The principal aim during 1997, The International Year of the Reef, is to increase awareness of coral reefs on a global scale, and particularly to highlight their value to both the marine environment and the people who visit and use it.

The occasion is being celebrated by all manner of events, from sponsored snorkelling contests to serious scientific research programs. Most effort however is directed at encouragement of more careful management of coral reefs to enable continued sustainable use of valuable natural resources.

Already an estimated 10 per cent of the world’s coral reefs have been mortally damaged by negligent human activity and severe degradation threatens to fatally wound at least a further 30 per cent in the next twenty years. In the Sultanate of Oman degradation of reefs has occurred just as in almost all other countries of the world. But an enlightened approach to coral reef management may provide a splash of hope in a deep blue sea of concern.

Publication of results.

1997 began with publication of the results of a coral reef survey conducted by the Ministry of Regional Municipalities and Environment in Oman. The survey covered four major regions: the Musandam peninsula and adjacent rocky shores in the Arabian Gulf and northern Gulf of Oman; the mainland coast and islands around Muscat in the Gulf of Oman; the Sharqiyah region in the Gulf of Oman; the southern shores of Barr al Hikman and Masirah Island in Oman’s central...
coastal region of the Arabian Sea; sheltered bays and isolated areas along the mainland coast of the southern region of Dhofar.

**New phenomena**
The survey revealed new information on the distribution pattern of corals in Oman including discovery of several species in northern Oman, previously only thought to occur in the southern province of Dhofar, such as *Gardineresirs platula* and *Euphyllia fimбриата*.

The survey also studied the extraordinary *Montipora foliosa* reefs of central Oman. This coral forms reefs constructed entirely from a single species, producing a reef framework over four metres thick upon which grow living whorls of coral, like giant porcelain cabbages four or five metres in diameter and the same in height. The extent of these reefs in Oman has generally been underestimated. Near continuous reefs of this type cover an area of more than 25 square kilometres, forming reef structures quite unique to the world.

**Same old problems**
Over 80 per cent of sites investigated were impacted to some degree by human activities. Coastal development, tourist pressure, eutrophication, oil pollution and littering on reefs have all increased in intensity. However, top of the list of threats were those caused by fisheries activities. Use and abandonment of ropes, lines, traps, anchors and nets impacted 70 per cent of sites surveyed, sometimes resulting in relatively minor damage, sometimes resulting in the death of entire reefs.

The degree of damage by nets to coral reefs depends on a number of complex factors which may interact in unpredictable ways, including reef type, exposure, frequency and intensity of storms, water depth, the condition and age of the net, presence/absence of net floats, anchors and sinkers, and other factors. Initial abrasion causes tissue loss and exposes corals to invasion by pathogens and the growth of algae which shade and out-compete corals. Branching forms of corals (for example the cauliflower coral *Pocillopora damicornis*) are more likely to snag abandoned or lost nets than for example, massive, sub-massive or encrusting growth forms.

**A sub-marine snowball**
In areas of prevailing water movement, such as that caused by currents, tides, swells and wave action, coral branches entangled in the net suffer breakage. Part of the net thereby becomes loosened from entanglement. Laden with coral fragments, the hydrodynamic resistance of the net increases. Further water movement gradually forces the loose end of the net to roll up. The bundle of net and coral fragments, aided by net floats that exert an upward pull, is progressively forced to roll and bounce across the area of reef to which the remainder of the net is still entangled, in a snowball effect. The expanding roll of net, heavy with accumulated debris, tears whole colonies from the substrate and crushes other colonies. A wave of coral rubble generally equal to the width and length of the net is created. In most cases, once the net has become completely rolled up, the weight of the net and accumulated debris prevents further movement.

**A solution for survival**
Coral communities are threatened by the continued devaluation or loss of coral reef resources, including those currently of value to fisheries, tourism and recreation, coastal protection, scientific study, marine biodiversity and marine ecology. Whilst natural phenomena probably represent a severe threat to coral reef ecology, fishery and other human activities have been repeatedly implicated in damage and degradation caused to coral reefs in Oman. Management intervention to enable the sustainable use of coral reef resources has therefore been recognised by government as imperative.

A Coral Reef Management Plan was prepared by the Ministry of Regional Municipalities and Environment based on the national survey as well as previous studies. Crucial to its formula for success is the development of programmes to enable the participation of local communities in coral reef management, thereby gaining the understanding, cooperation and active participation of the users and beneficiaries of the reefs. Whilst the plan will complement and build upon existing policies and strategies, traditional approaches involving the strict protection of certain areas in an attempt to preserve coral reefs in Oman is considered unlikely to succeed, particularly due to a lack of enforcement capability and historical “Marine Tenure” rights claimed by most fishermen.
Integrated community management will involve the initial collection of detailed information on local fisheries activities and the cultural practices and philosophy of fishermen, coupled with economic and ecological appraisals of activities, trawling and introduction of new fishing equipment and techniques, lost gear reporting, retrieval and disposal systems, and provision for educational advancement of local peoples, for example, through workshops and printed pictorial media. The possibility of incorporating the concept of traditional Marine Tenure rights in the modern approach of Protected Area Management will be investigated and incentives for the active participation of fishing communities provided.

Parallel, mutually reinforcing management measures will involve deployment of rangers in existing Protected Areas, training programmes and education and awareness campaigns. Coral reef restoration techniques will include physical measures to prevent further degradation of certain reef areas and encourage coral reef regeneration, and removal of harmful debris, such as fishing nets.

Reef recreation and tourism will be addressed, particularly with regard to the possible economic benefits of tourism and corresponding incentives for the conservation of coral reefs, both among government and local communities.

Regulations regarding the conducting and evaluation of Environmental Impact Assessments of proposed developments in coral reef areas will be strictly enforced. Supporting all management activities will be regular monitoring programmes, review and revision of management plans and focused scientific research.

In order for active field management to succeed, cooperation and coordination between relevant government and non-government authorities and definition of coral reef management policies will be encouraged.

The increasingly important role of the private sector in coral reef management will be promoted and future management policies will dictate increased support and involvement of non-government parties.

Implementation of this ambitious plan has already begun in the form of pilot schemes in selected areas. If successful the scheme will spread to other areas of the Sultanate, which will then continue to benefit from its valuable coral reefs, the living treasures of its shallow water seas.

DAMAANİYAT ISLANDS DECLARED A NATURE RESERVE

ONE OF OMAN’S CONTRIBUTIONS to the International Year of the Reef initiative was a Ministry of Regional Municipalities and Environment campaign in March to clean up the coral reefs of one of Oman’s most beautiful coral reef regions, the Damaaniyat Islands Nature Reserve.

A recent Royal Decree declared the Damaaniyat Islands a Nature Reserve, Oman’s first marine nature conservation protectorate. The area is important not only on a national level, but also on a global scale.

Removing lost and abandoned nets, other fishing gear and litter from coral reefs aids the ecological restoration of affected areas, reduces future impacts upon coral communities and restores the reefs’ potential value for fisheries, recreation and tourism. Additional management of coral reefs is required to prevent further damage recurring, but clean-up operations remain a necessary and immediate cure to many existing problems. Several successful clean-ups in the past provide evidence of their effectiveness.

In order to ensure that clearance of coral reefs achieved the desired results of reef regeneration, the clean up operation was carefully planned and involved the contracting of marine ecologists and specialist technical divers.

Dive teams and assistance were provided by the Royal Navy of Oman, the Royal Yacht Squadron, Royal Oman Police Coastguard, the Ministry of Agriculture and Fisheries and an extensive list of volunteer divers from the local diving community. His Highness Sayeed Shabib Bin Taimour Al-Said, the Advisor to HM the Sultan for Environmental Affairs personally took part in the event, together with his family, all of whom are experienced divers.

The campaign is set to continue in September in the southern region of Dhofar in Oman.