC, the Oceans and Coastal Areas Programme of the United Nations Environment Programme (UNEP), and does not necessarily reflect the official opinion of UNEP or its staff.

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Produced by Maximedia Ltd. Editor: Peter Hulm; design, layout and cartoons: Nikki Meith. OCA/PAC Liaison: Gillian Mayers. French version: Danièle Devitre. Spanish version: Eduardo Laureiro.

ISSN No. 0379-2463.

UNEP

The Siren

Number 49 Oct/Dec 1993

NEWS FROM UNEP'S OCEANS AND COASTAL AREAS PROGRAMME

Three new countries join Mediterranean family

The Mediterranean Programme, holding its latest Contracting Parties' meeting in October, welcomed three new countries to its ranks, moved forward to complete work on two new Protocols, launched three major coastal management projects, took steps to improve finances and agreed to set up a new Regional Activity Centre.

The Eighth Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Mediterranean Sea against Pollution took place in Antalya, Turkey, on 12-15 October. Fourteen member States and the European Community were represented. Bosnia and Herzegovina, Croatia and Slovenia, new independent States (formerly part of Yugoslavia) which became UN members in 1992, were invited as observers. After the unanimous approval of their accession to the convention by the contracting Parties, they attended the meeting as full members. Italy said it would accept a 1.29% increase in its contribution to make up the difference between the combined contribution of the new States (1.94%) and that of former Yugoslavia (3.23%).

The meeting decided to convene a Conference of Plenipotentiaries in 1994 – preceded by a short experts' meeting – for a Protocol on pollution resulting from exploration and exploitation of the

continental shelf and the sea bed and its sub-soil (Offshore Protocol). The Secretariat is to organize a second meeting of national experts to consider the text of a Protocol on prevention of pollution of the Mediterranean Sea by transboundary movements of hazardous wastes and their disposal (Hazardous Wastes Protocol). After France reminded the meeting of its reservations concerning the timeliness of this protocol and emphasized that it would be difficult to conclude negotiations by 1995, the meeting decided on the expert session and also agreed to instruct another expert meeting to look at the possibility of adapting the texts of the Convention and Protocols to the latest developments in international environmental law.

The UNEP/Co-ordinating Unit for the Mediterranean Action Plan (MAP) was headed by Ljubomir Jeftic, Deputy Co-ordinator, Salvino Busuttil having resigned as Co-ordinator on 31 August.

UNEP's new Deputy Executive Director Nay Htun told the meeting MAP had acquired even greater significance since the Rio Summit of the United Nations Conference on Environment and Development (UNCED) last year, when the concept of sustainable development had been consecrated at the highest level. MAP represented an important component in regional and global efforts to promote sustainable development, since it underscored the political will for cooperation and constituted a model for other regions, he said. Nay Htun assured the Contracting Parties that UNEP would continue to support MAP in its search for new resources.

The meeting accepted with thanks Spain's offer to host the 1995 Contracting Parties meeting on the 20th anniversary of the Barcelona Convention – to be held in the city where it was first signed. The Spanish representative announced a US$200,000 voluntary contribution for 1994 and a further US$200,000 for 1995 to be used for meetings of the Contracting Parties.

"We have many reasons for satisfaction," Dr Jeftic noted in presenting the report on activities. "We have reoriented MAP activities on priority issues, further developed our Coastal Areas Management Programme(CAMP), initiated a process leading to an Agenda 21 for the Mediterranean, and have been assigned an important role in the mechanisms foreseen in the Cairo Declaration on Euro-Mediterranean co-operation on the environment.

"There are also reasons for dissatisfaction, however," Dr Jeftic added. These, the meeting heard, included unpaid pledges exceeding US$4.5 million, disturbing delays in payment – especially by the major contributors, the non-ratification of Protocols by two countries, the failure to submit consolidated annual reports required under article 20 of the Convention, the small number of answers to a letter requesting information on the implementation of anti-pollution legislation, the poor response to questionnaires, the failure of seven countries to adopt national contingency plans relating to accidental spills, and the absence of national monitoring programmes in several countries. The Contracting Parties issued an appeal for all States to sign the Protocols and participate more actively in the programme.

Noting that 1992-1993 showed a budgetary deficit of US$2.4 million owing to delays in contribution payments, the governments decided to set up a Revolving Fund with an initial capital of nearly US$1.8 million to pay for activities which cannot be covered by the Mediterranean Trust Fund as a result of payment delays in contributions. ❑

Coral reef group meets on climate change

The Second Meeting of the Global Task Team on Implications of Climate Change on Coral Reefs took place in Miami, Florida, U.S.A., on 2-5 June.

The meeting reviewed a draft overview prepared by Task Team Co-ordinator Clive Wilkinson of Australia and Co-Editor Robert Buddemeir of the US Kansas Geological Survey on the basis of contributions from members.

"Gaps were identified, substantive comments made and amendments introduced into the draft text," reports OCA/PAC Deputy Director Makram Gerges, who opened the meeting as the UNEP representative on behalf of the co-sponsors, of the Task Team, UNEP, IOC and ASPEI (Association of South Pacific Environmental Institutions).

On the basis of the overview an Executive Report has been prepared in a glossy and coloured format in a language targeted to policy and decision-makers and was distributed at the IPCC World Coast Conference held in the Hague in November 1993.

The meeting also recommended inviting IUCN–The World Conservation Union to co-sponsor the Task Team. "The Task Team considered the possibility of identifying and implementing a few site-specific case studies related to the effects of climate change on coral reefs," Dr Gerges notes. "However, the consensus of the Team was that identifying particularly vulnerable coral reef sites for case studies at the present state of knowledge was not possible and that perhaps a different approach – site specific activities linked to the planned long-term monitoring activities – might be more appropriate."

In this context, the Task Team recommended the organization of regional training workshops on the use of the adopted common methodology for long-term coral reef monitoring, which has been published by UNEP in its Reference Methods Series under the title, "Monitoring of Coral Reefs for Global Change", Reference Method for Marine Pollution Studies No. 61 (available on request from OCA/PAC).

Black Sea

Black Sea States agree on action

Black Sea countries now have an Action Plan for their region as a result of a declaration by Ministers and senior officials meeting in the Ukraine city of Odessa on 6-7 April.

Once very productive in food, a favourite setting for recreation and important for transportation, the Black Sea has suffered over-exploitation and environmental degradation in recent years (see *Siren* 45). The new anti-pollution programme links Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine.

The Declaration on the Protection of the Black Sea signed by six countries on 7 April immediately banned the dumping of radioactive materials in the sea. They also said sewerage systems and sewage treatment plants are to be urgently established to protect public health where the local population is at risk.

By the end of this year, activity centres are to be chosen on the basis of existing national institutions to provide technical support and co-ordinate national and regional actions.

UNEP was asked to provide continued assistance to the Black Sea countries and to review the implementation of the Declaration as well as to recommend actions for its further development. UNEP will assist in preparing a consolidated triennial report on the status and implementation of the Declaration's provisions.

"This Declaration brings the number of UNEP's world-wide Regional Seas Programme to 12 in a strictly formal sense," said Peter Schröder, Director of the Oceans and Coastal Areas Programmes Activity Centre (OCA/PAC). "Three additional programmes are presently planned and preparations for their development are rapidly progressing."

One of the first steps in the Black Sea Plan will be to develop and adopt a Protocol on the transboundary movement of hazardous wastes and co-operation in combating such illegal traffic.

The programme of work includes developing common environmental quality objectives by 1996 and where possible emission standards for harmful substances, as well as the preparation by this date of co-ordinated national plans to reduce inputs into the marine environment especially of nutrients.

The high-level representatives also agreed to develop and implement by 1996 national plans for applying MARPOL (Marine Pollution Convention) requirements on special areas, including urgent improvement of harbour reception facilities.

They agreed to establish and improve nature conservation areas in the coastal zone of each State before 1996. By 1996 they decided to develop national and regional emergency response plans against pollution. They also agreed to complete by 1996 an assessment of the sources and levels of substances on black and grey lists of dangerous and potentially dangerous substances such as lead, synthetic materials, oils and radioactive fuels. Before 1997 they will also establish a trend monitoring system for substances that have been identified as potentially threatening.

The countries will also encourage restoration and conservation of biodiversity. Environmental impact assessment of all projects in the private and public

sectors is to be made compulsory according to national criteria by 1997.

The Ministerial Declaration constitutes an interim Action Plan. A detailed programme will be prepared as a result of a current Global Environment Facility project.

Comb jelly alert

Fishery specialists for the Black Sea region have urged top priority efforts to control a population explosion of the ctenophore (comb jelly) *Mnemiopsis leidyi*.

The recommendation came from a technical consultation on stock assessment in the Black Sea, held in Ankara, Turkey, on 15-19 February 1993. "The consultation confirmed that anthropogenic pressure on the Black Sea ecosystem resulted in the catastrophic decline in important fish stocks," reports Ivan Zrajevskij, OCA/PAC Senior Programme Officer who attended the consultation for UNEP. "But there has been an explosion of the predatory ctenophore, which is reported to have reduced zooplanktonic food for pelagic fish and their larvae and to be preying on fish eggs and larvae."

The comb jelly was apparently introduced to the Black Sea in the ballast of ships. The scene was set for the population explosion by the increase in nutrient inputs, removal of predators, and heavy fishing of small pelagic fish in the absence of agreed catch limits. All this resulted in a large increase of zooplankton. When *Mnemiopsis leidyi* showed up, it found plenty of food for growth.

"The consultation recommended two top-priority urgent actions: revision of

the Black Sea Fishery Convention with strengthening of the Fishery Commission, and development of a strategy of biological control," adds Zrajevskij. "Considering that the control of the biological population is an integral part of the efforts for the rehabilitation of the Black Sea ecosystem, the consultation requested support for this activity from the Global Environmental Facility (GEF)."

UNEP, which is a partner in GEF with the United Nations Development Programme (UNDP) and the World Bank, is to provide support for development of the strategy.

At the request of UNEP, GESAMP (the Joint Group of Experts on the Scientific Aspects of Marine Pollution) established a Task Team/Working Group at its last session (London, 19-23 April 1993) to look at opportunistic settlers and the problem of *Mnemiopsis leidyi* in the Black Sea. The main task of the group is to develop a general strategy to control ctenophore population using the situation in the Black Sea as an example.

Mediterranean

Saving seals and turtles

Activities to protect the endangered Mediterranean monk seal and sea turtle featured in a meeting held at the Regional Co-ordinating Unit of the Mediterranean Action Plan (MAP) last October.

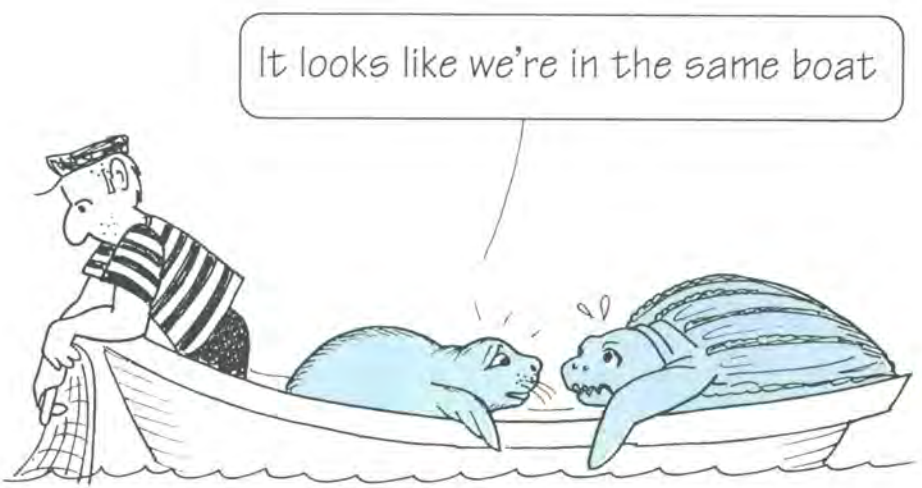
Albania took part for the first time in the second Meeting of National Focal Points for Specially Protected Areas (SPA), held in Athens on 26-30 October. It was also the first Focal Point meeting for the team at the newly established Regional Activity Centre (RAC/SPA) in Tunis, including Director Mohamed Saied.

MAP Senior Programme Office Ibrahim Dharat expressed satisfaction at the work performed in the very short period since the signature of the host country agreement, noting the quality of the documents distributed.

Turkey, Greece, Tunisia and France reported on action to save the monk seal. Turkey and Greece also told the meeting of efforts to protect the marine turtles.

The meeting noted that monk seals had been sighted in Cyprus for the previous three years, raising hopes that the animals would return to other countries where they had apparently disappeared.

Turkey has adopted a national strategy and has created a national committee to protect monk seals. With the cooperation of WWF International, it has developed pilot project in Foça with the local authorities and fishermen, and is carrying out a national assessment of populations and habitats.



Greece is also making an inventory of habitats and estimate of populations, protecting sites, conducting information campaigns for the public and fishermen, developing compensation mechanisms for fishermen, assessing threats and developing methodologies to deal with them. Sporades island, the first national marine park in Greece, has a rescue centre and a station for biological research, the meeting heard. Patrolling, monitoring and public awareness activities are taking place.

Tunisia's representative Adel Hentati told the other Focal Points that his country was carrying out an important programme in Zembra National Park in the hope that monk seals would return to the area, and asked for help from RAC/SPA in training.

French delegate Alain Jeudy de Grissac noted that the Port Cros National Park included a rescue centre. France was also monitoring the monk seal population on the Atlantic coasts of Morocco and Mauritania.

These activities were partially funded by the EC, which also supports three other activities, he added: the Sporades project, a Portuguese project in the Desertas Islands (Madeira), and the databank on monk seals developed by the Belgian Royal Institute of Natural Sciences.

Libyan representative Salaheddin Gashout noted that the last study of the monk seal population in his country had been in 1975, when there were an estimated 20-30 individuals, and he hoped that a re-estimated could take place through a mission within the framework of RAC/SPA activities.

With regard to marine turtles, delegate Gülsen Kugu said Turkey had established a national committee and had listed 17 nesting beaches, which are subject to special management.

RAC/SPA expert Chedly Rais reported that a training course had taken place in Cyprus and a manual compiled for the course on conservation of turtles in the Mediterranean. The manual is due to be published in English, French and Arabic. RAC/SPA had also engaged in an extensive exchange of documentation with interested countries. countries and non-governmental organizations were carrying out research, education and awareness activities.

Remote sensing centre

The Centro di Telerilevamento Mediterraneo (CTM) in Scanzano, Italy, will become a Regional Activity Centre for Environmental Remote Sensing in the Mediterranean region under the umbrella of MAP. It will be financed by Italy.

"The new RAC will offer training in the application of remote sensing techniques and provide Contracting Parties with information and data," notes Dr Jeftic.

PAP/RAC takes stock

MEDU's Priority Actions Programme (PAP) has established a network of 600 experts from all Mediterranean countries and cooperates with more than 50 international and national institutions.

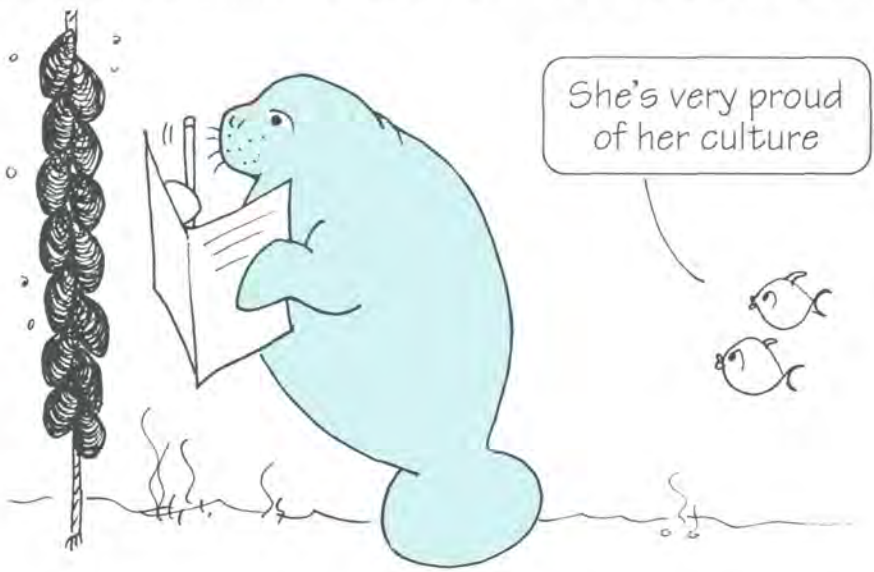
Its activities related to coastal area management have been applied in several regions, using Environmental Impact Assessment (EIA) and GIS (Geographical Information Systems) as management tools.

The PAP carried out several activities on historic settlements, water resources management, and aquaculture.

These were among the successes of the Split-based Regional Activity Centre reported at a meeting of PAP National Focal Points (NFPs) held in Athens on 23-25 November to evaluate activities and discuss the orientation for 1994-1995. Fourteen representatives, plus Croatia as an observer, took part in the ninth NFP meeting, along with international organization officials.

PAP activities cover integrated planning and management, cooperative projects, and individual priority actions. Reviewing PAP development, PAP/RAC Director Arsen Pavasovic noted that concrete activities began in 1983 after a 1979-1982 start-up phase.

The first phase, with 10 individual priority actions, was aimed at fact-finding. The second phase started in 1986, aimed at preparing in-depth studies. Implementation of the third phase began in 1987-1988 with four pilot projects in selected coastal areas and training courses on application of renewable energy sources, liquid waste management and water resource



management. In cooperation with OCA/PAC Nairobi, a practical procedure was developed for the application of Environmental Impact Assessments (EIAs), a number of pilot EIAs were prepared, and EIA training courses started.

Ivica Trumbic, PAP/RAC Assistant Director for integrated planning, reported that guidelines for integrated coastal zone management are being prepared in cooperation with OCA/PAC on the basis of experience gained with the Coastal Areas Management Programmes (CAMPs) during 1990-92.

Croatia's observer Viktor Simoncic remarked that the activities had been practical from the very beginning. Even in the preparatory phase of the Kastela Bay project, considerable experience was gained in formulating programmes seeking international financing. Several CAMP activities helped prepare a project on urban liquid waste collection, treatment and disposal in the Split-Kastela area. Two activities dealing with water resources management were used to prepare programmes of water supply in the western part of the area and two nearby islands. The training programme on GIS resulted in the establishment of a GIS database for the whole area. The overall experience gained, he added, will be used to formulate a proposal for a programme of integrated management of the northern Adriatic to be implemented in cooperation with Italy, Slovenia and Bosnia-Herzegovina. (For more on CAMPs, see page 13.)

A project to establish a network on aquaculture-environment interrelations had been re-launched on the proposal of the Food and Agriculture Organization of the UN and the United Nations Development Programme's Mediterranean Programme. A draft programme had been prepared for 1993-1995.

The water resources project helped Malta to prepare a water conservation project. The historic settlements project has held four methodological seminars and a workshop. The action on management of urban solid and liquid wastes was implemented in cooperation with the International Water Institute of Sophia Antipolis, the City of Marseille and FAO, providing training courses and case studies on management, reuse of treated water for irrigation, and recovery of polluted aquifers.

A cooperative project on mitigation of seismic risk in the Mediterranean region established a network on mitigation, provided training, held workshops and produced documents on several topics. The cooperative project on soil erosion implemented in conjunction with Spain, included Tunisia, Turkey and FAO as participants. The consolidated methodology of mapping developed as already been applied successfully in large field works in all three countries involved.

PAP/RAC's Director agreed with suggestions that in future more attention should be paid to management, training of experts, and transferring information to decision-makers, professionals and the general public. Mr Pavasovic also noted that with regard to tourism, PAP was gradually turning its attention to the carrying capacity assessment of tourism activities, considering it a very important tool of coastal zone management. In reply to questions, he said the Split office had difficulty in traveling during mid-1991 when all Croatian airports were closed. But the Croatian Government had taken special measures to enable the PAP/RAC's telephones and communications to function normally. ❑

Continuing our series on regional seas programmes that are managed from outside OCA/PAC we look at the Mediterranean, its current problems and its future. This section depended very much on the contribution of the Deputy Co-ordinator Dr Ljubomir Jeftic, Senior Programme Officer Dr Ibrahim Dharat, and the other members of the Co-ordinating Unit.

The Mediterranean example

By the Secretariat of the Mediterranean Action Plan (MAP) Co-ordinating Unit

MAP work has expanded from an initial concern with the pollution of the Mediterranean Sea to include problems of general environmental degradation caused by the uncontrolled development of the coastal area of the Mediterranean region. Mediterranean States now realize that the environmental problem is development related and thus a management issue.

The Mediterranean Sea is the common wealth and natural link of all the coastal States bordering it. Its ecosystems are fragile and have been put in danger by the uncontrolled human intervention throughout the region and the dramatic changes in the demographic characteristics and trends.

It has been noted, for example, in the Blue Plan scenario that by the year 2025 the northern Mediterranean States, which accounted for about two-thirds of the region's total population in 1950, may account for only one-third. In contrast, the population of the States from Morocco to Turkey may be double the current size and nearly five times larger than in 1950. This situation will be aggravated by rapid urbanization, particularly in the coastal areas in which populations and increased economic activity are concentrated, causing further pollution and degradation of the Mediterranean environment, unless it is controlled in advance through cooperation and coordination of the Mediterranean States.

The inevitable association of levels of pollution and environmental degradation of the environment, marine and terrestrial, with human activities has led to a particularly undesirable situation in the coastal areas, the exploitation of which is now the main cause of the degradation and the source of many pollutants. The other sources — industry, agriculture and urbanization in the hinterland — also have an impact on the coastal zone, since their pollutants

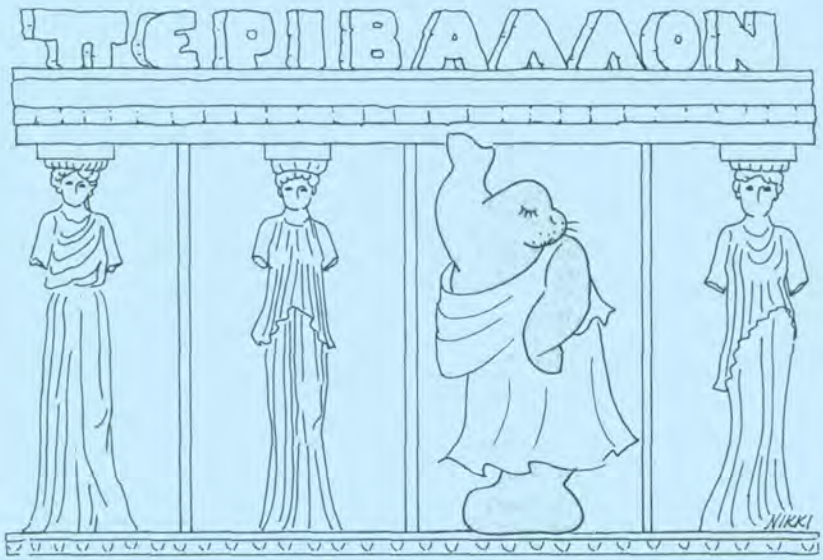
reach the coast mainly via rivers, although the atmosphere is a principal pathway for some of them.

Approaching the dual problems of environmental protection and development to achieve sustainable development by more or less disconnected studies of land-based sources, marine dumping, bathing-water quality – for example – while acceptable initially, must now give way to a much more integrated management approach to the use and protection of the coastal zone.

The MAP Coastal Areas Management Programme (CAMP) was therefore conceived to introduce or develop integrated planning and management of the development of the coastal zone. Based on the principles of integrated coastal zone development and, in the longer term, of sustainable development, a CAMP is a form of advanced collaboration between local and national authorities and international institutions.

In the MAP context, each CAMP is site-specific, each site being an example of a coastal area threatened or significantly affected by pollution and/or uncontrolled development, having sufficient local and national capacity to carry out the CAMP, and backed by the express interest of the relevant authorities in its execution. Additionally, the results obtained must be made available for application at other potential CAMP sites.

* now 12, see page 13



The great interest shown in the MAP CAMP by Contracting Parties (nine Camp projects are under implementation or preparation*) is a clear manifestation of their desire to integrate environmental considerations into development and to enhance their co-operation under the Mediterranean Action Plan (MAP). The EC initiative on Euro-Mediterranean Co-operation (Nicosia Charter) can also be considered an important instrument to achieve sustainable development in the Mediterranean Region. MAP has been given an important role in its follow-up mechanism.

In response to this interest and in the aftermath of the UNCED Conference, the MAP Co-ordinating Unit has also been laying the foundation for a regional effort in sustainable development through the preparation of an Agenda 21 for the Mediterranean region.

This approach has led to another positive development, in the form of the financial and technical support provided by regional and international institutions to some MAP project. Through UNEP/MAP assistance and advice, most of the Mediterranean coastal States, notably the developing States, have now created and strengthened institutional structures to meet the various environmental challenges, supporting the new orientation of MAP towards sustainable development.

With a view to completing MAP's institutional and legal structure, and to assist the Contracting Parties in their efforts to benefit from the wide range of initiatives concerning the Mediterranean region, intensive consultations with Mediterranean experts during the last three years have been undertaken for the preparation and subsequent approval of two new legal instruments: one on the Protection of the Mediterranean Sea against Pollution resulting from Exploration and Exploitation of the Continental Shelf and the Sea Bed and its Sub-soil (Offshore Protocol), the other on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal (Hazardous Wastes Protocol).

Furthermore, preparatory work has started on the drafting of an appropriate procedure for the determination of liability and compensation for damages from pollution of the marine environment in conformity with Article 12 of the Barcelona Convention.

MAP has continued to assist the Contracting Parties in the compilation of their environmental legislation. Since the training component is not only an important factor but a prerequisite if the developing Mediterranean States are to be able to benefit fully from the various environmental/development programmes, the MAP Co-ordinating Unit has been developing various general and specialized training programmes for the benefit of nationals from these States.

It is therefore fair to say that MAP has not just kept pace with the challenges posed by increasing development and the resulting impacts on the environment. MAP has, in fact, played a proactive role and, under the guidance of the Contracting Parties, has displayed the foresight and action orientation which has made it the example for the whole Regional Seas Programme.

– From the report of the Executive Director to the Antalya Contracting Parties Meeting

Planning for the future of the Mediterranean

By Ibrahim Dharat, Liaison Officer for all CAMP projects, and Ivica Trumbic, Assistant Director, PAP/RAC

Ibrahim Dharat

The history of MAP's Coastal Areas Management Programme (CAMP) goes back to 1987. It was recognized that during the first decade of the Mediterranean Action Plan, the bulk of its activities were focused on monitoring and interventions aimed at improving the state of the natural system. The emerging understanding that the sources of pollution problems are mostly (80%) land-based and the necessity for the harmonization of regional and global development with the receptive capacity of the environment, which calls for a permanent process of integrated planning as well as for a rational management of the limited resources available in the region, led to the refocusing of MAP activities carried out in coastal zones. The strategy was presented to Contracting Parties meeting in Athens in September 1987.

The Regional Activity Centre of the Priority Actions Programme (PAP/RAC) carried out preliminary work in 1988-1989 on four country pilot studies. In October 1989 the Contracting Parties decided to continue work on the studies and gave the venture its present title. The first four CAMP projects were formalized in agreements signed in late 1990.

It then became evident that the methodology used for the Mediterranean scenarios was not fully suitable for small geographical areas. During the 1991/1992 biennium in consultation with many Mediterranean experts, Blue Plan developed a more appropriate methodological approach.

The 1991 Contracting Parties meeting in Cairo approved two more CAMP projects and started preparation for three new projects.

Among the first four projects, the Kastela Bay (Croatia) and Izmir Bay (Turkey) CAMPs are to be completed by the end of 1993 and the Syrian Coast and the Rhodes projects by the end of 1994. A follow-up programme is to be agreed with the four countries. Moreover, the Rhodes (Greece) project is being co-financed with the European Investment

Bank (EIB) under an agreement signed for assistance totalling ECU360,000.

The procedure for each CAMP is well defined. A coastal State proposes an especially vulnerable coastal area. After its adoption by MAP/UNEP and all the Mediterranean States, the preliminary phase begins: to identify the main problems of the area, to define the options for their solution, and to elaborate a draft programme. A mixed team, made up of experts from MEDU and the Regional Centres and national and local experts, carries out the preparatory work within the framework of study missions and technical meetings. All the tools of integrated planning are used. The philosophy behind these coastal programmes is to help the States define, or redefine, the development of problem areas while respecting the environment; and further to mobilize national investments and promote greater international co-operation towards this end, as evidenced through the involvement of the World Bank and European Investment Bank.

This preliminary phase concludes with a document which becomes the official agreement signed by MAP/UNEP and the government in question. A workplan, along with a timetable and budget, is adopted for each biennium. The success of MAP in the future will depend on the success of these programmes. The four initial CAMPs provide a good illustration of the type of problems that coastal management is called upon to solve.

After this first phase of preparation through data collection, upgrading of capacities, knowledge of the environment and programme formulation, the second phase covers implementation through creation of a data base, training, integrated studies and so on. The

third phase covers follow-up including preparation of an integrated plan, its execution, integrated monitoring, and re-evaluation.

In all four of the initial CAMPs, with the assistance of GRID-UNEP and UNITAR (United Nations Institute for Training and Research), Geneva, training was organized on Geographical Information Systems at PC level. Assistance was given to buy equipment and software provided on a non-commercial basis.

The use of GIS has become commonplace in many businesses, universities and governments for an amazingly wide range of applications. It is a system of hardware, software and procedures designed to support the collection, management, manipulation, analysis, modelling and display of spatially referenced data for solving complex planning and management problems.

Practical applications of GIS to management were implemented in all four CAMPs. Training on integrated planning and management, as well as on the application of Environmental Impact Assessment (EIA), was also organized for local and national experts.

Kastela Bay: trapped by geography

For decades a pole of attraction for tourists, Kastela Bay in central Dalmatia has both benefited and suffered from its natural beauty. It is a semi-enclosed bay communicating with the Adriatic through a narrow channel which separates the island of Ciovo adjacent to the continent from the peninsula where the City of Split is built – an important port and regional economic centre. Several industries have been located on the narrow coastal strip that lies between the bay and the Kozjak mountains. The population, which in 1945 was 50,000, has increased to 350,000. Before the Yugoslav crisis, the population used to practically double with tourists in summer. Now Split has a large refugee population. In recent years the municipalities of Split, Trogir, Solin and the seven Kastelas (castle towns) have faced acute problems of waste disposal and environmental management. The problems have been made even more acute because the string of islands outside the bay form a second natural barrier. This limits water exchange and compounds pollution because of several tourist resorts established on the islands.

This project, supported by the World Bank, covered 12 activities. They included a survey of land-based sources of pollution, assessment of the risk from pollution by oil and other harmful substances and the preparation of a contingency plan, collection of data, a task team study of the implications of climatic change, application of a geographical information system (GIS), hazard assessment from industrial activities, development-environment scenarios for the next generation, environmental impact assessment, proposals for protection of the natural and historic area of Pantan and surveys of water resources. The report on hazard assessment and management of environmental risks from energy, industries, transport and other activities (HARM) has been affected by the war situation and has been prepared in a reduced form.

Some of the results of CAMP activities have already been used in a project by local authorities for waste water collection, treatment and disposal. A report has been produced on using GIS in preparing a model for urban rent charges.

Izmir Bay: waste treatment and rehabilitation

Demographic boom, urbanization and industrialization over the past 30 years degraded the environment of the Bay. From 1965 to 1988 the population increased each year by 30-80,000 people. Today more than 1.5 million live in the Greater Izmir area. A dynamic city, the largest commercial centre of the country, the second largest port after Istanbul, Izmir has more than 1,500 industrial enterprises. These represent 10% of Turkey's manufacturing production and 15% of exports, especially leather, textiles and food production/agriculture. The toll on the environment has been heavy, since pollutants dumped into the Bay received no treatment. Izmir Bay itself is shallow. Both water exchange and the self-cleaning process face difficulties. A project for a waste treatment plant was adopted in 1969, but the original plan

received several revisions, while remaining a top priority.

The CAMP provided for 11 activities. Several could not be carried out because of lack of funding. But at a meeting held in Izmir in September to present the results of the project, the Turkish Environment Minister and local authority representatives praised the CAMP for the results it had achieved.

The Minister, Mr Riza Akcali, commended the Izmir CAMP as a good example of management action implemented at the local level, thanking the local authorities which had taken the bulk of responsibility and largely contributed to the success of the project. He also recommended that the Izmir experience be used in dealing with other coastal areas of Turkey.

Mr Ali Riza Gülerman, Head of Izmir's Planning, Reconstruction and Implementation Division, pointed to the integrated management study carried out under the CAMP as one of the most significant achievements. He also praised the training programme on GIS which had contributed to strengthen his division and improve coordination of efforts on the national, regional and local level towards resolving the problems in Izmir. He welcomed the establishment of a Bureau for the preparation of the master plan and a Bureau for GIS activities. Finally he supported one of the basic recommendations of the study: the need to consider improving the institutional arrangements for coastal zone management.

The mayors of Urla and Manisa, who took part in discussions along with representatives of Iskenderun and Istanbul, insisted on including a wider region in the follow-up to the integrated coastal area management project (ICAM).

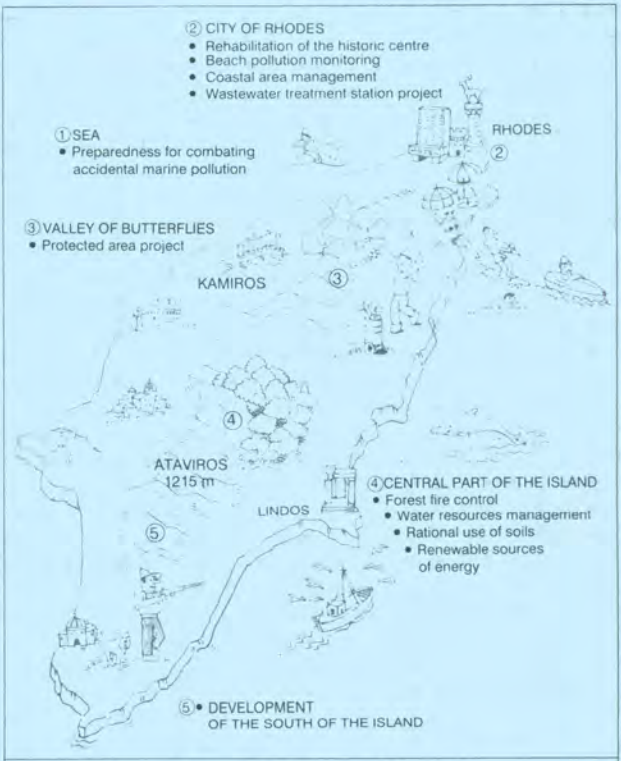
The Mayor of Izmir Municipality, Mr Yüksel Cakmur, opening the meeting, also spoke of the need for better co-ordination between the central authority and the local administration. He spoke of a number of misplanned developments, such as a housing complex of 2600 units constructed for immigrants in the protected area around Tahtali dam, miscalculations such as legalizing slum areas, and lack of finances.

The Governor of Izmir Province, Mr Kutlu Aktas, urged that the CAMP should include the coast of other provinces. He said waste water poured into the Bay from 389 discharge points and wastes dumped from ships were also an important cause of pollution, and there were disputes regarding authority over management of the Bay area. But studies on institutional arrangements for environmental management were being completed and would be submitted shortly to the National Assembly and Government, he told the meeting.

The management study set out a series of urgent measures for the coming five years to check the city's uncontrolled growth, decrease pollution, and create conditions for integrated coastal management including an integrated master plan for the Izmir area. The design of the liquid-waste treatment plant was partly modified as a result of an environmental impact assessment. The results of findings were applied to urban and regional planning. A GIS team was established and the planning department strengthened as a result of the CAMP.

Turkey told the 1993 Contracting Parties meeting that the programme was of utmost importance: it introduced for the first time in Izmir, and consequently in Turkey, the concept of coastal management which integrated environmental

values with economic, social, commercial and political values so that they could co-exist in harmony. The complex structure of coastal area management had made it necessary to re-identify the role of Izmir and the central institutions in a rather more realistic and co-ordinated manner. For that reason, the most marked result of the CAMP had been to make everyone realize that the complex nature of present institutional mechanism both at the local and the central level adversely affected the decisions made with respect to implementation.



MEDU

Rhodes: at the saturation level

The population has practically trebled in 30 years, but Rhodes could easily sustain its development if tourism did not upset the environmental balance every year at peak season: in 1990 800,000 tourists – 10 times the local population – arrived on Rhodes. Water shortage, a common problem of Greek islands, is severe in the summer. Despite several implemented projects, waste disposal has remained a major problem. Bathing water pollution has affected the vicinity of Rhodes harbour. To date, the island's economic boom has been based almost exclusively on tourism, to the detriment of the economy's primary and secondary sectors.

This CAMP has 13 activities. An integrated planning study was carried out for the island. A tourism carrying-capacity study was instituted as well as an environmental impact assessment of the waste-water treatment plant. The documents prepared were used in planning and management.

The study, carried out under the responsibility of the Blue Plan based in

Sophia Antipolis, listed four major issues that should be taken into consideration when planning the island's future development:

– **overdependence on tourism**. Problems here include lack of local labour, encouraging migration; concentration of the population in the island's northern triangle; dependence on investment decisions made outside the island; and a rigidity in the island's economy.

– **emerging processes of environmental degradation**. These include increased sea and water pollution, overbuilding and uncontrolled tourism construction. The general environmental situation cannot be defined as unfavourable, however, the study points out.

– **inappropriate use of natural resources.** Land-use conflicts have already sprung up. Water resources are under increasing pressure.

– **fragmented institutional structures of environmental management.** Implementation of planning is weak, while inspection and law enforcement not very effective.

"It is apparent that the Rhodes tourist industry will need a profound reconversion to adapt to the 'new tourist products' in demand and to a new social and economic environment where holiday-makers will be older than in the past and spread their vacations over the whole year, or take them for shorter periods or even long weekends," the study concluded.

The study considered an "economic efficiency" scenario with large units and external investment, a "social equality" scenario to maximize local benefits, a "conservation of the environment" scenario discouraging expansion, an "efficiency conservation" emphasizing existing units and tourism services that respect the environment, and finally a "sustainable development" scenario combining efficiency, equity and conservation.

"It requires a new conception of social behaviour and structural modification," the study warns.

The first and major step towards integrated planning and management, the study is designed as a practical tool for:

a) quick identification of development and environmental issues

b) determination of the most feasible future development of the island

c) development of strategies for management and

d) proposals for immediate action.

A climate change study was carried out by MAP and the Greek Environment Ministry on the basis of research by the Climatic Research Unit of East Anglia University (UK). Average temperature is expected to increase 0.9-1.4C and sea level to go up by 20-30cm by 2050. Water is expected to be scarcer. The tourist season will be longer, but the island will be more vulnerable to forest fires, which have been especially destructive in recent years. The impacts of climate change on infrastructure built near the shoreline are expected to be very significant on the densely populated north-west coast and the northern tip of Rhodes where the capital is.

The team report emphasizes the need for careful planning on the coastal zone, a re-adjustment of building standards and legislation, exploration of new water resources through construction of new dams and drilling of more boreholes into aquifers, and reforestation of the burned and eroded sections of the island.

The Split Centre co-ordinates activities for a water resources master plan with

experts and technical support provided by the Dodecanese prefecture and Municipality of Rhodes. The Greek Ministry for Environment has the overall supervisory role, entrusting the Institute for Geological and Mineral Exploration (IGME) with implementation of the hydrogeology study in close co-operation with the local authorities and the Ministry of Agriculture.

All these activities were presented to the Greek authorities at a conference in Rhodes at the end of 1992 bringing together over 200 people, mostly representing the local authorities on the island. The meeting enabled PAP to explain a number of tools and techniques of integrated coastal zone management, including Geographical Information Systems, Environmental Impact Assessment, and Carrying Capacity Assessment. This assessment has so far covered the Faliraki-Lindos area, which has considerable tourist capacity.

Syrian Coast

This is the country's most prosperous region, but it remains threatened by its prosperity. Though only 2% of national territory, the coast concentrates 11% of the total population (1.2 million of over 10 million), 90% of national citrus production, 63% of cement, 50% of oil-refining capacity. The population of the coastal strip has trebled in 30 years because of intense migration from the arid and poor hinterland to dynamic urban centres such as Bania, Lattakia and Tartous. This development has put tremendous pressure on the environment. The sanitation systems are inadequate. Treatment stations and underwater outfalls for sewage have been lacking. Discharges of industrial effluents are not regulated. As a result, marine, air and groundwater pollution have reached critical levels.

The Syrian CAMP has 10 activities. The existing pollution monitoring programme (MED POL) was expanded to cover the entire coast and, as a result, data are now available to start completing the full picture of the pollution problems of the coast. As part of the CAMP a survey of land-based sources of pollution was also initiated and the results are being integrated into the MED POL Programme. An integrated planning study was completed, along with a coastal resources management plan, which elaborated the various development options and principles of environmental protection for the coastal areas. An environmental impact assessment of the Amrit tourist complex (near Tartous) was completed. The Government and local authorities accepted the prepared document as the basis for immediate action. Several recommendations were made on the institutional, legal and land-use aspects of management and protection of coastal resources.

In addition, a comprehensive study of the implications of climatic changes on the Syrian coast was carried out as part of the CAMP, concentrating on the problems of soil and coastal erosion, and increased salinization of underground waters. The Minister of Environment of Syria expressed the view that the CAMP project was a successful one. The experience gained through the project was being used for the management of the Damascus area, where GIS was being fully applied. EIA was strictly applied for all development projects in the country and on this basis the EC was proposing a financial contribution to the Ministry of Environment to estab-

lish a more solid team to deal with EIA (US$300,000 from EC/METAP).

Fuka-Matrouh area, Egypt

The CAMP project was signed in November 1992 and the first MAP policy/technical mission visited the area in April 1993. Its operational activities are scheduled to include a programme for environmentally sound energy planning, development of environmentally sound tourism, proposals on soil erosion and desertification, and a water resources management study. The Egyptian side has indicated that soil erosion, desertification and water resources management are the most important activities to the people of the area.

Sfax area, Tunisia

The CAMP agreement was nearly ready for signature at the October 1993 meeting of Contracting Parties, and the meeting was told that the programme is expected to start on 1 January next year. A MAP policy/technical mission went to Tunisia in February 1993. Several high-level and technical meetings followed in Tunis and Sfax to draw up the list of agreed activities. These include a study on protecting and managing Medina of Sfax and Thyna Park.

Albania

An agreement was signed in September 1993 after a meeting of the project's experts with the representative of Albania in Malta last February immediately after a meeting of experts on Agenda 21 for the Mediterranean.

Morocco

A MAP official visited Morocco in February for preliminary discussions. The first multi-disciplinary mission to prepare a comprehensive programme is planned for the end of 1993.

Algeria

Only preliminary contacts were made in the first two years. The Contracting Parties meeting in October 1993 agreed to continue work on this CAMP along with the others.

Reviewing MED POL

The MAP Co-ordinating Unit asked five consultants to look at the scientific component of the Action Plan known as MED POL. The Bureau of Contracting Parties, meeting in Cairo in November 1992, had decided that MED POL should be the object of an outside evaluation. The following article (extracted from the document UNEP/OCA MED 19/3 INF.6) is what the team headed by Dr Michael Bernard reported:

MED POL so far has consisted of two phases. Phase I began in 1975 and concluded in 1980. Member states acquired experience in marine pollution measurements and research and began to compile data on baseline levels of contaminants in the Mediterranean.

Phase II, which began in 1981, was scheduled to run until 1992 but was extended until 1995. In this phase, the experience gained is being used to carry out long-term pollution monitoring and research. The programmes of work under Phase II include similar ones to those carried out under Phase I, but more emphasis was given to the acquisition of data on inputs of contaminants to the sea and survey work in coastal waters. Monitoring is currently carried out at hundreds of sampling stations (Map available).

The aim of Phase II is to give Contracting Parties the information required for implementing the Convention and its Protocols. It will also provide indicators and evaluation of pollution prevention measures taken under these treaties, scientific information that may lead to eventual revisions and amendments or new protocols, information that could be used to formulate environmentally sound national, bilateral and multilateral management decisions, and periodic assessment of the state of pollution of the Mediterranean.

As such, the objectives of both MED POL phases are not specific enough to provide the member States with the information needed for their work. Overall the MED POL programme has lacked detailed objectives, particularly for its baseline and monitoring work. The co-ordination of the work by MED Unit appears to have been carried out in a professional manner, but the national co-ordinators have failed to assist the MED Unit in the planning and scientific evaluation of the monitoring and research as outlined in the terms of reference laid down by the Contracting Parties. The task of obtaining, compiling and reviewing the results of the monitoring data appears to have fallen on the MED Unit and its cooperating agencies who were supported by scientists from institutes of the Mediterranean area.

The MED Unit staff has done an excellent job of providing logistical support to the national institutes and have established a good computerized system for the logging and retrieving monitoring data. However, they are clearly in need of support from the Mediterranean-based scientists to ensure that:

– there are clear and specific objectives for the monitoring work;

– the national monitoring work is carried out effectively and in accordance with the agreed protocols, including data quality requirements;

– the results are reported on time and in the appropriate reporting format; and

– an evaluation of the data is carried out following submission to MEDU.

The above tasks are essentially those of the designated national co-ordinators. It is clear, however, that the co-ordinators have not been able to do them. It is therefore necessary to devise an alternative system to provide MEDU with this essential support.

The monitoring activities during Phase I covered petroleum hydrocarbons in seawater (MED POL I), metals and chlorinated hydrocarbons in marine organisms (MED POL II and III), and microbiological quality of recreational waters and shellfish (MED POL VII). The baseline studies of pollutants in open sea areas for marine organisms, particulate and open-ocean sediments were pursued under MED POL VIII. A programme of intercalibration of analytical techniques and maintenance service for analytical instruments (MED POL XI) was designed to develop the ability of laboratories to measure levels of contaminants in the various marine matrices and to ensure that the data collected in different countries were comparable. The project remains of essential importance to the success of MED POL.

In general, during the Phase I, the monitoring work carried out under MED POL I provided inadequate coverage of the Mediterranean Sea. In addition, other factors contributed to the lack of success of MED POL II and III. Firstly, the quality of some of the data collected from participating laboratories was relatively poor; this reflected the initial inexperience and low analytical capability of the participants. Secondly, no attempt was made to screen the data base for inaccurate data using the results of the intercomparison exercises. This meant that accurate data became 'contaminated' with wrong and false data, thus making any conclusion about the concentrations of contaminants useless or even misleading. Consequently, wrong management decisions based upon either too high or too low concentrations may have been made. Lastly, the practice of averaging data over very large areas of the Mediterranean Sea did not allow identification of hot-spots.

Although 16 countries have signed monitoring agreements during Phase II, only nine of them have included a limited programme of monitoring of pollution sources in their national programmes. As a consequence, only a small number of stations were established to monitor the impact of industrial and urban waste discharge.

In general, the results from Phase II of MED POL still cannot provide the Contracting Parties with a description of the state of the marine environment in the Mediterranean, or a provisional estimate of the contribution of inputs to the Mediterranean or an indication of temporal trends of contaminants in marine organisms.

By September 1988 monitoring of contaminants in marine organisms during MED POL II provided approximately 14,600 data on heavy metals (mainly mercury, cadmium, lead, zinc and copper) reported by 12 Mediterranean States: 87% of the data were submitted by only four countries – Spain, Israel, Malta and Yugoslavia. Because of the

limited coverage of data and the fact that no all countries provided data on the same species for different areas, the spatial comparison of contamination in the Mediterranean Sea is still very poor. Also, none of the data provided by the countries are useful for establishing the trends in concentration of contaminants over time.

During 1983-1987 seven Mediterranean States reported data on micro-organisms, mainly fecal coliform (FC) concentrations from 300 stations. Eighty-two percent of the stations conformed to the interim criteria laid down by WHO/UNEP. This represents a considerable improvement on the 1976-1980 period.

MEDU

In the research component, most of the studies were of a descriptive nature. Pollution-induced modifications of marine communities were investigated in about 30 sites which were very unevenly distributed over the Mediterranean. Research on coastal transport of pollutants was understood by most investigators as the measurement of currents in the coastal zone by means of current meters or even by driftcards. The problems of dispersion and diffusion of pollutants and the exchange with the offshore were not properly addressed. The scarcity of information on oil slicks and floating tar balls was attributed to the lack of suitable ships and manpower required to carry out the necessary tasks.

Given the relative inexperience of participating institutes and the difficulties inherent to the programme, several problems were encountered in the research work under Phase I of MED POL. They largely relate to the validity and comparability of the data, and their uneven geographical coverage. Since Phase I was conceived as a preparatory phase for the following long-term programme for research in Phase II it appears, however, to have been a relatively successful exercise.

In spite of a more reduced budget, Phase II encompassed 13 research activities which in 1992 were regrouped into five research areas with no order of priority. In 1992, priority was given to eutrophication within 50% of the budget until 1995.

About 267 research proposals from 15 countries were agreed until 1990. Funding was very unevenly distributed among the 13 approved research activities. The funds approved for research

by the Contracting Parties appear to be constant at around $300,000 since 1987, but the actual financial availability to the research projects has been steadily decreasing, so that in 1992 it went down to about $180,000.

Some of the strategic problems encountered during Phase I remained unsolved during Phase II: the insufficient geographical coverage and the validity and comparability of some of the results. In spite of many limitations, the investigations carried out during Phase I and II and the conclusions and results of the workshops organized through MED POL provide a wealth of data and knowledge of great value for the Mediterranean scientific community. This is documented in the impressive number of volumes of the MAP Technical Report Series (75 publications to date).

Assessments of individual pollutants: the assessments have been of a high quality with regard to the way the existing information has been evaluated and utilized to propose adequate measures. They constitute another major achievement of MED POL.

Quality control of data: the achievements under this project can be considered to be one of the more successful components of the MED POL programme. Currently, there is evidence of improved comparability of data for some measurements carried out by the majority of laboratories. A few laboratories have also demonstrated that they have continued to improve their analytical capability over time. However, much more effort needs to be made by the majority of laboratories to improve the quality of their data if all of the objectives of MED POL are to be achieved.

Training and capacity building: MED POL considerably helped to lay the foundations of a scientific infrastructure in the Mediterranean. From 1982 to 1989 more than 200 junior scientists from 16 countries were given short-term training through participation in training workshops, intercalibration exercises or on-the-job training in other Mediterranean institutions. During the same period 530 fellowships were granted to Mediterranean scientists to attend workshops convened by MED POL or by other organizations. An important operational drawback of the programme is that its effectiveness is not evaluable.

International cooperation: no effort has been made to establish scientific collaboration between participating institutes. Cooperation between institutes from developed and developing countries can greatly improve the data quality and performance of the less experienced institutes.

In general, the MED POL programme can be considered successful despite the problems encountered. Many have been experienced and to some extent are still being experienced by other international organizations (e.g. those involved in the North Sea and Baltic Sea). It should be stressed, however, that the scientists in the institutes in the North Sea and Baltic Sea areas had a distinct advantage over their counterparts in Mediterranean institutes in that at the start of their programmes they were more experienced, better trained and had access to better facilities and instrumentation. The MED POL programme has achieved much in terms of equipping and training scientists in the region, particularly those from the southern and eastern parts. These achievements must be built on by the Contracting Parties by continuing to support these institutes and the scientific work of the MED POL programme.❑

21 ideas for Med Agenda 21

Malta's Prime Minister Edward Fenech-Adami summed up the implications of the Earth Summit of the United Nations Conference on Environment and Development (UNCED) for the Mediterranean and the Mediterranean Action Plan (MAP).

"While the real impact of the Rio Agreements will be felt only gradually as policies by Governments begin to take root, the Mediterranean Action Plan should from now give all of us the opportunity to harmonize between environment and development – creating the ideal setting for implementing the results of UNCED," he said. "The regional partnership that has promoted so successfully the cause of environment and development in the Mediterranean region could thus contribute to the global partnership that was delicately interwoven at UNCED."

He added: "Whatever strategy is to be adopted, priority must be given to the human dimension. Such an Agenda 21 for the Mediterranean must be credible and effective. It must be a human-centred development agenda that will achieve a better world for humankind."

His words were addressed to some 55 experts from the Mediterranean who gathered together for an informal consultation meeting held in Malta on 11-13 February 1993 to produce ideas that could form the basis for concrete recommendations and decisions that could lead to the formulation of a programme of action for the region in the next century as laid down for the world in the Earth Summit's Agenda 21.

Tunisia is to organize a "Mediterranean 21" conference in Tunis next November to examine in depth the link between environment and sustainable development, a move which received pledges of full support from the October 1993 MAP Contracting Parties' meeting.

The informal consultation produced 21 proposals on general issues, sustainable development, institutional aspects, and scientific assessment.

Noting a lack of professional links between the technical bodies in the Mediterranean, the meeting said MAP should "encourage cooperation among regions at all levels (e.g. among cities, parks and reserves, national environmental agencies, etc) and propose activities to serve as the pilot region for the implementation of the Convention on Biodiversity". The experts noted that research and training through university networks and NGOs could play an important role for the benefit of sustainable development of the Mediterranean and implement the recommendations of Agenda 21.

Efforts are needed, however, to make Agenda 21 and its implications widely known. Regional and national institutions may need to be adjusted to reflect Agenda 21's emphasis on sustainable development. New arrangements for regional cooperation may be required, giving special emphasis to eradicating poverty and to rational resource management. At the same time, the institutional framework at the regional, national and local levels should respect the principle of subsidiarity, the experts suggested. That is, no decision should be taken at a higher level if it could be taken by a lower one.

They gave MAP a special role in promoting Agenda 21 regionally: "The Mediterranean Action Plan," they said, "should proceed to the elaboration of Mediterranean sustainable development strategies, in line with the UNCED decisions, as soon as possible, based on national strategies regarding corresponding fields of common interest."

At the same time MAP should have a role in seeing how it is applied: "The Mediterranean Action Plan should monitor and report on actions taken by its member countries in connection with their post-Rio national strategies in the area of sustainable development," they suggested. However, several countries at the Contracting Parties pointed out that MAP was not equipped to be a comprehensive sustainable development organization and its activities must remain within the framework of its capabilities.

The expert group noted that the institutions set up as a result of MAP still have to be formalized (the Bureau, Committees and Regional Centres). They would need to be adapted and upgraded to cope with the shift from environmental protection and conservation to development.

Serge Antoine, chairing the session on scientific assessment, pointed out that the Rio commitments encouraged coastal States, their research centres, institutions and cooperation networks to review their scientific approach. More attention had to be paid to the time frame and to policy-oriented objectives of research, giving priority to trend monitoring, more forecasting and prospective studies and to target-oriented programmes with set deadlines.

This call was incorporated in the proposals. The scientific proposals ranged from the general to the specific. The experts urged the North of the Mediterranean to show more solidarity with the South in view of the wide gaps in expenditure as a percentage of Gross National Product on scientific research and development. The results of scientific research should be presented in a manner that facilitates its utilization by the end-user, they urged. Coastal States should also extend the benefits of integrated management to sustainable development through the multi-disciplinary training of scientists, managers, technicians and others. Particular attention should be paid to developing countries.

The experts urged Contracting Parties to make systematic review of Agenda 21 a foremost priority in order to identify the parts which apply specifically to the Mediterranean with a view to drawing up a regional strategy complementary to the global and national approaches for effective implementation of the Rio document.

As a result of this three-day brainstorming, the stage is set for an exciting "Mediterranean 21" next November and in the coming century.❑

Red Sea and Gulf of Aden

Revival plan approved

Experts from Member States in the Programme for the Environment of Red Sea and Gulf of Aden (PERSGA) have emphasized the need to activate the PERSGA Action Plan and a new plan is to be drawn up in the coming six months.

The recommendation was taken at a meeting held at the Arab League headquarters in Cairo on 10-11 January. It was attended by representatives from Egypt, Jordan, Palestine and Sudan along with officials from the World Bank, United Nations Development Programme (UNDP) and the League and by OCA/PAC's Deputy Director Makram Gerges on behalf of UNEP. Saudi Arabia, Somalia and Yemen are also participants in the Action Plan, adopted in 1982.

Noting the urgency of establishing a Regional Organization as provided for under the PERSGA Convention, the meeting agreed on integrating into one comprehensive project the three existing project proposals on data base operation, pollution monitoring and coastal zone management. This consolidated project would offer a "clear justification, objectives and institutional arrangements necessary for attracting funds from regional and international funding organizations," the representatives suggested. The draft project will be reviewed by Member States before final agreement at a coming meeting.

The PERSGA Action Plan has the usual four components: environmental assessment, environmental management, institutional and financial arrangements, and the legal component. Dr Gerges reminded the meeting that it needed review not only because of increased coastal development areas, growth of tourism and the spread of industries, but also in view of the obvious need for environmentally sound sustainable development in the region. Several environmental issues have come to the forefront of the international scene since PERSGA was signed. They included the threat of global warming, depletion of the ozone layer, and concern for biological diversity.

"The meeting agreed on updating the PERSGA Action Plan to cope with the regional environmental programmes in relation to global issues and their impact on coastal areas within the framework of Agenda 21 of the United Nations Conference on Environment and Development (UNCED)," reports Dr Gerges. "We also agreed on the importance of preparing national environmental action programmes interacting with the regional Action Plan; the necessity of seeking other sources of funds for implementing the Action Plan; and the importance of high-level communica-

tion for activating the PERSGA Action Plan."

Dr Sherif Arif of the World Bank, Dr Gerges and Dr Dirar Nasr of PERSGA came together in a working group at the suggestion of meeting chair Dr Mohammed A. Fouzi of Egypt to draft the outlines of the components of the proposed integrated project.

PERSGA's Executive Director Dr Nizar Tawfiq reported on difficulties in implementing the Protocol for cooperation in responding to major pollution accidents because no marine emergency mutual aid centre had yet been established and PERSGA Member States had not had the help of international organizations they had hoped in drawing up national contingency plans. To assist in this respect, Dr Gerges offered UNEP's help in obtaining assistance from the International Maritime Organization (IMO) to develop such contingency plans.

South Pacific

SPREP Treaty is signed in Apia

After long meetings and some hard decisions, the SPREP Treaty was concluded in the early hours of Wednesday, 16 June, in Apia, Western Samoa, reports SPREP information officer Wes Ward.

The Agreement Establishing the South Pacific Regional Environment Programme (SPREP) was signed after two days of intense negotiations. "Concessions were made by both the French and US delegations to reach a compromise agreement, allowing the legal formation of the region's newest autonomous intergovernmental organization," he told the *Siren*.

Most disputes during the negotiations centred on the ability of the Pacific territories to take part in decisions in SPREP's meetings. Finally, a compromise was presented by Tuvalu so that the final draft of the Treaty could be completed.

The meeting chair, the Hon. Misa Foni Retzlaff of Western Samoa, congratulated the delegates on their efforts to reach unanimity. The Premier of Niue, the Hon. Frank Lui, paid tribute to the outstanding leadership of the Chair and delegates and to the efforts of the SPREP Secretariat. SPREP's Director Dr Vili Fuavao finished with a prayer of thanks.

The Treaty provides for the legal separation of SPREP from its former home in the South Pacific Commission in Noumea, New Caledonia. "It also allows SPREP to now concentrate fully on its mission to encourage sustainable development in its member island countries," Mr Ward observes.

Turtle Meeting discusses Regional Programme

Many marine turtles are endangered. Overfishing, stray dogs on beaches and disturbed nesting areas are some of the growing problems facing turtles worldwide. The Pacific is no exception.

Turtles have a unique life-cycle, traveling vast distances between nesting and feeding grounds throughout the Pacific. They are also an important part of the diets and customs of many Pacific islanders. However, as females are 20-50 years when they begin to lay eggs, overexploitation can be particularly devastating to turtle populations. This is a growing problem where human populations are increasing rapidly or where turtles are fished for meat or turtle shell for the handicraft trade.

It is initially through monitoring and careful study that turtle populations can be effectively managed and conserved for these uses without depleting the populations. As turtles move freely around the region, any national efforts to study these animals must be co-ordinated. SPREP recognized this by initiating the Regional Marine Turtle Conservation Programme in 1990 to co-ordinate projects in the region with initial funding from the Australian and Canadian governments.

The Turtle Programme helps fisheries and conservation agencies in the 22 countries of the SPREP region to protect these unique and valuable creatures.

The Third Meeting of the Turtle Programme, held in Apia on 9-11 June, looked at a number of issues. These included conservation work such as protecting nesting areas, tagging and monitoring populations, public awareness about turtles, training and research, and a review of international and national legislation protecting turtles. Participating countries included Fiji, French Polynesia, FSM (Yap State), Marshall Islands, New Caledonia, Palau, Papua New Guinea, Solomon Islands and Vanuatu. Other countries attending the meeting were American Samoa, FSM (Pohnpei), Kiribati, Tonga, Tokelau, Tuvalu and Western Samoa.

An associated meeting followed immediately. This looked at the Regional Marine Mammals Programme, also co-ordinated by SPREP. It discussed why the whales, dolphins and dugongs are important, where they are, and what is happening to them. It then reviewed a Marine Mammal Conservation Strategy.

Wider Caribbean

ISTAC prepares for SPAW action

The Interim Scientific and Technical Advisory Committee (ISTAC) to the Protocol concerning Protected Areas and Wildlife (SPAW) met in Sinnamary, French Guiana, on 3-5 May to prepare the way for the major December meeting of the Monitoring Committee.

The Sinnamary session was held immediately following a Seminar on the Conservation of Wetlands in the Caribbean Region relating to the Ramsar Convention. It reviewed progress in the previous 12 months, made recommendations on implementing current activities, and reviewed planned activities for 1994 and 1995.

Reviewing draft guidelines for selecting and managing protected areas, ISTAC

decided to seek a peer review from all governments and organizations before they are adopted at the December monitoring meeting.

It was agreed that a Regional Activity Centre (RAC) for SPAW in Guadeloupe, as offered by the French Government, would help co-ordinate and implement specific SPAW projects assigned to it by the Regional Co-ordinating Unit.

This RAC would not preclude creation of other SPAW RACs when considered practical. The terms of reference revised by ISTAC will be reviewed for approval at the December meeting.

Raúl joins CEP

Raúl Mederos Báez from Cuba joined the staff of the Caribbean Regional Co-ordinating Unit on 1 August as Programme Co-ordinator for the CEP Regional Programme on Assessment and Control of Marine Pollution (CEPPOL).

A physics graduate from the University of La Habana in 1974, he holds a doctorate in sciences for his studies of environmental management and water quality criteria carried out in Cuban bays and harbours. The author of more than 30 published scientific articles, he was previously responsible for research programmes at the *Centro de Ingenieria y Manejo Ambiental de Bahias y Zonas Costeras de Cuba (CIMAB)*. Under UNESCO's sponsorship he has lectured in Colombia and Uruguay as well as being an associate professor for post-graduate programmes at La Habana and has been an active participant and consultant to the CEPPOL.

Raúl and his wife are joined in Kingston by two sons.

Wider Caribbean now special MARPOL area

The 1991 marine pollution convention governing ships (1991 MARPOL) entered into force on 4 April making the Wider Caribbean a Special Area. This gives the region greater protection against sea disposal of garbage from ships.

MARPOL 73/78, the original International Convention for the Prevention of Pollution from Ships, and its 1978 Protocol apply to more than 90% of world merchant ships.

Coastal Zone Canada '94: Call for papers

A major international coastal zone management conference will take place in Halifax, Nova Scotia, Canada, on 20-23 September 1994. The theme of the conference, Coastal Zone Canada '94, is cooperation in the coastal zone. Its purpose is to provide an opportunity for participants from many different disciplines and areas of interest to explore strategies for developing new partnerships in coastal zone management. Panel sessions, workshops and roundtable discussions will examine cooperative approaches and new working relationships among coastal zone stakeholders. Concurrent paper presentation sessions will focus on the sharing of new and existing knowledge, experience and technologies.

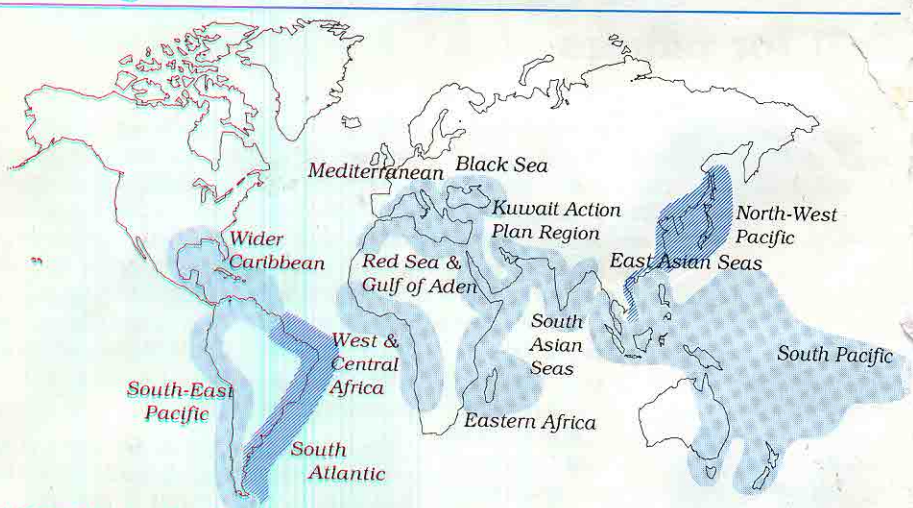
CZC '94 aims to be broad in scope, covering among its topics: community initiatives, scientific research, engineering development, conservation and protection, socio-economic issues, law, and politics and coastal management. Among coastal zone user groups expected to attend are residents, community-based organizations, aboriginal groups, scientists and engineers, academics, government representatives (municipal, provincial and federal), primary resource users, industry, business and the military, from Canada and other nations. A Trade Show and Exhibition and poster sessions will be prominent features.

Conference co-Chairs are Larry Hildebrand, Environment Canada Protection and Conservation, and Brian Nicholls, Marine Assessment and Liaison, Bedford Institute of Oceanography.

Deadline for submission of abstracts: 30 September 1993, manuscripts 31 March 1994. The conference office is located at the Bedford Institute of Oceanography (PO Box 1006, Dartmouth, NS, Canada B2Y 4A2). Tel: 1(902)-429-9497. Fax: 1(902)-429-9491.

contents

the regional seas



THE SIREN is issued in English, French and Spanish, as an informal presentation of news from OCA/PAC, the Oceans and Coastal Areas Programme of the United Nations Environment Programme (UNEP), and does not necessarily reflect the official opinion of UNEP or its staff.

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Produced by Maximedia Ltd. Editor: Peter Hulm; design, layout and cartoons: Nikki Meith. OCA/PAC Liaison: Rowena Rudd. French version: Danièle Devitre. Spanish version: Eduardo Laureiro.

ISSN No. 0379-2463.