The Role of Major Groups in Sustainable Oceans and Seas

A series of case studies prepared jointly by WWF International and the Division for Sustainable Development in collaboration with Equilibrium Consultants

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The case studies were written by Carole Saint-Laurent with Sue Stolton and Nigel Dudley of Equilibrium Consultants and Sue Wells of WWF International. Background research was carried out by Sheila Anthony and Zoltan Toth.

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WWF International
Avenue du Mont Blanc
CH-1196, Gland
Switzerland
Tel: +41-22-364-9111
Fax: +41-33-364-4238
Email: Infobox@wwfnet.org

United Nations Department of Economic and Social Affairs
Division for Sustainable Development
Two United Nations Plaza, Room DC2-2220
New York, New York 10017
USA
Tel: +1-212-963-8811
Fax: +1-212-963-1267
Email: dsd@un.org

Equilibrium Consultants
23 Bath Buildings
Bristol BS6 5PT
UK
Tel/Fax: +44-117-942-8674
Email: Equilibrium@compuserve.com

Contents

The Role of Major Groups in Sustainable Oceans and Seas

The case studies presented here have been prepared as a background paper for the seventh session of the Commission on Sustainable Development. They illustrate how the 'major groups' identified in *Agenda 21* can contribute to realising the objectives of Chapter 17: *Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection and rational use and development of their living resources*. These groups are:

- Women
- Children and youth
- Indigenous people
- Non-governmental organisations (NGOs)
- Local authorities
- Workers and their trade unions
- Business and Industry
- Scientific and technological community
- Farmers

Turning the tide

For centuries, the world's oceans have been seen as an inexhaustible supply of food and other products, and more recently as a free dumping ground for waste. Marine resources are, however, neither unlimited nor 'free'. Over-exploitation is having an increasingly devastating effect on marine ecosystems and on those human communities that rely on the seas for their livelihoods. Industrial and domestic development, and burgeoning tourism, compete and interfere with the wildlife and ecological processes of coasts and open seas. The nature and extent of the threats facing the world's oceans have, however, been detailed many times and do not need to be reiterated here.

As pressures on the land and its resources grow, oceans and seas are becoming increasingly important for sustenance, livelihoods, and recreation. The significance of the marine environment and its resources to our social and economic well being means that human needs must be taken into account in efforts to protect marine biodiversity. Equally, since human activities that depend on the marine environment almost always require a healthy ocean, there are also important social and economic reasons to halt its deterioration. Environmental concern must cease to be seen as a competing 'use' of oceans, and be recognised instead as a fundamental component of all marine activities and an integral part of sustainable development.

Fortunately, the importance of linking conservation with sustainable lifestyles and livelihoods is being increasingly recognised. Thousands of initiatives are underway world wide to address threats to oceans and seas and their resources. The case studies outlined below are literally only 'a drop in the ocean' in relation to the many others taking place around the world. They have been chosen for a variety of reasons:

- their role in illustrating how 'major groups' are contributing to the implementation of *Agenda 21*;

- their role in illustrating a range of possible and innovative solutions to some of the threats facing the world's oceans; and

- their participatory and collaborative nature, given that in most real-life situations different groups must work in partnership to achieve success.

This last point is particularly important. Although the case studies highlight the different roles of 'major groups' it should be noted that none of these projects are the domain of one single major group. *Agenda 21* stresses the need for the '*commitment and genuine involvement of all social groups'* and the '*need for new forms of participation*' to emerge (23.1 and 23.2). Indeed, the measures and practices required to conserve marine biodiversity and ecological processes and to maintain future prospects for sustainable development must take *all* human needs into account. The case studies presented in this document, therefore, all emphasise a participatory and collaborative approach that cuts across all sectors of civil society. It should therefore be noted that those sectors of society highlighted in this document need to be, and in general are, *partners* in sustainable development.

Cornerstones of success

Five key activities must be fulfilled in order to safeguard the world's oceans and seas:

- the introduction of measures to ensure that fishing is carried out in a sustainable manner;

- the establishment and implementation of a comprehensive global network of ecologically representative and well-managed marine protected areas;

- the reduction and elimination of marine pollution from land-based and marine sources;

- the use of integrated coastal management (ICM) as the major framework for sustainable management of marine and coastal ecosystems; and

- the conservation and recovery of threatened marine species, many of which also have significant economic and cultural values.

All of the 'major groups' identified in *Agenda* 21 contribute to these activities, as illustrated in the case studies.

The role of *women* has long been over-looked, but the two case studies from Tanzania and Guinea Bissau illustrate how recognition of women's involvement in fisheries and other marine resource use can rapidly lead to improved management practices. Furthermore, given their fundamental positions in the community they can be an important conduit for introducing the concepts of integrated coastal management and sustainable development in a way that is meaningful to their communities.

As on land, *children and youth* can provide the impetus for conservation through a range of activities and projects, in collaboration with their teachers, schools and the wider community. The two case studies present very different approaches to promoting awareness of marine issues, from bottom up and top down. In Guam, children have acted as a catalyst for a more general concern about the future of coral reefs, while in Malaysia a coalition of educators, government departments and an NGO has provided teaching materials on the marine environment that can reach pupils throughout the country.

The two case studies on *indigenous people*, one from New Zealand and one from the Arctic, show how traditional practices, although under threat, can contribute to both sustainable resource use and to the protection of threatened species. Indigenous people, who often have a long-term relationship with the ecology of an area, may be in a better position to promote and implement sustainable management practices than newcomers. However, both examples show that traditional practices will be more effective if backed-up with appropriate legislation and government support.

NGOs can play many roles in the sustainable management of marine resources, having greater flexibility than other groups and often acting as a link between local communities and government bodies, the academic community or industry. Two examples, from Turkey and Belize, illustrate what is now virtually a global phenomenon, and show the role that NGOs can play in facilitating and initiating new approaches to the protection and management of marine resources.

In many parts of the world *local authorities*, and thus the local people that they represent, have had little say in the decisions made about their environment and their livelihoods. Local government can, however, play an important role in ensuring that local communities are properly represented and fully involved in decisions that affect them. The two case studies presented, from Estonia and the Philippines, are examples of how local authorities are becoming more involved in Integrated Coastal Zone Management Planning. In both countries devolution of power to local authorities has produced both opportunities and challenges. The gradual reduction in central government control is a world wide phenomenon that has implications for many marine areas.

Perhaps as many as 700 million people derive their livelihoods directly or indirectly from the seas. The role of these *workers and their trade unions* cannot be underestimated. The case studies in this section both show what can be achieved when workers join together to fight an issue that is undermining both marine environment and their livelihoods. This applies both at the community level, as illustrated by the case study on small-scale fisheries in Thailand, and at the level of a global industry, as illustrated by the case study on shipping and the International Transport Workers' Federation.

Business and industry have vital roles to play. The Marine Stewardship Council demonstrates the progress that can be made when the fishing industry joins forces with other sectors of society to provide incentives for sustainable fisheries. The tourism industry is also increasingly recognising its role in supporting both the management of marine parks (in many areas these are prime attractions for tourists) and in safeguarding threatened marine species.

Scientific knowledge and understanding of the oceans lags far behind that of the terrestrial environment though enormous advances have been made in the last five decades. The case studies illustrate how through research and innovation the *scientific and technological community* is helping to reduce pollution (through the development of non-toxic paints for ship hulls) and improve marine park management and prevent damage to shallow water habitats (through the invention of a simple technique for mooring).

Farmers are perhaps not traditionally associated with the oceans, but 'ocean farming' – more commonly known as aquaculture or mariculture – is one of the most rapidly expanding industries in both the North and the South. It is an important component of sustainable fisheries management offering, at its best, increased food security in the face of declining wild fish stocks and potentially leading to a reduction in the catch of wild fish. Potential solutions to the urgent need to develop sustainable aquaculture are illustrated by case studies on traditional shrimp farms in Hong Kong and village-based clam mariculture in the Solomon Islands.

Global action for women towards sustainable and equitable development

Women's Participation in Coastal Conservation Planning in Tanzania

Experience demonstrates the advantages of involving local people in the planning, management and implementation of coastal resource planning. However, men often dominate participation and women's voices are not heard. The case study from northern Tanzania shows how women can be encouraged to participate in sustainable development projects. Some of the difficulties this can involve are also illustrated.

Introduction

In many societies men take most of the decisions, despite the fact that much of the work is carried out by women. However, if local communities are to be empowered to manage their natural resources with what is often only limited input from government, both men and women must be involved. Empowerment involves helping villagers build confidence in their own abilities, securing technical advice to ensure effective decision making, ensuring a strong policy and legislative framework and developing clear guidelines on use and management of resources and through transparent agreements. Encouraging gender equality in decision-making is therefore a priority.

Agenda 21 devotes a chapter on the need to recognise and increase women's participation in development. In particular the document stresses the need:

> *To consider developing and issuing by the year 2000 a strategy of changes necessary to eliminate constitutional, legal, administrative, cultural, behavioural, social and economic obstacles to women's full participation in sustainable development and in public life.* (24.2(c))

Since 1994 the government of Tanzania has worked with IUCN - the World Conservation Union, with assistance from Irish Aid, to establish an Integrated Coastal Management Programme in the Tanga Region, in the northern-most coastal region of Tanzania. The aim is to improve the capacity of government and community institutions to help local people use their near-shore fisheries, coral reefs, and mangroves in sustainable ways, including restoring degraded environments. The concerns being addressed are overfishing, destructive means of fishing, coastal erosion, destruction of mangroves, poor agricultural production due to vermin and poor enforcement of legislation. These issues were identified through wide stakeholder participation. This programme has also set out to specifically identify and recognise the differences between men and women in the community, so that greater equity can be achieved in well-being, access to resources, self awareness and identity, participation in decision making and control over resources.

Tanga's coast has one municipality, one small town and about 87 coastal villages (including sub-villages). The area is Muslim. The economy of most coastal households depends on a combination

of activities. Most households are not self-sufficient in food, but very little formal employment is available. Both sexes play important but different roles and there are gender differences in the activities carried out, in resource use patterns and in access to land, natural resources, equipment, labour, capital, outside income and education. There are also differences in the control that both sexes can exert over these resources. Artisanal fishing is the main activity, especially for men, with women involved in catching small shrimp from the shore. Farming is also important, especially rice farming by women. The growing of cash crops, primarily coconuts and cashew nuts, is mainly controlled by men. Other less significant activities are salt boiling, raising of livestock, boat and house building and pole cutting.

Activities

A wealth ranking exercise conducted in three pilot villages (Mwambani, Kipumbwi and Kigombe) in late 1996 showed that women are considered among the poorest people in coastal villages, because they own and control very limited resources. The Tanga project, therefore, aimed to address this gender inequality and promote a more equitable role for women in community life and sustainable development.

The first step was to work with both women and men to raise awareness of the need for the participation of both sexes in decision making, training and on study tours. Where the participation of women increased, confidence grew. Where participation continued to be low, special meetings were held to address this.

For example, women in Kigombe village were initially not attending the meetings which were analysing the priority issues (fish scarcity and vermin) of the village. Special meetings were thus held with the women to analyse both the consequences and the causes of their lack of participation. The women recognised that by not attending the meetings they would not be able to benefit from programme activities. They listed a number of reasons for their absence, the main one being that the men would not listen to them so they did not want to waste their own valuable time. The second reason was that the meetings occurred at times that were not suitable for them. They also complained that they were not properly informed about the meetings.

A meeting was then held with the women and men of Kigombe to discuss the women's absence. The men recognised that if women did not attend the meetings the men would not benefit from the women's ideas, experiences, suggestions and help. Asked about the reasons for the women's absence, the men said that it was a matter of customs and tradition. Obviously men and women had different perceptions of the issue. These were then discussed. Finally, the women decided that they would attend the meetings and the men promised that they would listen to them. They also decided that meetings would be held at more suitable times for the women and agreed on how the meetings should be announced.

Results

Levels of gender awareness, participation and motivation have increased. In the pilot villages environmental committees are in general gender balanced. Women have gained self-confidence and some are even actively participating in typical 'male' activities like village patrols. Women and men's priorities are equally addressed. Some activities are male dominated and others female dominated, but there is mutual understanding and support.

In Kigombe village, were the participation of women was initially low, women took part in the meetings analysing the priority issues and solutions. They also took seats in the village management committees that were planning, overseeing and monitoring implementation of activities, and they participated in the formulation of a fisheries management agreement. However, participation stayed lower than in the other pilot villages. At present 21 of 48 committee members (44 per cent) in Kigombe are female.

The pilot village programme has in general had positive results. Illegal mangrove cutting and destructive fishing practices, including dynamiting, have declined, largely through the enforcement efforts of the villages themselves, and there is a voluntary mangrove replanting and weeding programme. Many people, especially women, adopted seaweed farming and mariculture as an alternative income generating activity. The villagers are now much more aware of coastal conservation concerns and have started to learn the skills required to protect and use their resources in a sustainable manner.

Lessons learned

Addressing both gender and conservation issues can be complicated. There are potential conflicts between the gender equity objective and the objective of reducing fishing pressure by developing alternative livelihoods. In the Tanga project, mariculture was developed as an alternative to fishing. The broader objective was to create economic alternatives to fishing so that fishing pressure could be reduced. So far, however, the mariculture activities have been mainly undertaken by women (seaweed farming and oyster culture), whilst income generating alternatives for men, such as fish cage culture, are only just starting.

Good 'role models' are needed when trying to encourage gender equality. In the Tanga case study female extension workers were only available in the villages of Mwambani and Kipumbwi. In Kigombe, where there were problems with women's participation, no suitable female extension worker was found. It is reasonable to assume that these two facts could have a correlation. From their own experience female extension workers should have a better understanding of the obstacles that women face and can serve as role models for the women in the community. The situation in Kigombe slowly improved as women gained self-confidence after participating in training courses, workshops, and study tours and seeing the results of their activities. They thus created role models among themselves.

The Tanga village project has drawn up a list of key objectives to help ensure gender equality. These include:

- have women in assessment, extension and other teams whenever possible;
- use participatory approaches throughout;
- use special techniques to stimulate women's participation and dialogue and co-operation between the sexes;
- make men and women aware of the benefits of women's participation in all steps of the process and the benefits of dialogue and co-operation between the sexes;

- collect and monitor gender related data;
- ensure equal representation in activities like training courses, study tours, workshops, etc.;
- ensure fair representation in village meetings and village committees;
- conduct special meetings or other actions when participation of women is low or absent;
- assess gender equity in addressing priority issues, allocation of funds and materials and other benefits regularly so that adjustments can be made when necessary; and
- inform women about their legal rights.

This case study has been prepared from a longer and more detailed paper *Involvement of Women in Planning and Management in Tanga Region, Tanzania* by Trudi van Ingen and Claudia Kawau of the Tanga Coastal Zone Conservation and Development Programme, presented at a workshop on Participatory Natural Resource Management in Oxford, UK in April 1997.

For more information contact:
Tanga Coastal Zone Conservation and Development Programme
PO Box 5036
Tanga
Tanzania

Tel +255 53 47463/4
Fax +255 53 47465
Email: tangacoast@twiga.com

Women Add Value to Fisheries in the Rio Grande de Buba Basin in Guinea-Bissau

In the face of increasing and unsustainable commercial fishing in their waters by foreigners, communities in Guinea-Bissau are working with the government and IUCN to develop and manage their own commercial fisheries. Their approach is based on sustainable management and community participation. Women – as the primary vendors of fish to merchants and dealers – have contributed to this effort by developing ways to add value to the fish products sold and opening up new avenues for selling their products. Their success has meant a significant improvement in their cash flow situation.

Introduction

Agenda 21 stresses the need:

> *To formulate and implement clear governmental policies and national guidelines, strategies and plans for the achievement of equality in all aspects of society, including the promotion of women's literacy...their participation in key decision-making positions and in management of the environment, particularly as it pertains to their access to resources, by facilitating better access to all forms of credit... (24.2(f))*

In Guinea-Bissau, increasing participatory management of the local fisheries has involved forming women's and men's groups to develop activities which will make the most of local resources, whilst ensuring their sustainable use.

The Rio Grande de Buba river basin covers 3,150 square kilometres at the heart of what is known as the region of the "Rivers of the South". The area is sparsely inhabited, with only 45,000 inhabitants – one of the lowest population densities in the country. The Rio Grande de Buba region also boasts a diverse array of mammals and birds and around one hundred species of marine and estuary fish. The region has been largely isolated since independence in 1974 and has remained essentially rural.

The people of the Rio Grande de Buba basin had never undertaken commercial fishing. Fish for domestic consumption was caught using traditional methods. However, during the 1970s and 1980s, foreign fishermen from the North of Senegal began appearing. They were well organised and possessed technology that was much more advanced than anything in use locally. They efficiently and rapidly caught those fish with the highest commercial value and exported them fresh back to Senegal. The fishermen did not establish themselves in the region; they practically lived on their long dugout canoes, brought petrol and ice with them, and spent 5 or 6 days at a time on them before heading straight back to distant ports.

The 1990s saw the arrival of other foreign fishermen, from Guinea Conakry, Sierra Leone and Ghana. These people were often escaping from wars or serious economic difficulties. They set up permanent camps, focusing primarily on smoking fish for export to Saharan countries. They did

not possess sophisticated technology but their exploitation of the fisheries was intensive and showed little concern for sustainability.

Activities

In the early 1990s residents of the area were deriving very little benefit from local fisheries but the rate at which foreign fishermen were exploiting the resource had begun to arouse concern. IUCN - The World Conservation Union therefore proposed to help the area's residents to develop a local artisanal fishery based on a participatory management approach.

After a year of consultations, eight groups of fishermen from different villages were formed. Each was given funds with which to grant credit to its members for the purpose of purchasing nets and other fishing equipment. One hundred fishermen received an average of US$200 over a period of four years, most of which was reimbursed under the supervision of each village.

Six groups of women were also formed. Women are responsible for the whole series of activities that follow the landing of the fish, including preservation, transport and sale. Once returned to port, the fishermen sell their catch to women on a cash basis – even if a fisherman is selling to his wife – and the women resell the fish to merchants and dealers. This system works well on a small scale but with the potential increase in local fishing capacity, women were facing a shortage of funds with which to purchase fish for resale. Women were also keenly aware of the scarcity of money needed to purchase products to meet the basic needs of their families: food, soap, clothing and medication. Small amounts of money were therefore made available to allow women to buy and sell their fish individually. The women's groups manage the money and fix interest rates.

Efforts were also made to work with groups of women to develop local market potential. In 1994, women sought support from the project for an experiment involving finding new markets for fresh fish in the East Province. A vehicle and driver and project officers were provided to help the women. In this way, ten women reached Gabu, 200km away over bad roads, with a ton of fish and a great deal of enthusiasm. Unfortunately, this plan did not take account of the culinary habits of the dominant peoples of Gabu who preferred fish treated according to traditional methods (salting, drying). Eventually, the fish had to be sold off cheaply. Research supported by the project later found that one of the most popular fish products regionally is *escalada*, a semi-fermented barracuda, coated with peppers, then dried. The advantages of this traditional process are that it adds value to fresh fish and allows the fish to be kept for several weeks.

One of the indirect effects of the production of fish products for market has been the development of a market garden enterprise. In 1994 the project began encouraging women to produce the peppers needed to prepare the *escalada* in sufficient quantities. Small parcels of land were converted into common gardens. Funds were made available to dig six wells and to recruit a local co-ordinator who is a specialist in market gardening. The women threw themselves into the production of a variety of vegetables. This enterprise has itself become a significant local industry.

Simultaneously, the need to manage outside funding and other relations with outsiders gave rise to a desire to be able to read, write and count. An agreement was reached in 1994 with the national education authority to allow a small number of local teachers to give literacy courses to the adults in the groups. In exchange, the students would agree to build schools in the main villages. Women and men take the classes together.

In 1997 a new idea emerged: to build a new market for producers and buyers in Buba like those that operate weekly in the border towns of Guinea-Bissau. Women, fishermen and customary chiefs embraced the idea; the local authority promised to keep the peace and provide sanitary facilities; and private transportation enterprises offered to service less accessible villages. In less than two months a market place was built with covered stalls.

Results

The women and their communities have achieved considerable success. Today, the 20 women in the Buba groupings manage a budget of $US2,000, provided by the project for the purchase of fresh fish to be processed and resold. Between August and November 1996 more than $US5,000 was made through the sale of salted barracuda. This provided additional operating funds to buy fish and update equipment. This still left a profit of $US100 for each woman. The dried barracuda has become an important, marketable resource. The name of *buba* is now associated with a national product of high quality.

The market has flourished. The original plan had been to hold a market fair every 15 days. Beyond everyone's expectations, the fair kept going through the rainy season and became a weekly event. Each week a ton of fish is sold without advertisement.

The market garden has also been a success. Within three years the six groups of women involved were able to finance the purchase of school materials with proceeds from the sale of excess produce from their gardens.

The education project has continued, with enthusiastic support. The agreement was renewed after three years and now includes a permanent rotation of teachers and the production of manuals adapted to the daily life of fishing communities. Women have been the most attentive and have derived the most benefit. More often in contact with the outside world, they have seen the value of being able to read the weight indicated by a fish scale, verify the addition of a merchant, or sign their own names.

Other types of progress have also been made. There has been a real reduction in the presence of foreign commercial fishermen in the Rio Grande de Buba due to effective monitoring activities. The barracuda population seems to have stabilised since 1996 and encouraging signs of recovery are being seen. The "take" of barracuda, which was the sole province of foreign fishermen until 1995, has been reduced, but now 90 per cent of the value of this catch remains with local families (as much with the fishermen as with the women who resell the fish and fish products).

Furthermore, requests for training and support coming from both the women and men of the Rio Grande de Buba are growing exponentially as a result of the dynamic development process, access to markets and the visible results of this project.

Lessons learned

Participation of local people is indispensable in addressing threats to local natural resources which affect the future of a community, be it a threat to the source of revenue or food, or an obstacle to development. In the case of the Rio Grande de Buba, the local communities traditionally viewed fisheries as sources of food and as means of generating occasional income. Arguing that reducing the resource base now would be to the detriment of future generations would not have been enough

to motivate action in this situation. However, the development of activities that added value to the resource and generated immediate income has drastically changed the point of view of these people.

Women need to be involved in alternative income generating schemes as well as men – particularly as they are often more aware of immediate cash needs. The project shows that there are a wide range of income generating activities available to women in coastal communities, particularly related to processing and selling marine products and creating added value to the basic price of wild caught fish. Start-up mechanisms, such as credit loan schemes, are essential – particularly for women.

Literacy and education activities give added benefits to women. Literacy training is seen as one of the key aspects of the community's ability to develop and promote itself, giving the whole community a greater status in contacts with outsiders and governmental institutions.

Maintaining a number of small village groups, rather than uniting them into one larger group, can strengthen the diversity of interests and ensure the widest sharing of benefits possible. Paradoxically, the project has contributed to a strong sense of community cohesion.

Co-operation and ongoing consultation with men and women along traditional lines has been crucial. Families, traditional leaders, individuals and third parties are all consulted in order to identify the forces of change in the community, while at the same time working with traditional forms of organisation.

This case study has been prepared from a longer and more detailed paper *Le Project de Développement Durable de la Pêche Artisanale dans le Rio Grande de Buba, Guinée Bissau: Un example de co-gestion des ressources halieutiques au niveau local* by Philippe Tous, IUCN – The World Conservation Union and from additional materials provided by the IUCN Social Policy Group.

For further information contact:
Alex de Sherbinin
IUCN – The World Conservation Union
Social Policy Group
1196 Gland
Switzerland

Tel: +41-22-999-0260
Fax: +41-22-999-0025
Email: AMD@hq.iucn.org

Children and youth in sustainable development

A "Kids for Coral" Group is Helping to Protect Coral Reefs around the Island of Guam, Micronesia

Kids for Coral is a group of students from St John's School on the Island of Guam in Micronesia. Since 1990 children at the school have been raising awareness amongst the island's residents of the need to preserve Guam's coral reefs. By working together in a group, the children who have participated in the project have also learned that they can have an important role in helping preserve their environment.

Introduction

Agenda 21 stresses the important role that children can and should play in sustainable development. Activities with youth groups play a dual role, combining education with practical conservation achievements.

> *The specific interests of children need to be taken fully into account in the participatory process on environment and development in order to safeguard the future sustainability of any actions taken to improve the environment.* (25.12)

Such activities do not have to be large scale or well funded. Indeed, small and local initiatives are often the cornerstone of change; projects run by local people have the power to change attitudes and practices far more than activities initiated from far away.

Guam is an island of rugged mountains covered with tropical forests, deep valleys and broad coral plains. A coral reef, one hundred feet from the shore, protects the island against tropical storms and provides lagoons that are home to fish and other marine fauna and flora.

In recent years Guam has undergone tremendous growth. A rapid increase in tourism has led to a rise in the construction of hotels, roads, and tourism-related businesses. While the changes have brought an economic boom to the island, the environment has been put under severe stress. The coral reefs – which are an important reason for the tourism in the first place – are under increasing pressure. Erosion at construction sites has resulted in sediment washing into the oceans and suffocating the reefs. Poaching and harvesting of live coral have also contributed to the general problem of reef destruction.

Activities

In September 1990 the seventh grade geography teacher at St. John's School told her students about the problems facing Guam's coral reefs. One week later, the Director of the University of Guam Marine Laboratory came to the school as a guest speaker and discussed the urgency of the

problem. Responding enthusiastically, the students decided that the problems facing the coral reef would become the focus of a year-long study. The students set goals and identified the means to attain them. They concluded that their main priority would be to educate the general public about the conditions of the coral reefs on Guam and to encourage people to preserve the reefs.

To accomplish these goals, *Kids for Coral*, as the students came to be called, composed a list of dozens of ideas that were then prioritised into a general *Save the Reef* project. In turn, the seventh grade teachers collaborated on ways to incorporate the study of coral reefs into their particular disciplines.

First, the students needed to learn more about coral reefs. The science teachers devoted a two-week unit to the topic. In addition, four divers from the Professional Association of Diving Instructors (PADI), including three Navy divers, offered to certify 19 students in skin diving. During this field trip, the students snorkelled on both living and dead reefs, thus gaining first-hand experience of the problems.

Public awareness grew when the students were featured in the *Pacific Daily News*. The media also frequently covered arrests being made for the illegal harvest of live coral on Guam. Under the supervision of their English teacher, the children wrote letters to the local Judge supporting sentencing in cases, to the Attorney General encouraging stricter laws and to senators supporting harsher fines and prison sentences for illegal harvesting.

Fund-raising activities organised by the project included art shows and the sale of T-shirts, bumper stickers. The art teacher worked with his students creating artwork on the ocean environment throughout the year. This included ceramics, water-colours and three-dimensional papier maché designs. Invitations to a show, entitled *Reef Motif* were sent to Governor Joseph Ada, all senators, parents and students of St. John's School and to several businesses on the island. An exhibition at the Council on the Arts and Humanities Association Gallery was held to display approximately 180 pieces of artwork. An estimated 250 people attended the opening and press coverage of the show was considerable. The school also hosted two Coral Reef Symposiums planned by the Kids, attended by middle and high school students from around the island. Speakers were invited to share expertise on the condition of the reefs, local laws, problems facing the region's reefs, scuba diving destinations, water safety, and related topics.

The students' efforts to promote awareness included the sponsoring of a *Save the Reef Week*. Guam's Governor was asked to sign a proclamation officially declaring the week. In conjunction with *Save the Reef Week*, the Department of Education held an island-wide essay contest with "Saving Guam's Coral Reefs" as the theme. Nearly 100 students participated, and it was decided that this contest would be offered again the following year. The Guam Environmental Protection Agency set up many booths at the Micronesia Mall and invited several organisations, including Kids for Coral, to set up displays which would alert the public to environmental concerns.

The Kids for Coral also became involved in campaigning against potential plans for an underwater observatory. Concerned about damage to the reef and disruption to the marine habitat at the site of the proposed project, over thirty students attended the Territorial Seashore Protection Committee hearing. The Kids were interviewed by the *Pacific Daily News*, the *Guam Tribune*, and Cable News television. Subsequently, the project was put back into the review process for further study of its effects on the environment.

Results

Launched initially as a one-year project, Kids for Coral has now become a permanent club, which currently has about 50 active members. *Save the Reef Week* is now an annual island-wide event. As the project grew, publicity increased in all the local media outlets. Poems, photos and letters to the editor became commonplace. The initial aim was expanded to include a focus on the passage of laws and on working with national and international organisations such as Reef Relief in Florida and the Cousteau Society.

The student's work has been recognised both nationally and internationally. The Department of the Interior recognised the efforts of the students in the beach clean-ups and awarded two certificates for their participation. The Guam Visitors' Bureau made a contribution to the Save the Reef Fund and also awarded a certificate for outstanding participation in beach clean-ups. The Environmental Protection Agency invited two students and the three teacher-sponsors of the project to their annual banquet and award ceremony. There, the Kids for Coral were recipients of three major awards, including the United Nations Environmental Programme Global 500 Award. Finally, the U.S. Department of Soil and Conservation invited the students and their families to their annual banquet at Government House. Kids for Coral were again given a certificate of appreciation.

Lessons learned

By working together children can increase their understanding of issues and can make their voices heard. For the students involved in the Kids for Coral project, the obvious lesson learned is the increased understanding of the value and importance of Guam's coral reefs. They have learned to be proactive in saving the reefs and have reached a better understanding of the political process, how laws are passed and how long it can take to change policies. They are not afraid to air their feelings about issues that are important to them. They have also learned to operate as a group and work to predetermined schedules and deadlines. In the words of Janette Deagle, the Advisor for the Kids for Coral:

> *They have been told that it doesn't have to be a coral reef, it can be anything, but* [that they should] *be proactive about their environment throughout their lives in some way*.

Children can be effective educators of the wider community. The Kids for Coral project has had a major impact on raising awareness about the need to preserve Guam's coral reefs. Their aim has been to get the local community to value reefs and thus care for them. To do this, the students have run a very visual campaign and the project's profile is high; everyone involved stresses the importance of positive publicity. Students have been involved in giving presentations to elementary students around the island on reef preservation, speaking on radio and television and being members of the Governor's Coral Reef Initiative Policy Advisory Committee.

Small projects such as this can be funded locally through innovative ideas. The Kids for Coral project has been achieved without outside funding and the project's ability to raise funds through T-shirt and other merchandise sales has been key to its success, proving that small, locally funded initiatives can achieve important results. The funds generated by the project have enabled the project to donate over US$4,000 to the University of Guam Marine Laboratory for educational materials that have been distributed throughout the islands of Micronesia.

This case study is based on the work of Janette Deagle, Advisor to the Kids for Coral.

For further information contact:
Janette Deagle
Advisor, Kids for Coral
911 Marine Drive
Tumon
Guam 96911

Tel: +671-646-5626 (St. John's School)
+671-734-6366 (Home)
Fax: +671-649-1055 (St. John's School)
E-mail: Janette@stjohns.edu.gu

Developing an Education Kit to Raise Awareness about Marine Issues in Malaysia

Education is essential to ensure that marine resources are preserved for future generations. In Malaysia a Marine Education Kit has been developed with teachers to increase awareness, knowledge and understanding of the marine environment among students. The project brought together a wide range of sponsors, including government agencies, corporations and non-government organisations to work towards helping educate the young on environmental problems and solutions.

Introduction

As stated in *Agenda 21*:

> *Youth comprise nearly 30 per cent of the world's population. The involvement of today's youth in environment and development decision-making and in the implementation of programmes is critical to the long-term success of Agenda 21*. (25.1)

As governments usually take the lead in formal education, their role in developing environmental education resources is of critical importance. *Agenda 21* emphasises the role of the state in environmental education by pointing out that there is a need for governments to:

> *Ensure access for all youth to all types of education, wherever appropriate, providing alternative learning structures, ensure that education reflects the economic and social needs of youth and incorporates the concepts of environmental awareness and sustainable development throughout the curricula….* (25.9 (d))

Malaysia has over 4,800 km of coastline and is dependent upon the marine environment for many resources. Fisheries provide an important source of protein and are a major income generating activity for communities living along the coast. Marine-based tourism is also an industry of growing importance.

As in many other parts of the world, the coastal environment in Malaysia is under threat. Mangrove forests are being lost as a result of agriculture, aquaculture and other developments. Marine mammals are in decline. Coral reefs are in danger from land-based pollution, fishing activities (in particular using dynamite to stun fish) and collection for the aquarium and curio trade. Inappropriate tourism activities, such as anchoring boats on reefs and the impacts of divers and snorkelers, are also threatening reefs.

The aim of educational tools such as the Marine Education Kit is to help create a positive attitude towards the marine environment. Teaching materials should highlight the problems facing the marine environment and help create attitudes in which people want to protect and conserve marine resources.

Activities

The idea of producing a Marine Education Kit for upper primary and lower secondary school students goes back several years. The process was led by the Department of Fisheries Malaysia, the Ministry of Education's Curriculum Development Centre and WWF Malaysia, but developed in close collaboration with Malaysian schools.

A marine education training camp for teachers, held in Pulau Redang Marine Park in April 1994 to review the draft, was crucial for the development of the Kit. This gave teachers the opportunity to carry out the activities suggested in the draft Marine Education Kit, as well as provide their comments and feedback on the Kit. Their comments were then used to revise and refine the Kit. In addition, the teachers were exposed to marine conservation issues in Malaysia and were trained to play the role of resource persons for marine issues in their respective schools or regions. Three years later, in June 1997 the Marine Education Kit was launched.

The Kit, which is closely linked to the school curricula, is an important part of the Curriculum Development Centre's implementation of environmental education in the school system. More generally, the Ministry of Education has been developing a range of environmental education initiatives including the publication of a teacher's guidebook for environmental education across the curriculum.

The Kit is made up of four units - mangroves, seashores, coral reefs and oceans and seas. Each unit highlights the way in which the habitat functions as an ecosystem, outlines the main ecological threats and highlights the urgent need for marine conservation. The units each contain a booklet with:

- Teachers Notes: which provide brief introductions to each habitat.
- Factsheets: giving more detailed information on each habitat and summarising some specific environmental issues.
- Worksheets: which follow each factsheet and can be distributed to students for use in class.
- Indoor Activities: such as games, discussions and debates that can help to increase students' understanding of marine environments.
- Outdoor Activities: such as field visits to the various environments that are discussed in the Kit
- Posters: which provide a visual summary of each environment studied.

In addition there is a *Mangroves Snakes and Ladders Gameboard.* The whole pack is produced in bright colours and is packed in an attractive folder.

Results

The Marine Education Kit has been distributed to all primary and secondary schools in Malaysia - 10,000 Kits in Malay and 2,000 in English.

Following the launch, twelve workshops were held in order to raise awareness amongst teachers and to help them incorporate the Kit into their teaching syllabuses. These were jointly organised and funded by the three organisations involved in the project. In addition to lectures by various experts on each habitat covered by the Kit, teachers attending the workshops were also given the opportunity to experience the marine environment first-hand through field activities such as snorkelling and visiting a mangrove area. In addition, outdoor activities and games with a conservation message were conducted to enhance the knowledge gained and to demonstrate environmental education practices.

The response so far has been very positive. The Kit has addressed a gap in resource material on the marine environment in schools in Malaysia. It has also acted as the catalyst for further actions to achieve the overall objective of raising awareness about the marine environment. For example, funds are now being sought for the production of a marine education CD-ROM based on the Kit.

The Kit has been well received by children and their parents, and there are plans to organise a series of events for children based around the activities described in the Kit. For example, a one-day camp with children from the local school at Pulau Redang Marine Park was held where the Kit was used. The children played the snakes and ladders game, went through the posters and learned names of animals, snorkelled, played games on the beach and had short story sessions based on the factsheets. In some schools the Kit has been used as a basis to develop further awareness raising events such as ocean discovery days, individual or group projects, factual research and art projects.

Lessons learned

Involving a range of stakeholders has helped increase the Kit's effectiveness. Children can benefit greatly from innovative educational resources that, like the Kit, incorporate games and other activities that normally lie outside formal education. The effectiveness of such materials, which are often produced by NGOs and other bodies outside the school system, is immeasurably increased by involving those responsible for school curricula. In this case, WWF Malaysia (an NGO) worked closely with the Ministry of Education, as well as the Department of Fisheries for the marine input.

Educating the teachers, as well as the pupils, ensures the Kit's proper use. The success of the project has depended on the teachers effectively using the Kit. This has been achieved by involving teachers in the development of the project and by running workshops for teachers on the effective use of the Kit following its launch.

The Kit has provided a successful blueprint for environmental, and specifically marine, education materials further afield. One of the unanticipated benefits has been the level of national and international interest in the material. The Kit has been sent to a number of education agencies in other countries, where it is being used as a model.

This case study is based on information provided by Li Ching Lim of WWF Malaysia.

For more information contact:

Pusat Perkembangan Kurikulum (Curriculum Development Centre)
Jabatan Pendidikan
Kementerian Pendidikan Malaysia
Pesiaran Duta, Off Jalan Duta
50604 Kuala Lumpur
Malaysia

Tel: +60-3-651-1522
Fax: +60-3-651-0861

Jabatan Perikanan Malaysia (Department of Fisheries Malaysia)
Kementerian Pertanian Malaysia
Tingkat 8 & 9
Wisma Tani
Jalan Sultan Salahuddin
50628 Kuala Lumpur
Malaysia

Tel: +60-3-298-2011
Fax: +60-3-291-0305

WWF-Malaysia
Locked Bag No. 911
Jalan Sultan P.O.
46990 Petaling Jaya
Selangor
Darul Ehsan
Malaysia

Tel: +60-3-703-3772
Fax: +60-3-703-5157
Email: LCLim@wwfnet.org

Recognizing and strengthening the role of indigenous people and their communities

Sustainable Use of Marine Species by the Inuit and Inuvialuit in the Canadian Arctic

Wild species, many of them marine, are the single most common subject of natural resource use in the Arctic, occurring across all regions and practised by virtually all indigenous peoples. In some areas, co-management agreements are resulting in sustainable levels of use and long-term conservation of biodiversity. Indigenous communities in the Canadian Arctic collaborated with a non-governmental organisation to study the sustainability of the wild catch, in order to ensure its sustainability.

Introduction

Many human communities depend on wild species for subsistence and/or commercial use. This is particularly true in the Arctic where marine species play a critical role in providing food and other resources. Communities such as the Inuit and pre-Inuit peoples of Northern Canada have hunted wild species on a subsistence basis for millennia.

At the same time, the Arctic circumpolar region harbours a wealth of important biodiversity. It is home to unique ecosystems and species that display remarkable adaptations to the harsh and highly variable climatic conditions. The conservation value of these ecological features is enhanced by the fact that much of the Arctic remains in a natural or semi-natural state.

Agenda 21 recognises the importance of wild species to many indigenous peoples, including:

> *Recognition that traditional and direct dependence on renewable resources and ecosystems, including sustainable harvesting, continues to be essential to the cultural, economic and physical well being of indigenous people and their communities.* (26.3 (iv))

In the Canadian Arctic, considerable efforts have already been made to integrate wild species use with maintenance of wild populations. Indigenous communities and relevant government agencies work jointly under a co-management system and within a policy framework that assigns priority to traditional rights as well as biodiversity conservation.

The term co-management is used to describe a situation in which some or all of the relevant stakeholders are involved in a substantial way in management activities. Specifically the agency with jurisdiction over the area or activity develops a partnership with other relevant stakeholders (particularly local residents and resource users) which specifies and guarantees their respective functions, rights and responsibilities with regard to the area.

Activities

Indigenous communities in the Canadian Arctic collaborated with the Arctic Programme of the World Wide Fund for Nature to study the links between biodiversity conservation, at present and in the future, and the traditional consumptive use of wild species.

Three communities were asked to take part in the research, which was conducted in co-operation with local indigenous authorities. Clyde River is an Inuit community of around 700 people on the north-east coast of Baffin Island in the Nunavut Settlement Area. The community maintains a largely subsistence-based economy, with ringed seal (*Phoca hispida*) and Arctic char (*Salvelinus alpinus*) being the most important marine-based dietary mainstays. Taken much less frequently, but nevertheless of great cultural importance, are polar bears (*Ursus maritimus*) and narwhal (*Monodon monocerus*). Further west the Inuvialuit (the name generally used for the Inuit of the western Canadian Arctic) also maintain a largely subsistence-based lifestyle. Inuvik is a community of roughly 3,300 people on the Mackenzie River delta on the southern edge of the tundra. Despite being a cash-based economy, the community is still heavily dependent on wild fish, waterfowl and beluga whales (*Delphinapterus leucas*). Paulatuk, on the coast of the Beaufort Sea north of the tree line, has a population of around 280, almost all of whom are Inuvialuit. It maintains a strong subsistence economy based principally on caribou *(Rangifer tarandus*) and to a lesser degree on fish, seals and waterfowl.

Results

Overall, use of wild species appears to be of actual or potential conservation benefit in the three case-study communities. The importance of wild species in the communities, for both subsistence *and* cultural reasons, is the primary reason that the indigenous communities have placed constraints on or expressed objections to development activities such as mining and fossil fuel exploration. These types of activities and their related infrastructure have profound impacts on marine and terrestrial ecosystems. Thus the use of wild species is helping to create a synergy between conservation and social concerns. Furthermore, the environmental costs of using species locally for subsistence purposes, as practised in the case-study communities, are significantly less than the alternative of importing food and other products from distant regions.

Indigenous communities feel a high degree of responsibility for maintaining viable populations and biodiversity. However, while many traditional use patterns are attuned to annual cycles and the maintenance of ecological processes, two major changes – distribution of the indigenous population and the technology used in hunting and fishing – have had a major impact on these. These changes are due in large part to government resettlement programmes and various incentives that favour living within settled communities. Although this concentration could result in local over-exploitation, this may be compensated for by the greater mobility provided by motorised transport.

A further possible cause for concern relating to the long-term sustainability of consumptive use is that the system relies on the continued involvement of the *whole* community in hunting and fishing activities. There is a fear in the communities, however, that traditional knowledge is being lost as young people are increasingly being drawn to waged employment and thus have less time and need for, and consequently less interest in, traditional activities.

Another problem is that the 'conservation' values of the communities may not be adequate to address two of the most significant threats to biodiversity and ecosystem health: contamination by long-range transport of heavy metals and persistent organic pollutants and the impacts of local mining and fossil fuel development. Curbing pollution and activities such as mining and ensuring that local communities are compensated for any losses and risks these activities impose on them will require co-ordinated efforts of all stakeholders.

None of the communities studied are currently economically sustainable. There is thus much interest in diversifying their economic base, as demonstrated by repeated attempts to develop commercial fisheries and in the ongoing development of non-renewable resources. How communities can move towards economic sustainability while maintaining a largely subsistence-based economy is therefore an important question. Furthermore, if the populations of these communities continue to grow, their subsistence needs may begin to exceed the capacity of the ecosystem to provide a sustainable source of wild food and related products. The challenge in the future is to develop other avenues of economic development that will not compromise the integrity of the region's ecosystem or the ability of the communities to maintain the subsistence sector of their economy.

Finally, although consumption is a driving force for the management of wild species use in the communities, cultural reasons are as important. The long and intricate relationship between the Inuit/Inuvialiut and their Arctic ecosystems encompasses many non-utilitarian, non-economic values that in large part define their culture. The fact that the Inuit/Inuvialuit wish to preserve their traditional culture may in the end be the defining factor when taking decisions about land and water use in the region.

Lessons learned

The rights of indigenous people to the sustainable use of wild species should be recognised, as should their contribution to sustainable development. This collaboration in the Canadian Arctic has highlighted some factors that contribute to sustainable, consumptive use of marine species. Recognition of rights is one such factor. Indigenous peoples have a long history of wild species use in the Arctic that continues to this day. The rights, benefits, and responsibilities of such use have been recognised in recent indigenous land claim agreements and are evident by the participation of indigenous groups in international fora such as the Arctic Council.

Co-management systems provide a way of involving both local indigenous communities and national/international conservation stakeholders in maintaining the health and integrity of ecosystems. Traditional practices should be integrated into co-management approaches, whereby indigenous people and government agencies sit together on management boards and jointly make

management decisions. Such systems also provide a framework for the feedback of information to local resource users, other stakeholder groups, scientists and policy makers. In the Canadian Arctic wild species in the region are managed under a co-management system that serves to bring together traditional knowledge and western science for decision making.

The maintenance of traditional lifestyles, and the threat to those lifestyles that may be posed by unsustainable economic development activities, may be important in attracting the support of a diverse group of national and international stakeholders that are concerned with conservation and/or human rights.

This case study has been based on the work of Curtis Freese, in particular the discussion paper: *Guidelines for the Consumptive Use of Wild Species in the Arctic: Synthesis of the Clyde River and Inuvik-Paulatuk Case Studies*, April 1998, by Curtis H Freese, Peter J Ewins and Peter Prokosch.

For further information contact:

Curtis H Freese
WWF Senior Fellow
Executive Director, Yellowstone Ecosystem Studies
8891 Bridger Canyon Road
Bozeman
Montana, 59715
USA

Tel/fax: +1-406-587-3282
Email: cfreese@montana.campus.mci.net

Preliminary Guidelines for the Consumptive Use of Wild Species in the Arctic

This collaboration with the Inuit/Inavialuit was a follow up to a larger three-year study into the links between consumptive use of wild species and nature conservation. One of the outcomes was a set of 15 guidelines for use at both policy and field level. A major goal is to ensure that the consumptive use of wild species is compatible with, and where possible, a benefit to, biodiversity conservation. The guidelines recommended social, economic, and ecological factors that could be considered by stakeholders if wild species use is to be sustainable.

The full text of the 15 guidelines can be found in Freese, Curtis H (1988); *Wild Species as Commodities: Managing Markets and Ecosystems for Sustainability*, Island Press, Washington DC.

The Maori use National Legislation to Support Customary Management of Coastal Fisheries in New Zealand

The Maori are re-establishing customary management of fisheries resources in New Zealand in part by working through the legislative process, in co-operation with the government. Legislation is providing the means to protect and conserve local fishery areas that are of special significance to the Maori, both as a source of seafood and for spiritual and cultural reasons.

Introduction

Customary management rights have been documented for oceans, coastal waters and estuarine areas on all continents. Use rights within communities vary and may be restricted to specific locations during particular seasons, to specific species, or for a specific gear type. Despite being binding within the community, most systems of customary management are unwritten and informal.

Agenda 21 recognises the rights of indigenous peoples in the management of resources:

> *Some indigenous people and their communities may require, in accordance with national legislation, greater control over their lands, self-management of their resources, participation in development decisions affecting them, including, where appropriate, participation in the establishment or management of protected areas.* (26.4)

Furthermore, *Agenda 21* states that Governments, in full partnership with indigenous people and their communities, should ensure the:

> *Establishment of a process to empower indigenous people and their communities through measures that include: Adoption or strengthening of appropriate policies and/or legal instruments at the national level.* (26.3 (a) (i))

Before the European colonisation of New Zealand (*Aotearoa*), each Maori (*tangata whenua*) tribe (*iwi*) had its rights to fisheries defined. Fishing grounds were identified by way of boundary marks, reference points such as prominent rocks, landmarks and/or natural features. These areas were strictly managed and protected through closures/reserves (*rahui*) which maintained the fishing stocks at a sustainable level. Breaches of any *rahui* resulted in severe penalties.

The coastal *iwi* would provide seafood to the "inland people" and in return, the inland people provided or traded other resources to the "coastal people". Many of these traditional rights became eroded following European colonisation.

Maori groups across New Zealand, however, have never given up their rights to manage their resources within their tribal boundaries. There are currently several initiatives by Maori groups to safeguard traditional fishing practices and to ensure participation by indigenous communities in fisheries management. These include working with the government, and in some cases lobbying the government to encourage changes in legislation that formalise and protect traditional, sustainable fishing systems.

The Maori currently constitute approximately 17 per cent of New Zealand's population and it is estimated this will rise to 20 per cent by 2050.

Activities

> *The sea has been our food cupboard for generations. We need to make sure that the seas will be there for our mokopuna (children).*
> Walter Clapham Mountain, Te Rawhiti, Bay of Islands

One of the first examples of recent oceans-related legislation in New Zealand supportive to Maori needs was the Maori Fisheries Act of 1983 which allows for the establishment of *taiapure* – i.e. local fisheries areas which have customary significance to the *iwi* as a source of food and for spiritual and cultural reasons. This act was brought into force in response to and in close co-operation with Maori leaders who were concerned that the new Quota Management System would impact negatively on customary fishing rights. The aim of the *taiapure* is to manage and enhance fisheries resources within the tribal boundaries in a way that provides for sustainable harvesting at appropriate seasons and using traditional methods. These methods usually include restrictions aimed at maintaining stocks - for example not taking snapper (*Lutjanidae* species) during their spawning season.

Taiapure provide an opportunity for the local Maori community to participate directly in the management of the fisheries. This participation involves forming a management committee of Maori and local community representatives, which gives advice to the Minister of Fisheries on the setting-up of fisheries regulations within the fisheries area. The *taiapure* are also used to promote education on traditional Maori values and guardianship and on resource management issues by involving user groups such as recreational fishers, commercial fishers, commercial tour operators, community and school groups. Other legislation has also allowed indigenous peoples to reassert traditional rights. For example, the Fisheries Act of 1996 has a number of provisions that allow for Maori input and participation in fisheries management.

Results

The experience of the Ngai Tahu tribe provides a good example of how this approach has been successful. The Ngai Tahu tribe, the largest Maori tribe in the South Island with one of the largest coastlines under its traditional control, has been a key player in promoting customary fisheries in New Zealand. The philosophy of all customary fisheries management initiatives of the Ngai Tahu is that they secure and promote customary fishing rights within the context of sustainable use. Underlying this philosophy is the belief that all rights are accompanied by responsibilities.

The work that the Ngai Tahu members have been undertaking in customary fisheries management spans a number of activities ranging from educating people through the use of a video and booklets to developing and implementing a Geographic Information System (GIS) for managing information. The key feature of the Ngai Tahu members' initiative has been their strategic approach to addressing a range of issues to ensure the tribe becomes an effective and significant player in fisheries management in New

Zealand. An important element of their strategy is to enter into agreements with relevant parties and stakeholders in New Zealand fisheries. The Ngai Tahu has a customary fisheries management team which guides the initiative, with nine staff positions, six of which are funded by contracts of service with the Ministry of Fisheries.

Negotiating effective legislation – such as the Fisheries Act of 1996 – has provided the basis for the success of the Ngai Tahu tribe. More importantly, Ngai Tahu and other South Island *iwi* were able to negotiate and implement the Fisheries (South Island Customary Fishing) Regulations in 1998. These give a framework through which Ngai Tahu members can exercise their customary fishing rights.

Maori groups are also using legislative processes to set up marine conservation areas. For example, in the eastern Bay of Islands in North Island, New Zealand the *hapu* (family group) of Ngapuhi/Ngati Wai of Te Rawhiti wishes to set up a *taiapure* and reserves. The tribe is seeking to use legislation to provide the necessary statutory basis for exercising guardianship (*kaitiakitanga*), seeing it as their traditional obligation to act as guardians of the sea. This Ngapuhi/Ngati Wai group still depends heavily on fish and shellfish as their primary food source. The area at present has no active protection of the marine fish resources. The Ministry of Fisheries regulations are on the whole ineffective for protecting customary fishing rights. The Ngati Wai members are concerned that snapper and trevally populations are depleting rapidly. Stocks are being adversely impacted because fishermen are using methods such as commercial drag netting and scallop dredging that are indiscriminate killers of all sizes and species of fish. Unwanted catch, such as commercially worthless and undersized fish, is also dumped.

The Maori are also using research to effect legislative change. The Maori have carried out research into the management of resources, and they aim to become an important source of expertise on this. For example, joint work between the Ngati Wai and the Department of Conservation has developed a protocol for the management of stranded whales. The Marine Mammals Protection Act of 1978 prohibits the taking of a marine mammal, whether alive or dead, from its natural habitat or from any other place without a permit. The Ngati Wai project has provided general guidelines for the management of whales stranded within the Ngati Wai tribal boundaries and for the recovery of bone for cultural purposes by Ngati Wai members. In 1999, Ngati Wai is also embarking on a collaborative project with Waikato University and the National Institute of Water and Atmospheric Research (NIWA) to research customary fisheries and traditional practices and management.

Lessons learned

Traditional fishing practices are increasingly being seen as an effective way of reversing the trend of marine depletion. In New Zealand, this means ensuring that the Maori participate fully in fisheries management, so that customary fisheries management for food security, spiritual and cultural purposes is maximised for this and future generations.

Legislation helps indigenous people to achieve the outcomes they want, in a manner they approve of and which is supported by the government. This case study shows how legislation that takes into account the needs of indigenous people can be developed, in contrast to many cases where minority groups have suffered as a result of unsympathetic laws and regulations. However, all stakeholders must understand that the legislative process is extremely time consuming and takes considerable resources and funds. The involvement of a wide group of stakeholders is crucial.

Educating the public about indigenous customs can play an important role in safeguarding traditional lifestyles. Maori tribes such as the Ngai Tahu aim to promote the role and function of customary fisheries management, empowering and assisting Maori tribes to pursue their traditional roles. Education is the key to this, and the Maori have found that the dissemination of information is an effective way of increasing understanding of their lifestyle and traditions.

The information for this case study was researched by Katherine Short of WWF New Zealand and supplied by Miranda Cassidy of the Ngai Tahu *iwi* and Moea Armstrong and Hori Parata of the Ngati Wai *iwi*.

For further information contact :

The Customary Fisheries Manager
Ngai Tahu Development Corporation Limited
Level 6, Te Waipounamu House
158 Hereford Street
PO Box 13-046
Christchurch
New Zealand

Tel: +64-3-366-4344
Fax: +64-3-374-9264
E-mail: miranda@ngaitahu.iwi.nz

Hori Parata
Ngati Wai Resource Management Unit
PO Box 1332 Whangarei
New Zealand

Tel: +64-9-4300-939
Fax: +64-9-4380182
E-mail: rmunit@igrin.co.nz

Local authorities' initiatives in support of Agenda 21

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Co-operation to Maintain Traditional Grazing Systems and Reduce Agricultural Pollution on the Baltic Sea Coast of Estonia

The Helsinki Commission - Baltic Marine Environment Protection Commission (HELCOM) has been working since 1974 to identify urgent environmental issues in the Baltic Sea region. Teams consisting of local authorities, scientists and NGOs have drawn up management plans for six priority coastal areas, including two in Estonia. A key aim is to involve and strengthen the role of local authorities which has been changing rapidly as the result of the decentralisation of administration following the break-up of the Soviet Union. The development of integrated coastal zone management plans has concentrated on land-based activities, particularly agriculture, which is threatening the coastline and waters of the Baltic.

Introduction

The Baltic Sea is a unique and fragile marine ecosystem. It is virtually cut off from the rest of the Atlantic, except for a narrow passage between Sweden and Denmark. The ecology of the Baltic is under serious threat from coastal pollution, particularly as a result of intensive agriculture in some of the bordering states.

The rapid transition from communism to a market economy in Central and Eastern Europe, and the resulting changes in political, social and economic conditions, have created both opportunities and problems for sustainable development.

In 1993, the Helsinki Commission - Baltic Marine Environment Protection Commission Programme Implementation Task Force (HELCOM - PITF) established a working group on Coastal Lagoons and Wetlands. The group's mandate was to initiate and co-ordinate the development of management plans for selected priority areas. The overall objective was to identify the main problems and conflicts and the most urgent environmental needs and to propose how to improve co-ordination of various ongoing activities to promote sustainable development. The working group also recognised that the future of coastal areas and wetlands in the region will ultimately not depend on HELCOM and national governments, but on local stakeholders and authorities. Furthermore, the rapid process of decentralisation of administrative processes has created a need to strengthen institutional capacities at a regional and local level. As *Agenda 21* states:

> *Because so many of the problems and solutions being addressed by Agenda 21 have their roots in local activities, the participation and co-operation of local authorities will be a determining factor in fulfilling its objectives.* (28.1)

Traditional, sustainable use of grasslands has been carried out for thousands of years in Estonia and has included grazing, mowing, forest clearance and reed harvest. As a result, the area has developed a highly diverse semi-natural system of meadows. The last 50 years have, however, seen many changes in agricultural practice, related to reduced profitability of traditional agriculture, high unemployment levels, migration from the countryside towards towns and cities, and problems with rural infrastructure.

Eutrophication caused by nitrate fertilisers and intensive livestock production is causing serious pollution in the Baltic Sea. (Eutrophication is accelerated plant growth, in particular algae, which reduces access to sunlight resulting in algae below the surface dying; the decomposition of the algae then deoxygenates the water.) The disappearance of traditional grazing regimes is causing dramatic reductions in many wild plant and animal species. These problems were intensified when the old Soviet-based agricultural system collapsed. There is a fear that some of the dominant elements of the EU Common Agricultural Policy – i.e. high fertiliser and pesticide use -- will destroy those unique semi-natural habitats that still remain in Estonia and will also add to the pollution levels in the Baltic Sea. In this case, marine problems have to be addressed by changing management approaches in the surrounding land.

Addressing agricultural pollution is a key – perhaps *the* key – challenge facing the ecology of the Baltic. As *Agenda 21* notes:

> *the degradation of the marine environment can result from a wide range of sources. Land-based sources contribute to 70 per cent of all marine pollution and land-based activities such as agriculture, coastal developments, forestry and tourism all have major effects*. (17.8)

As the establishment of the market economy continues, the pressure on coastal areas in the Baltic area will increase. There is, therefore, a more urgent need than ever to maintain and preserve important areas. To this effect the HELCOM committee selected six priority areas for the development of management plans. These *Task Areas* included Käina Bay and the Matsalu Catchment in Estonia's northern Gulf of Riga region.

Käina Bay is a shallow bay of 900ha, situated on the southern coast of the island of Hiumaa. The bay is important for wild birds and as a fish nursery. Major problems are eutrophication and the growth of rank vegetation (and consequent out-competing of many wild flower species) as traditional grazing and haymaking activities decrease. The Task Area in the Matsalu Catchment covers 3,710 square kilometres, a large part of central Estonia. Matsalu Bay, which forms an important part of the 40,000ha Matsalu Nature Reserve, is included in the area. The bay was the only site in the former Soviet Union designated as a wetland site of global importance under the Ramsar Convention. It faces similar problems as Käina from eutrophication and changes in grazing patterns, as well as over-fishing and land-use changes in general.

The Task Area plans aimed to find ways to use the natural coastal and alluvial meadows of the region sustainably. It was recognised that this would only be possible with the co-operation and participation of the local authorities and local people. A major objective was to protect and enhance biodiversity and local development by, for instance, improving conditions for endangered species and opportunities for local employment and trade.

Activities

The first step in producing Integrated Coastal Zone Management Plans (ICZM) was to ensure that there was a comprehensive and democratic planning process in place. To this end a Task Area Team was

established for each area, consisting of local and central government officials (including the local mayor), scientists and representatives of non-governmental organisations.

The involvement of the local authorities in the towns and municipalities was seen as being particularly important as these authorities provided the "key" to reach local farmers, fishermen and other stakeholders. The teams have regular meetings at least twice a year.

A project to support traditional land use around Käina Bay was initiated and local authorities, villages and farmers are being involved. Local farmers are compensated for the non-market values that they are producing or protecting, such as the maintenance of biodiversity and landscape. Both of these are also important for the tourism sector and for maintaining local history and cultural identities. Farmers are given the opportunity to take up grazing or mowing contracts and are then subsidised for their activities. Grazing subsidies, for example, are 2EEK (approximately 14EEK = US$1) per cow or horse day and 1EEK per sheep day. Mowing subsidies are 120EEK per hectare in the case of open meadows and 1,000EEK in the case of wooded meadows. The government funds the subsidies, and foreign aid is obtained by the project to renew the machinery used for meadow management.

The aim is that the experiences in Matsalu and Käina Bay will be applied to other west Estonian coastal wetlands, as well as other coastal regions in the Baltic Region.

Results

Although the projects have proved successful in Matsalu, Käina and elsewhere, the mix of conservation and wise use needs to be further integrated. A recognition of the need to plan for sustainable development and the importance of maintaining traditional management is now high among the Estonian authorities. Co-operation with local authorities, farmers and other local stakeholders should however be increased.

In Matsalu, 66 contracts for grazing 1,500ha of coastal meadows were taken up and the decline in grazing was halted. However, the grazing intensity was still generally insufficient. Twelve contracts for mowing and grazing alluvial meadows have been made and in 1996, the first year of the project, 1,500ha were mowed, three times more than in 1995. Nine contracts for wooded meadow management were made, covering a total of 24.2ha, which halted the decline of the meadows. In subsequent years the contracts have continued to be funded.

Several developments are planned, including investment in new animals, as there are currently not enough grazing animals, and the development of extensive grazing systems. The project also plans to help conserve traditional Estonian horse and cattle breeds which are suited to the coastal conditions. There are plans to identify new and sustainable uses of 'traditional' products such as meat, wool, hay and reeds. Traditional niche markets such as tourism (based on nature and culture), eco-meats (high quality meat from natural pastures) and bioenergy from hay, reeds and willows will all be tested.

Lessons learned

Involving local authorities in sustainable development increases understanding of environmental problems. The planning processes used in Käina and Matsalu have influenced the way that protected areas and coastal areas are managed throughout Estonia. The involvement of the local authorities and all other key stakeholders has been recognised as crucial.

Capacity building and full participation of all local stakeholders are important as a rapid transition takes place from central control to local levels of government in most Central and Eastern European countries. In many countries NGOs have taken the lead in developing participatory projects but there is no such tradition in countries of the former Soviet Union. One hindrance is the sceptical attitude of the public as a result of experiences gained during the Soviet era.

If local government is to be really active and involved, economic benefits must be clear from an early stage. In this case study local authority participation was quite weak at the beginning of the process. Although the local mayors and other stakeholders attended the meetings and discussions, their participation was fairly passive. However, as investments on the ground were started (albeit on a small scale) the number of ideas and proposals from the local authorities and individuals increased.

This case study draws on a paper by Lennart Gladh of WWF Sweden, the co-ordinator for six ICZM projects in the Baltic region, titled *Coastal planning in the Baltic Region – case study Estonia*.

For further information contact:
Lennart Gladh
WWF Sweden
Katrinelundsvägen 2 C
S 722 19 Västerås
Sweden

Tel: +46-21-137-179
Fax: +46-21-131-729
Email: lennart.gladh@u.lst.se

Involving Local Authorities and Communities in Developing Integrated Local Management Plans in the Philippines

In 1991 the Philippines devolved most aspects of government, including environmental and development planning, to local authorities under a new Local Government Code. For coastal communities, the tasks of land use and coastal development planning are implemented most appropriately within the framework of Integrated Coastal Zone Management (ICZM). The Community-based Coastal Resources Management Project in Bolinao in the Northern Philippines provides an excellent example of how the participation of local authorities can be developed through a process of consultation and sectoral representation.

Introduction

Devolution by the central government of activities such as environmental planning to the local level will only be successful if the relevant authorities and communities are able to fulfil the roles expected of them. Although the 1991 Local Government Code in the Philippines allowed for decision making to take place at a local level, many local authorities did not have the knowledge or technical expertise to undertake planning exercises. In Bolinao, along the North West coast of Luzon in the Philippines, a Community-based Coastal Resources Management (CB-CRM) Project sponsored by the International Development Research Centre of Canada aimed to play a catalytic role in bringing the whole community together to formulate a coastal development plan.

Such participatory processes are encouraged in *Agenda 21*, which states:

> *…Through consultation and consensus building, local authorities would learn from citizens and from local, civic, community, business and industrial organisations and acquire the information needed for formulating the best strategies. (*28.3)

The Municipality of Bolinao has one of the most extensively developed reef systems and associated habitats in the region. Bottom-feeding fish, shellfish and seaweed living in reef and seagrass areas dominate the local fisheries.

Local interest and involvement in environment and development concerns was stimulated in the early 1990s by a proposal to set up a cement plant complex in Bolinao (including a quarry site, power plant, cement factory, and wharf for water transport of bulk cement to Taiwan). The proposal, first announced in a public meeting in June 1994, was the first major initiative towards industrialising the "Northwestern Luzon Growth Quadrangle".

The ensuing controversy was presented as a clash between industrialisation and the environment. The Bolinao-Anda reefs, comprising the only coralline section of the Lingayen Gulf, function as spawning and feeding grounds for a significant number of fish and invertebrate species. The Department of Environment and Natural Resources finally turned down the cement plant proposal

in 1996 as a result of local, national and international concern about threats to the natural resources that support coastal communities.

Fuelled by a vigorous programme of public education, environmental awareness grew quickly and evolved into the whole community calling for a more appropriate model of coastal development. This need was further highlighted by evidence of unsustainable levels of resource extraction in the area, including the collapse of the town's valuable export-driven sea-urchin fishery in 1992 and a general decline in fish stocks in the area.

Activities

The Community-Based Coastal Resources Management (CB-CRM) project was initiated in 1993. In 1994 and 1995, the focus was on public environmental education and community mobilisation. An environmental education and information campaign was conducted in eleven of the fourteen coastal villages in Bolinao. The data collected showed that 3,000 families of marginal fishers (30 per cent of the area's population) would lose their resource base if appropriate management was not successfully initiated. It became clear that the development of an effective ICZM plan would only be successful if a strong foundation was developed, composed of local institutions that were filled with people who were environmentally aware and oriented to coastal resources management. Once organised and empowered with knowledge and skills, the groups could embark on resource management interventions, including networking with other CRM-oriented groups and developing environmentally friendly livelihood activities.

By early 1996 People's Organisations (POs) had been set up in four coastal villages, two on the mainland and two in Santiago Island. Among the first POs proposals was the establishment of marine protected areas in the waters next to the villages of Balingasay, Arnedo and Binabalian, and in a mangrove rehabilitation area in Barangay Pilar.

Soliciting the support and participation of the local government was key to the implementation of the plan. However, this only became possible after the initial problems had been addressed. While the cement plant controversy was raging, elected leaders refused to consider a more comprehensive development plan. Once the initial dispute was resolved, discussions and negotiations were initiated with the key officials of the Municipal Development Council (the executive branch of the local government). Municipal officials were informed of the CB-CRM project, of the PO proposals and of the desire of the latter to collaborate with the local government in refining and realising the plan. The Municipal Mayor gave his support for the collaboration and agreed to sponsor a multi-sectoral consultation on the development of Bolinao.

A pre-consultation workshop was held in November to present the integrated development plan of the federation of POs to other stakeholders. Representatives of the local government, local organisations and other concerned groups all attended. During the workshop, a consolidated plan was formulated which divided the Municipality of Bolinao into four zoned areas, each with a specific management goal: Ecotourism, Multiple-Use (Milkfish pens and Fish cages), Fishery Management (Reef fisheries), and Special Management (Trade and Navigation).

In December 1996 a Multi-Sectoral Forum on Coastal Development Planning for Bolinao was held. The meeting was attended by about 120 people, most of whom were leaders of the local coastal villages, heads of village-based organisations, the media, representatives of the provincial government and other government agencies and community sectors.

Among the objectives of the forum was the presentation of the consolidated zoning plan and the formation of a multi-sectoral body to draft the Coastal Development Plan (CDP). On December 7 the Municipal Mayor issued Executive Order No.6 that created the Multi-Sectoral Committee on Coastal Development Planning, which was composed of 21 members representing 11 community sectors, including the four POs. The first two months of 1997 were devoted to setting up the internal mechanisms and work plan of the Committee. By the first half of 1997 community consultations were completed and all inputs and amendments were collated. From August to October 1997 the Committee conducted a series of meetings to finish drafting the text and in January 1998 the Municipal Council approved the proposed CDP.

Results

The CDP was implemented in 1998; it is thus too early to comment on the impacts of the management interventions. What can be evaluated, however, is the impact of the participatory planning process on the perceptions of the community sectors, on the steps they took to achieve a collective development goal and on the mechanisms they developed in writing a plan to achieve this goal.

The events leading to the development of the CDP in the Bolinao community resulted because of the cement plant controversy. Shortly after this was resolved, in the second half of 1996, another major issue surfaced. This was the proliferation of milkfish pens along the main channel between Santiago Island and the mainland of Bolinao, most of which were owned by elected leaders of the town. The fish pen controversy brought to the fore issues of deteriorating water quality and access by subsistence fishers to both traditional fishing grounds and to navigation routes in the channel.

In both controversies, the coastal development planning exercise provided the most effective avenue for consensus building by articulating a development vision as well as formulating action plans to achieve it. The collective sense of ownership of the plan remained strong within the Committee. Indeed, the Municipal Council meeting held shortly before the approval of the CDP acknowledged that the consultative and participatory process should be incorporated into the formulation and passage of municipal legislation in general.

The timing of the planning exercise could not have been more opportune. In October 1997 President Ramos issued Executive Order No.450 requiring the 800 coastal municipalities of the country to formulate comprehensive CDPs that would form the basis for the passage of fishery ordinances. When the executive order was released, the CDP for Bolinao was about to be submitted by the Multi-Sectoral Committee. Consequently, other towns around Lingayen Gulf expressed their desire to formulate their own CDPs, and suggested that perhaps the people of Bolinao could provide the necessary experience to help them with this task. Key government agencies and NGOs working in coastal areas around the country, and in other sites in Southeast Asia, also requested copies of the Bolinao CDP as reference in their planning exercises.

Lessons learned

The key lesson learned from this experience in the Philippines was that the education of local authorities is essential before they can take appropriate action. The technical studies conducted by the CB-CRM project and others provided a solid basis for information dissemination and were accepted as credible information sources by the various stakeholders in Bolinao.

Direct resource users (subsistence fishers, fish vendors, etc.) when mobilised and empowered can help encourage the involvement of local authorities in sustainable planning. In Bolinao the collective effort of the POs in integrating their plans was a major turning point in the development of the CDP. Crucially, it spurred the local leaders to be involved in an exercise that had the potential to provide the much-needed blueprint for the town's development. The partnership with non-aligned sectors of the community and with the local government was seen as necessary to begin realising key management interventions contained in the plan.

The active involvement of the executive and legislative branches of the local government was critical to the formal acceptance of a Coastal Resources Management planning process. In the early stages of the CDP plan, elected leaders felt insecure because it was the people's organisations that initiated the process. This insecurity was overcome when the municipal government was asked to be the major sponsor of the Multi-Sectoral Forum and to participate in subsequent activities. These representatives and their colleagues learned that there is no substitute for actual consultation and sectoral representation in developing consensus for collective action.

This approach could be used as a blueprint for other local, national and international projects. For example, a US-AID funded coastal resources management project is working in six areas in the central Philippines assisting communities and local governments to develop CRM plans that, once completed, will cover some 2,000 km of coast.

This case study has been adapted from a longer paper titled *Participatory planning for coastal development in Bolinao, Philippines*, by Liana Talaue-McManus, Alexis C. Yambao, Severino G. Salmo III, and Porfirio M. Aliño. All authors are from the Marine Science Institute, University of the Philippines.

For more information contact:
Liana Talaue-McManus, Ph.D.
Associate Professor
Marine Science Institute
University of the Philippines
Diliman, Quezon City 1101
Philippines

Tel: +632-922-3921
Fax: +632-924-7678
Email: liana@msi01.cs.upd.edu.ph

Strengthening the role of non-governmental organizations: Partners in sustainable development

Conservation Efforts to Protect Sea Turtles on the Eastern Mediterranean Coast of Turkey

Marine turtles are threatened in many parts of the world because they are accidentally caught in fishing nets and lines. In Turkey, an NGO has played a key role in producing valuable new information about the numbers of turtles being affected, by working with fishermen. Education programmes for fishermen have helped reduce the damage and the participatory approach promoted by the NGO has meant that fishermen have viewed the exercise positively, rather than seeing conservation as a threat to their livelihood.

Introduction

NGOs can play a vital role in pioneering new initiatives that may at first be seen as too risky for more conventional institutions. One example of this is the new field of participatory research and development. *Agenda 21* points out that reaching the goal of sustainable development:

> *will depend on the willingness of all sectors to participate in genuine social partnership and dialogue, while recognizing the independent roles, responsibilities and special capacities of each.* (27.2)

It goes on to note that NGOs:

> *possess well-established and diverse experience, expertise and capacity in fields which will be of particular importance to the implementation and review of environmentally sound and socially responsible sustainable development.* (27.3)

In Turkey, the Society for Protection of Nature (DHKD) – an NGO, with the co-operation of key representatives from the fishing industry and the government, has been looking at how to improve the efficiency of fishing and thus reduce the damage to other forms of marine life. DHKD has selected the green turtle as a flagship species to highlight both the effects of overfishing in the Mediterranean and the related problems of bycatch.

'Bycatch' is a term applied to the unwanted catch of non-targeted fish species and other marine wildlife by unselective fishing gear. Bycatch poses a major threat to some species, with conservative estimates indicating that as much as 20 per cent of all marine fish landed on commercial fishing vessels world wide never reaches the consumer. Instead it is thrown back, dead or injured, into the sea.

Agenda 21 recognises the problems caused by bycatch and calls on governments to:

> *promote the development and use of selective fishing gear and practices that minimize waste in the catch of target species and minimize bycatch of non-target species.* (17.46(c))

Species of sea turtle are amongst the most important victims of incidental capture world wide. In Spain 20,000 loggerhead turtles (*Caretta caretta*) are captured every year by the longline fishery - 4000 of which are believed to die as they are returned to the sea with the hook still embedded in their throats. Until relatively recently 48,000 sea turtles were caught annually by shrimp fishermen in the USA. The US National Marine Fisheries Service estimated 11,000 of these turtles died each year. However, pressure from environmental groups led to a modification of trawl nets so turtles are excluded from the catch.

Unfortunately, turtles are still threatened by accidental capture in many other parts of the world. The Eastern Mediterranean coast of Turkey is a significant habitat for sea turtle nesting and feeding. The area is especially important as the living and wintering environment for the endangered green turtle (*Chelonia mydas*), which mates and nests on the shores of the region. The area between Mersin and Iskenderun on the East Mediterranean coast of Turkey is also important for the fishery industry. Although considerable conservation effort has been focused on sea turtle nesting areas, the equally important problem of turtles being trapped in fishing nets has been virtually ignored. Despite being a serious threat to marine mammals and fish, there has been little work on the effects of bycatch in Turkey.

Activities

In 1995 DHKD initiated the first systematic study of turtle bycatch in Turkey, with the aim of both measuring and publicising the problem.

The aim of the research component was to determine:

- the number of turtles trapped in nets in the Turkish Eastern Mediterranean;
- the size of the turtle population; and
- sea turtle mortality in nets during trawling season (September 15-May 15).

The project had two components:

- research to assess sea turtle bycatch; and
- public awareness activities to help reduce sea turtle bycatch.

Boat captains recorded relevant data on standard forms every day during the fishing season (September 15-May 15). A project executant worked with the fishermen on board vessels to verify

the data collected. The activities were initially carried out in a pilot area, Karatas in Adana. The initial success meant that the number of boats collecting data was increased as the project developed. Co-operation has also been developed with the Ministry of Agriculture, the Coast Guard, the Governorship of Adana, local authorities and universities.

Results

In the 1995-96 fishing season the five trawl boats taking part in the project reported that their nets trapped 160 green turtles and 26 loggerhead turtles. In the 1996-97 season 12 trawl boats reported that trawling nets entrapped 306 green turtles and 116 loggerhead turtles. These are very high figures for an endangered species.

The pilot area, Karatas, is surrounded by protected areas – to the west is the Akyatan Permanent Wildlife Reserve and to the east the Yumurtalik Nature Reserve. Karatas, in between these two protected areas, is the only free-fishing zone in the area. The majority of entrapped sea turtles (85-90 per cent) were caught in the region between Karatas and Yumurtalik.

The results of the project were presented in July 1997 at a workshop organised in Adana. The workshop was led and financed by DHKD and supported by the Ministry of Agriculture. The workshop participants also included the Governorship of Adana, and representatives from the Ministry of Environment, Ministry of Forestry, Coast Guard, District Governor of Karatas, academics from Çukurova, Ege and Dokuz Eylül universities and fishermen. Within the group discussions, the roots of the problems were identified, along with possible solutions and responsible authorities. The local authorities in the region supported the project and helped to provide logistic support. They were regularly informed on the progress.

The Ege University Faculty of Fisheries has launched new research on turtle excluder devices, sponsored by TUBITAK (The Scientific and Technical Research Council of Turkey) and based on the results of the DHKD project. Information exchange between Ege University and DHKD will continue.

Press articles were prepared and published in several magazines and newspapers to disseminate the results and education and awareness materials have been distributed to the fishermen, as well as to local and central governmental authorities through the Ministry of Agriculture.

Lessons learned

NGOs are playing a role facilitating joint actions between various stakeholders. Ensuring the co-operation of key representatives from the fishing industry and the government has helped make these conservation efforts in Turkey successful. Involving fishermen and getting the co-operation of boat captains to record details of accidental turtle catch helped create a feeling of ownership amongst the fishermen. Training programmes designed specifically for fishermen proved very successful in increasing their awareness about threatened species and making them more careful. Regular visits and the workshop also helped create a better co-operation between those involved. This type of communication also led to a feeling of "ownership" by the authorities, which in turn made this collaboration more effective.

NGOs have an important role in pioneering participatory research and development. From a technical point of view the project has provided a good basis for further research into solving the problem of turtle mortality as a result of fishing activities in the area. The research will also help to identify the status, population and nesting sites of the green turtle. In particular, it has been noted that tagging is essential for

determining the real figures of sea turtle bycatch. The participatory nature of this work, and the full involvement of boat crews has resulted in the captains of the pilot boats being willing to co-operate in applying a tagging system if further training on applying the system is provided.

This case study was based on a paper by Ayþe Oruç of the DHKD Marine and Coast Program titled: *Conservation Efforts for Sea Turtles in the Eastern Mediterranean of Turkey.*

For further information contact:
The Society for the Protection of Nature (DHKD)
PO Box 971
Sirkeci 34436
Istanbul
Turkey

Tel: +90-212-528-20-30
Fax: +90-212-528-20-40
Email: ayse.oruc@dhkd.org

NGOs and Governments Working Together on Sustainable Development in Belize

The Toledo Institute for Development and Environment (TIDE) is a recently formed NGO in Belize. TIDE is dedicated to involving communities in protected areas planning and management to enable them to manage resources and gain economic benefits from them. By working with the government, TIDE is using its expertise to provide services to local communities that go beyond those that the state is able to offer.

Introduction

Agenda 21 notes the need for increased dialogue between NGOs and governments:

> *…a mutually productive dialogue should be established at the national level between all Governments and non-governmental organizations and their self organised networks to recognize and strengthen their respective roles in implementing environmentally sound and sustainable development.* (27.7)

The Toledo Institute for Development and Environment (TIDE) is a new NGO, which was formed to meet the environmental and development needs of the Toledo district, the southernmost of Belize's six districts and the largest and least developed. Since its establishment in June 1997 TIDE has been working with the government in Belize in a variety of integrated conservation and development projects in Toledo. TIDE's mission is:

> "*to research and monitor Toledo's natural resources, to assist with protected areas planning and management, and to lead the development of responsible tourism, and other environmentally sustainable economic alternatives in Toledo by providing training and support to local residents*".

TIDE recognises that local communities are dependent on many of the natural resources of the area and that wise utilisation of resources is the only way to sustain both the local culture and the environment.

Toledo is the only district in Belize with an unpaved highway. Because of this, development here has been minimal, allowing the district to retain a relatively pristine environment in the country. The Belize Barrier Reef in this part of the country has suffered little damage due to the area's low population. Recently, however, the Government of Belize has begun to upgrade the Southern highway, thus opening the way for further development.

TIDE's main focus is on the Maya Mountain Marine Areas Transect (MMMAT), a million-acre corridor that connects the Sapodilla Cayes, a World Heritage Site on the Belize Barrier Reef, to the Maya Mountains inland. This corridor includes the proposed Port Honduras Marine Reserve, Paynes Creek National Park, Bladen Nature Reserve, Maya Mountain Reserve, Deep River Forest Reserve and the Sapodilla Cayes Marine Reserve.

The MMMAT encompasses diverse terrestrial and marine habitats, all linked within a ridge to reef corridor. The limited biodiversity studies that have been undertaken to date reveal that the area is very high in terrestrial and marine biodiversity. It harbours rare and endangered species, including impressive local and migratory avifauna and charismatic megafauna.

TIDE's work includes protected areas planning and interim enforcement of the Paynes Creek National Park and the proposed Port Honduras Marine Reserve. It also provides training in sustainable tourism and conservation to community members. In general TIDE is assisting local community members to be involved with sustainable industries that are consistent with protected area development and management. Support for TIDE's work comes from a number of sources including the US NGO the Nature Conservancy.

Activities

TIDE's Integrated Conservation and Development Projects (ICDP) are focused on the coastal and marine reserve planning and management for Port Honduras and Payne's Creek. Activities include:

- sustainable tourism business development for local residents;
- environmental monitoring to support regional coastal management;
- environmental education and awareness building;
- geographic information support to coastal management and planning;
- enforcement of and education about existing fisheries and forestry laws; and
- trinational co-operation on coastal management for the Gulf of Honduras.

In 1998 TIDE developed management plans for Paynes Creek and the proposed Port Honduras, both of which have been submitted to the Government of Belize for approval. Developing and implementing management plans (with participation from the local community, NGOs, and government), is critical to consolidate the protected areas corridor of the MMMAT. TIDE is now working closely with local communities and the Fisheries, Forestry and Environment Departments and Ministries of Tourism, Natural Resources and Environment, all of whom have a shared desire to implement these plans.

Although the Government of Belize is willing to enter into agreements with NGOs like TIDE to manage national protected areas, it has limited funds available for this. TIDE therefore plans to raise money by embarking on a sustainable tourism business and has researched various environmentally friendly income generating activities. It has concluded one of the best options would be to establish a modest fly-fishing lodge in the Port Honduras Marine Reserve that could also be used to accommodate conservation/student groups in the off season. In addition, this facility would include a ranger station for the Marine Reserve. By having a physical presence on the edge of the Port Honduras Reserve, TIDE staff would be able to monitor the activities in the area more closely. The lodge could also generate business for the trained fly-fishing guides who formerly earned their living as net fishermen.

Results

Effective conservation of the MMMAT requires the replacement of some traditional fishing activities. A major part of TIDE's activities has therefore concentrated on working with local communities to help them develop sustainable employment alternatives, consistent with natural resource conservation. For example, in coastal communities where net fishing is damaging marine and coastal resources, sport fishing and kayak guiding are being introduced and are rapidly gaining acceptance. Sixteen local fishermen and hunters have been trained as fly-fishing and kayak guides and are using their training to entertain clients. Small hotel owners have also been trained in hospitality and business management.

TIDE is also involved in monitoring the coral reefs, in collaboration with the Fisheries Department and other Marine Reserve managers in northern Belize. This year TIDE will be implementing two coastal monitoring programmes whereby communities will receive training in water quality monitoring and will eventually be monitoring their own waters. TIDE is also participating in a three-year study of current flows through the trinational basin of the Gulf of Honduras, primarily focusing on spawning aggregation of commercial fisheries and physical aspects, as a basis for integrated coastal zone management. Together with the Fisheries and Forestry departments, TIDE has been conducting joint patrols to monitor illegal fishing activities by foreigners and illegal killing of endangered manatees.

Lessons learned

TIDE's activities have focused on an area that is currently fairly pristine but which faces the threats of major changes in the near future. One important lesson is that it is better to act before a problem emerges than trying to stop or repair damage once it has begun.

NGOs can play an important role in acting as a go-between for government, industry and local communities. NGOs have a flexibility that is difficult for civil servants or business people to emulate, although the reverse of this is that NGOs often have to strive harder to gain credibility for their aims. In Belize the government has been particularly willing to collaborate with NGOs such as TIDE.

NGOs can organise training, monitoring and other schemes which communities and governments might not have the expertise or resources to do on their own. In Belize TIDE has been able to assist members of the local community to undertake more environmentally sustainable activities, such as those related to tourism.

NGOs can help communities by helping to raise funds from a variety of sources for a wide range of conservation activities. In this case TIDE has been able to raise funds from the United States to help attain its goals.

This case study has been prepared from information prepared by Sharon Ramclam, TIDE's Scientific Officer.

For more information contact:
TIDE
P.O. Box 150
Punta Gorda Town
Toledo District
Belize C.A.

Tel: +501-7-22274
Email: tide@btl.net

Strengthening the role of workers and their trade unions

Fisherfolk Manage Local Resources and Protect Coastal Biodiversity in Thailand

The coastal seas around southern Thailand have traditionally been some of the most productive in the world but today they are under intense pressure as a result of commercial over-fishing. Fishers in coastal communities are now organising themselves into groups to protect their own resources and are working with NGOs in a nation-wide effort to maintain fish stocks and protect biodiversity. Actions include organising against illegal fishing, building artificial reefs to encourage fish recovery and lobbying for changes in policy.

Introduction

Agenda 21 recognises the role of workers in sustainable development:

> *Efforts to implement sustainable development will involve adjustments and opportunities at the national and enterprise levels, with workers foremost among those concerned*. (29.1)

In many coastal communities fishing is the main form of work and those who go to sea to catch fish, those that process the results, and those who market the products are the principal workers. Coastal fishing communities in southern Thailand have lived in balance with nature for centuries. Predominantly Muslim in a Buddhist-dominated country, the fisherfolk have traditionally been somewhat isolated, geographically and politically, living in small villages in bays and on islands and often having no title to their land.

This traditional lifestyle is now under threat from a wide range of pressures, including tourism, industrialisation, shrimp farming, destruction of mangroves and, in particular, an influx of commercial fishing operations. Over the past fifteen years, large mechanised fishing boats have invaded the area, using push nets and trawl nets, resulting in a dramatic fall in fish stocks. Push nets are less discriminate in the fish that they catch, resulting in large-scale by-catch and capture of many undersized fish. They also cause extensive damage to coral reefs and sea grass beds by pushing along the seabed, particularly when they are used illegally within the 3,000 metre exclusion zone – the coastal area that is protected by law from mechanised fishing operations. Coastal communities are now suffering economic hardship. Young people are drifting away to work, often illegally, in neighbouring countries and drug abuse is increasing. At the same time, important marine species, including dugongs *(Dugong dugong*) and turtles, are also under severe threat.

Members of coastal fishing communities started to meet informally, assisted by an NGO, to talk about a series of problems that were rapidly developing into a crisis. After several months of discussion a meeting took place of a hundred village representatives from eight provinces. The workers discovered that they had many things in common; as a result they decided to organise themselves into the Federation of Small Scale Fishermen to help address shared problems in a co-ordinated fashion. Although the Federation now operates throughout southern Thailand, activities are co-ordinated by regional Fishermen's Associations and local actions are carried out by village or district-scale Fishermen's Clubs.

Activities

The basic objective of the Federation was to empower small-scale fisherfolk to manage their local marine resources in a sustainable manner. Precise aims varied from one community to the next, but the objectives of the Small-Scale Fishermen's Club of the Nong Jik District in Pattani Province – made up of six separate villages – are illustrative:

- to eliminate illegal fishing and the use of destructive fishing gear within the 3,000 metre coastal boundary;
- to rehabilitate and conserve coastal and marine resources;
- to co-ordinate the union of small-scale fishermen in Nong Jik District; and
- to collaborate with external organisations, both government and non-government, to resolve problems.

Most of the activities are planned and implemented by the fishing communities. Eight national and local NGOs are offer capacity building, research, networking and policy support.

The first activity embarked upon by many of the fishing communities was the physical demarcation of the 3,000 metre restricted zone – enshrined in law but frequently ignored in practice. Cheap and easily accessible materials such as bamboo and palm fronds were used to demarcate the boundary in Pattani district in south-eastern Thailand. Once three kilometres had been marked, the communities asked local officials to inspect the work, leading to the government helping with the work. With access to greater resources, Nong Jik was demarcated with modern buoys.

Demarcation has also sometimes involved demanding an increase in marine protected areas. In Phang Nga province in the south-west, the fishermen have been working with NGOs to lobby for an extension of the boundaries of the Phang Nga Marine National Park. The original boundaries of the conservation areas (where only non-destructive, small-scale fishing is allowed) were modified under pressure from large-scale trawler operators who wanted access to as many fish stocks as possible, to exclude almost half the area.

Subsequent pressure from the fishermen's clubs resulted in the boundaries being enlarged again, although one type of trawler, however, which is unable to fish in the deeper waters outside the new boundaries, is being allowed to fish within the boundaries for a further five years. The following year, Pattani Province became the first province to demarcate the 3,000m conservation zone along its entire 116km coastline.

In Pattani, demarcation was followed by a revival of traditional artificial reefs (*sung*). Each *sung* is made from inexpensive natural and non-polluting materials - a bamboo pole with coconut fronds attached, weighted with sand-filled sacks - and provides a refuge for fish and shrimp. Strict village

regulations control fishing near the *sung*. Studies by fishermen showed both quantity and diversity of species increased only one month after the *sung* was installed. The reefs also made it easier to control illegal boundary infringement by fishing vessels. Species that had not been seen in 30 years – including dolphins, sharks, sting rays and marine turtles - began to return. The *sung* have also created better ties between the villagers and government, as government officials have travelled to the village to see the work of the fishermen.

The workers' organisations have also lobbied to improve patrolling of the 3,000 metre boundary. Fishermen's clubs donate to a Petrol Fund that helps purchase fuel for the patrols. Such patrolling is essential but time-consuming and dangerous. In 1997 a fisherman from Phang Nga was shot and killed by someone on a trawler that was fishing illegally. Co-ordinated lobbying has increased government involvement and now in most areas villagers are accompanied by armed government officials while patrolling at night. Further work aimed at formalising this system of "participatory patrols" is now underway.

In both Pattani and Phang Nga provinces fishing communities are setting aside high biodiversity areas such as mangroves, sea grass beds and coral reefs. These "Community Conservation Areas" are chosen if they are under threat from mechanised fishing or development. The fishing community discusses, agrees, records, publicises and regulates such areas and liases with relevant government departments to obtain official recognition for the protection. By involving the government – for example by asking a high-ranking official to declare the area – the protection gains some credibility, although there is as yet no *legal* recognition for such areas.

Results

The greatest result of the fishermen's efforts may be the increased confidence that workers have to tackle problems that until recently seemed overwhelming. Increased media exposure has also enabled them to access funds, both from government and external donors such as DANCED (Danish Co-operation for Environment and Development). There is also increasing collaboration within and between communities and with NGOs and government officials.

In addition to the practical successes, pilot activities have also led to policy reform, both at micro and macro-levels. In the long term, this may well have been the most significant success of the initiative. Changes that have been influenced by the workers' initiatives include controlling registration of new fishing vessels and increasing budgets for many activities started by the Fishermen's Clubs.

Conservation and environment priorities, such as eliminating push-netting, banning mangrove clearing and institutionalising participatory resource management are now included in the government's eighth five-year plan. In February 1998 push-netting was banned throughout Pattani Province.

Social and biological improvements can also be seen. Livelihoods and incomes in small-scale fishing communities have both improved and social stability has increased as a result. Recovery of damaged habitats including mangroves, sea grass beds and corals and several previously endangered species can already be seen.

Lessons learned

Co-operation among workers who share a common problem brings strengths and benefits.The groups in Thailand go beyond the mandate of traditional co-operatives by including environmental and sustainability issues. This has allowed workers co-operating within and between fishing communities to address what at first sight seemed a series of insurmountable problems from over-fishing.

Several important factors have helped the process. Social cohesion through kinship and religious ties made it easier for workers to co-operate. The resilience and rapid recovery rates of the marine ecosystems also helped maintain and strengthen community interest; positive results could be seen within a year. The fact that workers faced a common problem encouraged self-mobilised action and also resulted in the rapid scaling up of local initiatives to regional and even national scale. The Federation of Small-Scale Fishermen has since expanded its operations to cover all 13 provinces of Thailand.

Workers and communities often need time to arrive at agreed and viable responses to problems. Many of the actions in Thailand described earlier only took place after months of discussion but were stronger for having emerged from inside the community rather than having been imposed from outside. Focusing on conservation of biodiversity *within* rather than *separate from* or even *opposed to* sustainable development was an important factor in the success of the initiative. The rewards of such an approach are shown by the phenomenon of local fishing communities lobbying for an increase in protected areas.

Individual successes will only achieve long-term security if they are accompanied by policy reform. The link between action on the ground, through the fishermen networking among themselves, and lobbying for changes in policy is regarded as one of the most important reasons for the gains made by the fishing villagers of southern Thailand.

This case study draws on material written by Sejal Worah of WWF-Thailand and Edward Tupacz, Suvimol Piriyatanalai and Tanu Nabnien including a report written for the *Workshop on Priorities for Biodiversity Conservation*, 28-30 April 1998, New Delhi, India as part of WWF-India's *Biodiversity Conservation Prioritisation Project*.

For further information contact:

Federation of Small-scale Fishermen of Southern Thailand
11 Magrood Road, Soi 9
Tambon Saparang
Amphur Muang
Pattani 94000
Thailand

Campaigning by the International Transport Workers' Federation (ITF) for Better Implementation of Social and Environmental Controls at Sea

The International Transport Workers' Federation (ITF), a global organisation of transport workers' unions, has been carrying out a campaign against flags of convenience (FOC) for many years. FOCs allow ships to register with countries that have a poor record in implementing laws and regulations to avoid social and environmental controls. Recently ITF has organised an exhibition on board the Global Mariner, a ship travelling to many of the world's ports. FOCs are central to the problem of lack of flag state implementation that is threatening the marine environment and marine living resources.

Introduction

The International Transport Workers' Federation (ITF) is a global organisation of transport workers' unions. It brings together some 533 unions in more than 136 countries in every part of the world and represents over five million trade union members in every branch of transport. The ITF campaigns on behalf of its affiliates for an integrated and environmentally responsible approach to transport policy, both nationally and internationally. The ITF has been active in combating the "Flags of Convenience" problem for some 50 years.

As *Agenda 21* states:

> *...trade unions are vital actors in facilitating the achievements of sustainable development in view of their experience in addressing industrial change, [due to] the extremely high priority they give to protection of the working environment and the related natural environment, and their promotion of socially responsible and economic development.* (29.1)

There are a number of international instruments to prevent shipping from polluting and otherwise damaging the oceans. The effectiveness of these depends on nations exerting appropriate controls over vessels that fly their flag. However, many nations lack the will and/or ability to enforce the obligations of the instruments to which they are party. Unscrupulous ship owners can register their ships in, and thus take on the flag of, such nations - termed a Flag of Convenience (FOC). Half the world's shipping tonnage is registered in this way, i.e. in countries other than the real country of ownership.

The FOC system enables a substantial proportion of ship owners to secure a short term competitive advantage over their competitors by:

- avoiding taxation and social security requirements, as well as requirements regarding the nationality of crews;

- determining themselves the extent to which requirements set out in international instruments are complied with – including those related to fundamental human and trade union rights, to the safety of life at sea and to the protection of the marine environment;

- reducing staff to the point where it is impossible to undertake essential maintenance; and

- under-cutting those countries with high standards.

The world shipping fleet is currently increasing in size, as is the FOC problem. Most of the newly built tonnage is being registered with FOCs and existing tonnage is changing from national flags to FOCs. Since 1980 the number of states that have been designated by the ITF as being an FOC has increased greatly. In 1980 there were 11 so-called "flag of convenience registers", this figure has now risen to 27. In addition to these there have in recent months been a number of others which are coming on stream and hoping to attract customers, e.g. Bolivia and Mongolia.

The scant regard for safety regulations on many FOC vessels means that FOC ships tend to be older than rest of the world fleet. Many of the detentions by Port State Authorities involve FOC vessels that are barely seaworthy. The results are that worker casualties tend to be higher on FOC vessels – in 1997, 46 per cent of all losses in absolute tonnage terms were accounted for by just eight FOC registered vessels.

Activities

The ITF's campaign against FOCs has recently included buying and equipping a 12,778 tonne general cargo ship, re-named the *Global Mariner*, as a floating exhibition. The vessel is currently on a global tour and will call at many of the most important ports, where the general public is invited to visit the vessel and tour its exhibition. The on-board exhibition highlights the importance of the shipping industry. In particular, it aims to provoke public awareness of the falling standards and conditions endured by many seafarers as a consequence of the growth of FOCs.

On an international level, the ITF is campaigning to urge international bodies such as the Commission on Sustainable Development to agree that FOC operations amount to a negation of international law which needs to be addressed. The ITF in particular is asking the International Maritime Organisation to develop, as a matter of high priority, a mandatory instrument on vessel registration which would give full effect to the United Nations Convention on the Law of the Sea (UNCLOS), which has many measures addressed to the flag state. The ITF also stresses the urgent need for greater transparency within the shipping and fishing industries and invites the competent bodies to identify measures that will facilitate greater transparency.

Results

During its 18-month tour of world ports, the *Global Mariner* has acted as host to local musicians and artists, carried displays from national unions and other organisations, and acted as a communication centre to boost the ITF's FOC campaign. The voyage began in July 1997 and by December 1998 more than 122,000 people had visited the on-board exhibition, including many government and regional trade union representatives, school groups, seamen and crews on FOC ships, who are being advised on how to deal with problems concerned with wages and living

conditions. On board the ship thousands of names are being stamped on steel plates as part of the permanent protest against FOCs.

In Rio de Janeiro, one of the most recent ports of call, a seminar was organised by the National Federation of Seafarers, Inland Navigation and Fishermen in conjunction with the Fishermen's Union and Rio de Janeiro State Fisheries Foundation. The seminar highlighted the problems of marine pollution caused mainly by FOC vessels, many of which come to Latin America after having been expelled from Europe and the United States. In the evening the Brazilian Minister of the Navy, Admiral Mauro Cezar Pereira, added his name to the permanent ship board protest against FOC.

The ITF's campaign has many levels of activity. For example, it campaigns for crews members who are owed large sums of back wages. In 1997 the ITF secured US$37 million in wages being withheld from seafarers on FOC and other sub-standard vessels.

Lessons learned

Trade unions are often assumed to be interested only in wages and working conditions; the current project shows that they can also play an important role in promoting environmental protection and the implementation of international legislation. When a large institution works on a single issue – in this case FOCs – it affects a wide range of other issues and the broader lessons are seen as important. Trade unions can be particularly effective because they bring together people who are united by their skills and experience and by their need to have a safe, secure working environment. This creates a significant incentive to achieve change.

Trade Unions can have an important role in using education as a means of effecting positive change. In this case, by locating the exhibition on a ship, the ITF found that it not only created a milieu that attracted the general public, but also presented its ideas in an environment that was likely to appeal to its own members.

Support is likely to increase if positive results can be seen at an early stage. By campaigning for back pay, the union is doing something that will be instantly understood and appreciated by all its members. At the same time, it is locating this effort in a wider approach to the issue that goes beyond the immediate experience of many professional sailors and requires action by national and international bodies. Asking prominent politicians and celebrities to sign what amounts to an international petition, union officers are ensuring that their demands reach a wider audience.

This case study has been prepared using information supplied by Jon Whitlow of the ITF and Lucien Royer of the International Confederation of Free Trade Unions (ICFTU) and the Trade Union Advisory Committee to the OECD (TUAC).

For more information contact:
Jon Whitlow
ITF House
49-60 Borough Road
London SE1 1DS
UK

Tel; +44-171-403-2733
Fax: +44-171-357-7871
Email:Whitlow_John@itf.org.uk
WWW: http://www.itf-ship.org/

Strengthening the role of business and industry

The Marine Stewardship Council is Linking Industry with Conservation to Encourage Sustainable Fishing

Over-exploitation has caused a dramatic decline in global fish stocks, with implications for food supplies, jobs, the economy and the environment. The Marine Stewardship Council in collaboration with the fishing industry has been set up as a way of helping to ensure that fishing is sustainable, by encouraging fisheries to undergo independent certification to show that they meet agreed environmental criteria and are sustainably managed. Trial certification schemes are now taking place around the world.

Introduction

Marine conservation and sustainable development efforts should not begin and end with the work of NGOs, individuals and local communities. Nor can they simply be left to governments. The enormous influence of business and industry makes it essential that this major group plays a part in tackling the problems facing the world's oceans. *Agenda 21* is clear on this issue:

> *Business and industry, including transnational corporations, and their representative organisations should be full participants in the implementation and evaluation of* Agenda 21. (30.1)

One of the most important links between the business community and the world's oceans is through commercial fishing. Every year, 80 million tonnes of marine fish are sold and eaten. Fish is an important source of protein for many of the world's poorest people and is increasingly popular with the consumer classes. Global demand continues to rise. Fishing has become increasingly mechanised and efficient; huge factory ships stay at sea for months, using highly sophisticated equipment to track down vast schools of fish.

Unfortunately, long-term management of fisheries has been appalling, and the fishing industry must shoulder a significant part of the blame for this. Over-fishing is currently endangering the functioning of entire marine ecosystems and is threatening the world's fishing industry – and the 200 million people who rely upon it for employment – with a catastrophic loss of jobs and money. According to the UN Food and Agriculture Organisation, 60-70 per cent of the world's fisheries need to control fishing immediately to avoid further declines of fully exploited or over-fished resources and to rebuild stocks. Populations of some species have already collapsed. Some fisheries that have sustained coastal communities for generations have now virtually disappeared.

Modern fisheries are enormously subsidised; world wide, governments pay tens of billions of dollars a year in subsidies to an industry that catches only US$70 million worth of fish. The fishing industry is also extremely wasteful. Every year, 18-40 million tonnes of fish and other marine life – between one quarter and one third of the world's catch – is thrown back, dead or dying. Certain trawl nets also catch undersized fish, sea birds, marine turtles and even small whales and dolphins. There is increasing evidence that these losses have reached levels where they represent a serious threat to marine biodiversity.

A comprehensive response is required, including improved enforcement of legislation, reduction of harmful subsidies, establishment of no-fishing areas, and elimination of destructive fishing methods. One important way in which the industry can itself contribute to this effort is through various forms of self-regulation linked to consumer awareness.

The initial impetus for the MSC came from a partnership formed between the food processing company Unilever and WWF - World Wide Fund for Nature International. The two organisations began from very different starting places; senior staff at Unilever were worried about long term business implications of collapsing fish stocks while WWF campaigners were concerned about the ecological implications. However, both came to similar conclusions about the best way of addressing the problems.

Consumer pressure had already been brought to bear on specific issues, such as the campaign in the early 1990s to promote "dolphin-friendly tuna". Hundreds of thousands of dolphins were being killed in purse-seine tuna fisheries in the eastern tropical Pacific. Public concern encouraged labelling of tuna caught without damaging dolphin populations.

By the middle of the 1990s there was a crisis of confidence amongst the more responsible people in the fishing industry. Some governments were finding it difficult to protect fish stocks, and international agreements were either not in force or not being implemented. Consumers in the developed countries were also becoming increasingly alarmed by reports about falling fish stocks and the impacts of fishing on other marine life. Responsible companies were concerned that they were receiving the blame for the poor practices of others.

This experience focused attention on the potential for a more general labelling system for sustainably produced marine products. The discussions drew on experience outside the marine field and particularly on the growth of other "ecolabelling" schemes and the independent certification of products that meet agreed social and environmental criteria. These include organic food standards, and the newly launched standards of the Forest Stewardship Council which aims to provide a guarantee that timber and other forest products bearing an agreed label have been produced in ways that do not damage people or the environment.

Activities

Formed in 1997 and officially launched in early 1998, the Marine Stewardship Council (MSC) is an independent, non-profit body that sets broad principles and criteria for sustainable fishing. The role of the MSC is to work with responsible stakeholders in the fisheries sector to promote and achieve its objectives of:

- conserving marine fish populations and the ocean environment on which they depend;

- promoting for public benefit the effective management of marine fisheries, and ensuring the sustainability of global fish stocks and the health of the marine ecosystem generally;

- establishing and promoting the application of a broad set of Principles, Standards and Criteria for sustainable fishing; and

- providing certification and accreditation services to individual fisheries complying with such Principles, Standards and Criteria.

These objectives are being achieved through a transparent consultation and communication process. A governance structure that ensures that all stakeholders' views and opinions are heard and debated, and that no single interest predominates, underpins this process.

The MSC aims to provide a framework for promoting marine products caught without causing long-term damage to either biodiversity or the wider environment. It is based around a market-led solution to problems of fish stocks world wide, using independent certification of sustainable fishing operations according to previously agreed principles. Only fisheries meeting these principles will be eligible for certification by independent, accredited certifying firms. Certified products will be allowed to display the MSC logo, thus allowing consumers to choose marine products that have been caught with as little impact on the environment as possible.

The success of the MSC depends on extensive and inclusive dialogue with the many organisations and individuals involved in the fishing industry. The first phase of MSC consultation in 1997 involved a series of conferences held around the world. During the second phase, the MSC is establishing national working groups that will provide a direct line of communication between fisheries representatives and the MSC Advisory Board, and draw up national marine certification standards. They involve representatives of fisheries and fishers, scientists, fisheries companies, as well as major retailers and environmental organisations. The first of these groups was set up in the UK in December 1997, and the second formed in Germany in March 1998. It is hoped that a group will shortly be established in the Netherlands.

There is also a major communication and consultation programme in countries where the MSC has, to date, been unable to set up a formal dialogue. Initially these include Argentina, Chile, and Peru. The process will be expanded to other Southern and Central American countries and hopefully into Asia and Africa. The MSC aim is to establish as broad a communications network with representatives of the fishing industry as possible.

Five certification companies have been working on a series of test cases, involving both large and small-scale fisheries in developed and developing countries. Examples included an Eritrean mixed reef fishery, fishing off the coast of Ecuador, the Alaska Salmon Fishery and the Thames herring fishery in the UK. Issues such as the viability of providing accurate “chain-of-custody” information (i.e. details of activities from the moment of catching the fish to its eventual sale) are being examined.

Results
Following the multi-stakeholder consultations, the MSC has reached agreement on a set of three broad principles for sustainable fishing. The principles are:

- PRINCIPLE 1: A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

- PRINCIPLE 2: Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

- PRINCIPLE 3: The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Each of the principles also has a more detailed set of criteria. For example, the MSC insists that the fishing methods used should minimise bycatch (i.e. accidental catches) of either juvenile target species or of other species. Meeting the criteria can mean changing both methods and equipment - for instance the introduction of turtle excluder devices (TEDs) on shrimp trawls to avoid inadvertently catching endangered marine turtles. The MSC recognises that efforts are most likely to be successful when there is full co-operation among all fisheries stakeholders, including those who are dependent on fishing for their food and livelihood. On a voluntary basis, those fisheries that conform to the MSC's *Principles and Criteria* will be eligible for certification. The MSC will not carry out inspections itself, but will *accredit* independent certification companies that meet its agreed standards, and the certification companies will carry out inspection to make sure that the fishing operations meet MSC standards. Operations passing the inspection will be eligible to display an MSC label that acts as a guarantee for consumers. Fish processors, traders and retailers will be encouraged to make public commitments to purchase fish products only from certified sources.

The MSC published an accreditation manual for certifiers in June 1998, covering issues such as impartiality, legal constitution, competence, expertise and management structure. Certification methodology includes guidelines covering pre-assessment procedures, the full assessment and the importance of tracking chain-of-custody, all the way from the boat to the retailer.

Signatories and supporters of the MSC have been drawn from the fishing industry in many countries around the world, from Australia to Zimbabwe, and several major suppliers have signed up to the scheme.

Lessons learned
The MSC is still in the development phase and until significant supplies of certified products become commercially available it is difficult to make more than a limited assessment of its impact. Nonetheless, the experience of establishing the MSC has already illustrated some important principles.

Business interests can demonstrate conservation-minded leadership on some issues, particularly when long-term resource security is at stake. Interest in the industry may be primarily driven by fears of a collapse in supplies but is also a result of less tangible motives such as the desire to live in a world where the oceans remain healthy with a diverse range of wildlife. When there is synergy between commercial and conservation interests, rapid progress is possible. It is difficult to imagine that any intergovernmental process would have been able to achieve anything of this scale and complexity in the same time.

Small-scale industries can benefit and be involved in management of the oceans and the use of certification, as much as large-scale ones. In many regions interest in the MSC has been strongest in the small-scale/artisanal fisheries co-operative organisations, while large-scale industry representatives have been less enthusiastic. Most stakeholders recognise that pressure from wholesalers and retailers who are in turn being pressured by the public, will generate stronger commitment to the MSC.

Certification of fisheries is likely to be a difficult and therefore slower process than has been the case with some other environmental certification schemes. The fisheries issue has not yet really penetrated into the public consciousness in the way that, for example, tropical deforestation is now recognised all over the world. Furthermore, there is some concern about the difficulties of applying the Principles and Criteria objectively. For example, stock assessment and estimation cannot be completely objective and the whole question of defining sustainability remains problematic. Nonetheless, progress has been steady and there is now a solid body of support for the development of certification schemes. Experience with other labelling initiatives suggests that initial reluctance and opposition tends to fall away once labelled products are being sold and a system is in place.

This case study was prepared from Marine Stewardship Council materials.

For further information contact:
Brendan May
Marine Stewardship Council
119 Altenburg Gardens
London SW11 1JQ
UK

Tel: +44-171-350-4000
Fax: +44-171-350-1231
Email: Secretariat@msc.org
Web-site: http://www.msc.org

The Tourism Industry in Canada Takes Step to Limit the Impacts of Whale Watching

The tourism industry has created a major new source of income, exceeding marine extractive industries such as commercial fishing, in the area of the St.Lawrence Estuary and Saguenay Fjord of Canada. In particular, whale watching has increased rapidly over the last few years. While this can be a sustainable way of combining conservation with employment, inadequately managed whale watching activities can disturb and harm marine mammals. The tourism industry, with the collaboration of the Saguenay-St. Lawrence Marine Park and the Department of Fisheries and Oceans Canada, is now taking a role in finding ways to protect whales without damaging human livelihoods.

Introduction

Agenda 21 stresses the need for industry to:

> *strengthen partnerships to implement the principles and criteria for sustainable development.* (30.7)

The tourism industry world wide has undergone rapid growth over the last few decades. More recently responsible travel (with regard to the environment and local people) has gained popularity and has been promoted by many conservationists as a way of gaining economic benefit from sustainable development. For this aim to be achieved, however, it is important that the industry takes a role in the conservation and sustainable management of the environment that it relies upon.

Whale watching is now one of the fastest growing sectors in the tourism industry. Whale watching can change attitudes about whales and whaling by providing an alternative source of income for whaling and fishing communities. It also provides many holidaymakers with a unique experience and, when carried out with respect for the whales and with an educational content, indirectly aids conservation by increasing support for their protection. Whale watching trips are now run in at least 65 countries around the world, providing for over 5 million whale watchers a year and generating US$504 million annually.

As in many other countries, whale watching is booming in the Saguenay-St. Lawrence Marine Park (SSLMP) in Québec, Canada. The estuary is virtually an inland sea, where fin (*Balaenoptera physalus*), blue (*B. musculus*), minke (*B. acutorostrata*), humpback (*Megaptera novaeangliae*) and sperm (*Physeter catodon*) whales can all be seen, along with three species of seals, harbour porpoises and a resident and endangered population of St. Lawrence beluga whales (*Delphinapterus leucas*). As a result of the rich variety and large numbers of marine mammals, and the proximity to many harbours, the area has been described as one of the best locations in the world for whale watching.

Numbers of commercial whale watching boats have increased rapidly, from 10 in 1983 to a total of 52 in 1998 that make more than 9,500 trips a year. In addition, people watch whales from planes, kayaks or their own pleasure craft. Although shore-based observation is possible, it is less popular than going out to sea in the hope of getting close to the animals. Whale watching is a major employer in the area, accounting for a thousand full or (mainly) part-time jobs. It is estimated that in 1995 300,000 people

took part in trips. As a result, visitors spent around Can$51 million, including almost $7 million in ticket sales alone.

Although whale watching is in theory good for both conservation and business, poorly managed tours and heavy visitor pressure can cause problems for whales and observers by affecting the quality of the experience. Boats can disturb whales, particularly if there are several vessels circling the animals and competing for the best views, or if the boats move quickly. Collisions between tour or pleasure boats are reported in the St. Lawrence region every year. The impacts of noise and general disturbance are still poorly understood but it is clear that boat activity can disturb the communication and feeding behaviour of marine animals. Research has shown that the duration of feeding dives of fin whales is reduced in the presence of boats, yet cumulative and long-term impacts remain unknown, calling for the adoption of precautionary measures. Observers suggest that while most individual tour operators are responsible and generally follow the voluntary codes, conduct can "degenerate into potentially dangerous situations" when large numbers of boats congregate.

This is particularly relevant to the St. Lawrence population of beluga whales. These whales are the famous white whales that are also known as "sea canaries" because of the wide variety of sounds they make. In the St. Lawrence estuary, first commercial and then sport hunting caused a massive population decline. Only a few hundred individuals remained by the time hunting was finally banned in 1979. Given their isolation from other populations and the multiple threats present in the habitat, the status of the St. Lawrence beluga whale gives particular cause for concern. Since 1983 it has been designated as being "endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

For the last few years the St. Lawrence population of beluga whales has been the focus of a major recovery programme, co-ordinated by the federal government and World Wildlife Fund Canada. Despite considerable efforts, the St. Lawrence beluga remains under threat, because of high levels of contamination from PCBs, mercury, lead and other pollutants, which may be affecting reproduction and increasing susceptibility to disease. However, increased boat traffic largely associated with tourism has also been identified as another possible limiting factor. Although there has for some time been an informal agreement to exclude beluga whales from tours, increased visitor pressure has been eroding these voluntary controls.

Fears about the future of the beluga, about whale watching pressure on fin and blue whales (both of which are designated as "vulnerable" by COSEWIC) which use the area as a summer feeding ground and a general concern about the ethical, educational and environmental implications of whale watching in general, have prompted an effort to tighten controls on the way in which tours operate. Responsible tour operators have contributed to these efforts. Because of the importance of whale watching to local human communities, and also because of its potential role in increasing conservation awareness, particular care was taken to ensure that there was wide stakeholder support for any conservation measures.

Activities

After a series of studies were made publicly available and following individual consultations, a workshop on whale watching activities was held in Tadoussac in Québec in May 1998. The park authorities hosted the meeting with more than ninety participants from the tourism industry, government, conservation organisations and academic institutions.

The aim was to develop an adequate managerial framework for whale watching activities at sea. Key elements include minimising disturbance and stress to cetaceans, reducing risks of collisions with ships, identifying areas requiring particular protection, providing special protection for the beluga and reducing underwater noise.

Before the meeting started, a range of possible actions was identified, the four most important being:

- defining a code of conduct;
- introducing measures to prevent aggregation of boats;
- using zoning to protect key areas; and
- issuing permits.

The suggestions were circulated to participants before the workshop and much of the discussion took place in working groups.

Results achieved

The workshop achieved a high level of consensus about how to increase protection for marine mammals. There was unanimous agreement that a regulatory code of conduct should be drawn up in collaboration with stakeholders, including both commercial whale watching companies and kayakers, and that whale-watching tours and their content should be diversified. Consensus was also reached on developing a system of boat rotation at observation sites, involving defining zones and imposing time limits to allow different companies to operate effectively without crowding or threatening the whales. Most participants agreed with a suggestion that a 30-45 minutes time limit with the whales on each tour would be reasonable.

There was slightly less agreement with respect to suggestions on zoning, although there was unanimous support for respecting reduced speed limits near marine mammals. Consensus was reached on establishing special protection zones to favour land-based observation or to increase protection of sensitive sites, such as those visited by beluga and their young. However, there was disagreement on zoning with respect to the tidal cycle (which could have restricted boats in the high tide period when whales feed most intensively).

None of the working groups opposed the implementation of a system of permits, albeit with caveats about the need to protect jobs in villages relying on whale watching. The general idea of introducing competency standards was also supported along with support for mandatory training of captains and there was a clear support for sanctions of some kind against people violating permits. The majority of participants also agreed with the idea of establishing a moratorium to limit the number of boats operating tours and to increase co-operation amongst themselves by forming a representative association.

As a result of the workshop and further meetings, the marine park authorities are working on a zoning plan. They are also co-operating with the industry to set up training programmes for captains and naturalists of whale watching boats and developing ways to inform consumers about how to minimise potential negative impacts by choosing environmentally-friendly services. Leaflets have been produced to explain the minimum recommended distances that different vessels should keep from whales and how boats should be handled near marine mammals.

In the future, it also seems likely that regulations will be introduced so that boats will no longer be allowed to approach the beluga whales. At the same time, shore-based whale watching is being encouraged, both through by developing special observation facilities and by keeping boats away from observation points to eliminate chances of disturbance and to ensure a quality viewing experience for land-bound observers.

Lessons learned

The tourism industry can potentially play an important role in the sustainable management of oceans and marine species. When the SSLMP and others identified the need to tighten controls on whale watching, they recognised the importance of ensuring that industry participated in and supported the decisions taken. Making money from non-consumptive use of whales creates a major business incentive to protect them. Getting agreement on the need for and structure of controls is important. In this case, some whale watching tour operators were at the forefront of calling for controls, whether to ensure whale protection and quality whale watching experiences or to protect their market.

Industries, such as tourism, increasingly recognise that they depend on sustainable management of the resources they use. In Canada, tourism industry leaders perceived the importance of sustainable management and were open about the need to discuss and initiate controls to improve the situation for both the whales and business. There is increasing recognition that whale watching can only be sustainable in the long-term if quality services are offered that fully respect the marine mammals on which the industry is based.

Involvement of a wide range of stakeholders was considered to be vital when the project in Canada was being developed and considerable preparation work was carried out beforehand; for example all participants had a detailed dossier with questions and options to consider before the first meeting.

In some parts of the world, the tourism industry has itself been the driving force behind marine conservation and sustainable livelihoods. As the links between the marine environment and tourism become better understood, it is to be hoped that the industry will continue to play a major role in actions to ensure that tourism is a net benefit to the marine environment.

This case study is based on information supplied by Nadia Ménard of Canadian Heritage, Parks Canada.

For more information contact
Nadia Ménard
Canadian Heritage, Parks Canada
Saguenay-St. Lawrence Marine Park
182 de l'Eglise Street
PO Box 220
Tadoussac, QC
GOT 2AO
Canada

Tel: +1-418-235-4703
Fax: +1-418-235-4686
Email: nadia_menard@pch.gc.ca

The following sources were used in the preparation of this case study: **Carlson, C.** (1996); Whale watching and its effects on whales. *Whalewatcher*, vol **30**.; **Gilbert, M.-C. and Saguenay-St-Lawrence Marine Park.** (1998*); Proceedings of the regional Workshop on Whale-Watching Activities at Sea*. May 25 and 26 1998, Tadoussac (Québec); **Groupe-Type** (1996); Documentation sur la méthode d'estimation de la fréquentation du parc marin du Saguenay-Saint-Laurent: saison estival 1995; **Hoyt, E.** (1995); *The World-Wide Value and Extent of Whale Watching: 1995*. Whale and Dolphin Conservation Society, Bath, UK; **Hvenegaard, G.T** (1997*); The Social and Economic Aspect of Ecotourism: A Review Relevant to Whale Watching*. Paper presented at the Socioeconomics of Whale Watching Workshop, Kaikoura, New Zealand, December 1997; **Lindberg, K. And Hawkins, D.E.** (Eds.) (1993); *Ecotourism: A Guide for Planners and Managers*. The Ecotourism Society, North Bennington, Vermont; **Michaud, R. et J. Giard** (1998); Les rorquals communs et les activités d'observation en mer dans l'estuaire maritime du Saint-Laurent entre 1994 et 1996: 2. *Évaluation de l'impact des activités d'observation en mer sur le comportement des rorquals communs*. GREMM, Tadoussac (Québec); **Saguenay-St. Lawrence Marine Park** (1997); *Whale-Watching Activities at Sea: Discussion Paper;* **Saguenay-St. Lawrence Marine Park** (1998*); Regional Workshop on Whale Watching Activities at Sea: Proposed Actions. Participant's Notebook*; **St. Lawrence Beluga Recovery Team** (1995); *St. Lawrence Beluga Recovery Plan.*

Scientific and technological community

Using Environmentally Sensitive Moorings to Reduce Anchor Damage to Coral Reefs

Simple technological developments can eliminate the impacts of human activities in seas and oceans. In recent years there has been a growth in tourism related activities on and around coral reefs. A unique mooring buoy system, tested at French Reef in the Key Largo National Marine Sanctuary in the US in 1981, has been modified and expanded to help mitigate anchor damage to reefs around the world.

Introduction

Agenda 21 highlights the role of science and technology in sustainable development:

> *Scientists and technologists have a special set of responsibilities which belong to them both as inheritors of a tradition and as professionals and members of disciplines devoted to the search for knowledge and to the need to protect the biosphere in the context of sustainable development.* (31.7)

This search for knowledge can sometimes take the form of relatively simple, technical fixes to problems which, if left unsolved, can cause significant environmental damage. For example, a system for curbing the damage caused to coral reefs by leisure boat users in the US has evolved into technology that can be used to anchor a range of vessel types on coral reefs world wide.

Coral reefs are among the largest and oldest living communities of plants and animals on the planet. Covering less than 1 per cent of the Earth's surface they rival tropical rainforests in biodiversity, with nearly a third of all fish species living on coral reefs. Reefs also protect coastlines from damage and provide important breeding grounds and nurseries for many fish species; between 70 and 90 per cent of all fish caught by coastal fishers in tropical Asia are reef-dependent at one time in their lives. Despite this enormous diversity and their importance to many local communities, human activity potentially threatens over half of the world's coral reefs.

With the rapid growth of marine tourism, and increasing affluence in many parts of the world – so that more and more people own or hire boats and yachts and can afford the time to visit reefs – reef damage from anchors has become an increasing threat. Human impact on coral reefs is of particular concern in marine protected areas. The number of people visiting reefs poses a management problem, not only in terms of managing crowds and safety, but also due to the effects of increased boat use. Boats of all sizes anchoring on reefs inadvertently break and damage corals with their anchors and ground tackle. In some cases anchor impact can be severe.

Park managers in the US began working with scientists to develop environmentally sensitive mooring buoys as a means to reduce or even eliminate anchor damage in the early 1980s. The initial research was carried out in the coral reefs in the Key Largo National Marine Sanctuary (KLNMS), located off the coast of Key Largo, Florida and in the Looe Key National Marine

Sanctuary, which is located in the Lower Florida Keys. In both sanctuaries, the reefs' fragile corals were exposed to heavy use by pleasure boats – more than a million people dive in the Florida Keys each year – and consequently the areas were suffering considerable damage from carelessly placed anchors.

Activities

Mooring buoys are not a new idea, but several technical improvements have led to their wide spread use as coral reef protection devices. Traditional mooring buoys could themselves lead to coral damage. They were often weighted or attached to the seabed by a large block of cement or rock, which led to breakage of surrounding corals. The new mooring buoy consists of a metal rod, cemented into the ocean floor near a reef, the installation of which causes little damage. At the top of the rod is an eye-hole through which a heavy nylon cord is attached; this floats and avoids the coral breakage caused by the previous use of heavy chains or cables. At the surface the cord is attached to a plastic buoy to which boats can be secured, instead of dropping their anchors. The result is a mooring that is strong, permanent and ecologically compatible with the seabed to which it is attached. The most popular mooring buoy system was developed and tested by John Halas, a marine biologist working at KLNMS.

In the early 1980s six experimental buoys were tested at French Reef in the KLNMS. Later, forty additional mooring buoys were installed in the KLNMS, improved as a result of the research gained from the initial trial. Site selection for the expanded trials was determined by reef popularity. Reefs that are heavily visited had the greatest need for mooring. The buoys were also used to help distribute visitors more evenly around the reef. By fixing buoys in some of the lesser known yet attractive reefs, impacts were spread more thinly across a wider area. Certain reef areas could also be protected by not placing any buoys in the vicinity. The precise location for each mooring buoy was determined by conducting a detailed diving survey of each reef. The ideal locations were areas with a suitable seabed, in this case areas of exposed reef (limestone) bedrock in an area near well developed reef outcrops, and desirable diving/fishing areas.

Demand for mooring systems that can be used in a variety of seabeds has steadily increased. Where there is a solid limestone base, the site selection process is not complicated. It becomes more complex, however, in other seabeds. Increased boat size and the need to tolerate stronger sea conditions in relatively small areas can add to that difficulty. It is important, therefore, that moorings should not be placed in unsuitable areas that may not have sufficient holding power.

Results

User reaction to the buoys has been favourable. Although the buoys installed in Florida did not initially receive much publicity, the boat users soon started using them when they where available. In the Florida Keys sanctuaries there was no requirement to use the buoys; however, boat users were encouraged to use them.

One clear management advantage of the buoys was that park officers spent far less of their day checking boats for 'anchor-in-the-coral' violations, thus leaving more time for education and other management activities. In other areas moorings can facilitate the collection of marine park entrance fees, when all boats are required to tie up to the buoys. For example, in the Hol Chan Marine Reserve in Belize, patrol boats simply go round the mooring buoys to collect the fees.

The success of the project in Florida has led to the mooring buoy technology being adapted to the needs of a variety of coral reef habitats around the world and to different types of boat – small and large. Through advanced technology, mooring buoy deployment has become a significant tool for

reducing anchor damage in environmentally sensitive marine habitats and a useful technological tool in the management of marine protected areas.

By 1999 nearly 3,000 mooring systems had been installed in coral reefs all over the world, including in Malaysia, Samoa, Jamaica, Egypt, Australia, Indonesia, Jordan, Mexico, Fiji, Kenya, Colombia and Venezuela. The system has been taken up by a wide variety of stakeholders, including dive operators, NGOs, central, regional and local government agencies and research institutes.

In areas where high anchorage use was having a detrimental effect on coral and the reefs were becoming barren, divers began to abandon well known sites in search of new territories elsewhere. This often had an effect on local economies that had traditionally benefited from the income brought to the area by the coral reefs' popularity. The use of mooring buoys is one clear and relatively easy way to reduce this problem. Thus, the installation of buoys has in many areas had the added bonus of bringing the tourism industry into much closer contact with the management of the reefs on which they depend. In some areas, moorings were purchased by the government. In others, such as the Bahamas, the dive operators and shops funded mooring projects. The use and installation of mooring buoys has now become standard practice among environmentally aware dive operations, many of whom work together to share installation and maintenance costs.

A US-based non-governmental organisation, The Nature Conservancy, has been involved in several mooring buoy projects, for example, those in Palau, Jamaica and the Virgin Islands. Another group, Reef Relief, has funded projects in Florida. Many of the Caribbean marine parks and reserves, such as the US Virgin Islands Marine Park and Biosphere Reserve, Saba Marine Park and the Caymans, as well as popular dive sites in many other parts of the world, like Hawaii and the Great Barrier Reef, have installed the system. From a simple beginning the installation of the buoys has gained momentum. For example, John Halas conducted a training course in Belize in the early 1990s at the invitation of a local NGO. Local dive operators became very interested, and community-based mooring buoy programmes involving local dive operators, hotels and others were set up in several places. Assistance was subsequently provided by the Fisheries Department and more training courses were held. As a result, a national mooring buoy programme is being developed by the Fisheries Department, which will be assisted by the national Coastal Zone Management Programme and carried out in collaboration with local communities and the tourism industry.

A key element in the success of the mooring buoys is the simple installation system and the low cost. Reef Relief asks for a donation of US$500 for setting up mooring systems, which it estimates is sufficient to cover materials, boat and equipment time, installation and maintenance for about two years. NGOs in particular have helped raised funds for the implementation of mooring systems with innovative projects such as the '*adopt-a-buoy*' idea – where visiting divers name buoys and dive sites in exchange for contributing to the cost of installing moorings.

Lessons learned

Mooring buoy systems are an effective tool for reducing coral reef damage both directly by stopping anchor damage, and indirectly by regulating visitor use through the location of the buoys.

Technology has played an important role in marine conservation. In many countries, installing mooring buoys has been the first step in reef conservation. Although anchor damage has a relatively small, localised impact on reefs, it is one threat that can be removed very easily. The

system is easy to implement and brings very quick visible results, as corals tend to grow back quite fast, so it plays a good educational role. This often leads to concern and interest in other, more difficult aspects of reef conservation. Local communities, particularly when involved in, or dependent on, the tourism industry, often take part in installation projects, and local businesses like to provide financial support. If a government installs the system, this provides a quick demonstration of the government's good intentions in dealing with the problem of reef damage. In either case, an increased understanding of reef protection develops.

The technology has been adapted to fit situations world wide. Modifications to the original system and the development of a range of tools and installation methods has been a key element in the implementation of moorings in the diverse conditions encountered in the world's reef systems. One problem encountered in some countries has been that the buoys have been stolen – often by fishermen who used the buoys as floats on their nets. This problem was overcome by using bits of drift wood and plastic bottles as buoys, i.e. material which fishermen have anyway.

Scientists and technologists can have a major effect in spreading knowledge and technological advancement if they are willing to train others in the use of their technology. Courses have been carried out all over the world to train people to install buoys themselves, train others and adapt systems to local conditions. The willingness of the biologist who created the system to share his discovery and take part in installation and training projects in many countries has ensured the success of the project.

This case study has been prepared using information provided by John Halas of the National Marine Sanctuary program in Key Largo, Florida, USA. In particular two papers by Mr. Halas have provided the majority of the information*: A Unique Mooring System for Reef Management in the Key Largo National Marine Sanctuary* (presented at the Fifth International Coral Reef Congress in Tahiti in 1985) and *Advances in Environmental Mooring Technology* (Presented at the Eighth International Coral Reef Symposium in 1995).

For further information contact:

John Halas
Florida Keys National Marine Sanctuary
Upper Region Office
PO Box 1083
Key Largo, Florida 33037
USA

Tel: +1-305-852-7717
Fax: +1-305-853-0877
Email: jhalas@ocean.nos.noaa.gov

Scientists Working to Find Environmentally-friendly Alternatives to Anti-fouling Paints in Germany

Serious marine pollution occurs as a result of treating ships with anti-fouling paints containing TBT and other similarly toxic chemicals. TBT is one of the most toxic chemicals deliberately released into the marine environment. In Germany, scientists, paint manufacturers and the shipping industry are working together to find environmentally sound, biocide-free alternative anti-fouling products.

Introduction

Agenda 21 highlights the need for more co-operation between scientists and other interest groups, for example:

> *more interdisciplinary studies* [should be] *developed between the scientific and technology community and policy makers and with the general public to provide leadership and practical know-how to the concept of sustainable development.* (31.1)

Fouling organisms grow or cling onto the bottom of boats, interfering with the performance and durability of the craft. They include both animals (e.g. barnacles, molluscs, polychaete worms, encrusting hydroids, bryozoa and sea squirts) and plants (e.g. green, red and brown algae and diatoms), and have significant cost implications to the shipping and leisure industries.

Tributyl tin (TBT) and other similar substances were widely used in anti-fouling paints on boats in the 1970s and 1980s, due to their high toxicity to organisms such as barnacles and algae, combined with their low toxicity to mammals. TBT paints found instant popularity, particularly with recreational boat users, as they were easy to apply and maintain, and came in a wide range of colours. However, further research showed that the effects of organotins – tributyl tin (TBT) and to a lesser extent triphenyl tin (TPT) – had serious long-term, sub-lethal effects on non-target species such as crustaceans, molluscs and fish. The challenge today is to find suitable alternatives.

In the late 1970s TBT was suspected to be the cause of declining oyster (*Crassostrea gigas*) production along the Atlantic coast of France and in the UK. In the Mediterranean, TBT and its breakdown products have been found in bottlenose dolphins (*Tursiops truncatus*), bluefin tuna (*Thunnus thynnus thynnus*) and blue shark (*Prionace glauca*). Residues have also been detected in most samples of muscle tissue of fish collected from local markets and seafood shops in India, Bangladesh, Thailand, Indonesia, Vietnam, Australia, Papua New Guinea and the Solomon Islands. The most dramatic impact is the now infamous development of masculisation or imposex (and the resultant possibility of sterilisation) in the female dog whelk (*Nucella lapillus*); this can occur at very low levels of TBT concentration in water, i.e. one nanogram per litre.

Many countries recognised the detrimental impact that TBT paints were having on some marine invertebrates and banned their use on sea-going vessels under 25 metres in length. This curtailed their use on recreational craft. However, although inputs of organotins have been reduced in the coastal waters of countries where the ban was imposed, the continued use of these paints on ocean-going vessels is still resulting in large emissions of toxic chemicals into the marine environment. In areas close to ports and dockyards, dog whelks are still affected and are frequently in decline. Effects on edible whelks have also been reported in busy shipping lanes in the North Sea. NGOs are now calling on the International Maritime Organization (IMO), the UN body that regulates shipping, to ensure that a global ban on the use of organotins in anti-fouling paints is introduced by 2003. However, there is still concern over the availability of alternatives to TBT, should a global ban take effect quickly.

The possibility of enforcing a total ban in 2003 would be much improved by a proven range of alternative treatments. With this in mind, a multi-stakeholder project in Germany has started work on identifying environmentally sound, biocide free alternatives to organotin-containing paints.

Activities

The German project involves a wide range of interest groups, including two research institutions, three Ministries, eight shipping companies (both federal and private), nine paint manufacturers, the German Paint Manufacture Association, seven dockyards and WWF Germany. The Laboratory for Freshwater/Marine Research and Comparative Pathology and the Coastal Research Station of Lower Saxony are co-ordinating the research. Ministries, shipping companies, paint manufacturers and WWF jointly provide funding. One of the scientific institutions, LimnoMar, has ten years of experience in research and development projects involving paint manufacturers in the field of non-toxic anti-fouling paints.

The aim of the project is to test alternative paints on ship hulls of over 25m in length, i.e. those ships not affected by the TBT ban. Each ship's hull is cleaned in the spring and an alternative paint applied (several stripes of paint per hull). The paint manufacturers have provided free samples of the test-paints and the coatings are applied under their surveillance. The ships then operate on a normal basis. Scientists investigate the vessels every two months and regular meetings are held with all the participants to discuss the intermediate results. The inspectors detail the type and coverage of fouling, the dry weight of the fouling community, adhesion strength and paint condition.

A number of existing ecological alternatives are being tested or will be tested in the future:

- self-polishing, anti-fouling paints without biocides;
- non-toxic, non-stick coatings to prevent settling (smooth silicone or teflon coatings);
- hard, non-abrasive coatings in combination with special cleaning procedures (e.g. wax, hydro jetting, rotating bristles);
- electro-chemical methods; and
- self-polishing anti-fouling paints with biogenic biocides.

In total 14 biocide free formulations are being tested and compared to 10 controls based on TBT, copper and organic biocides.

The ships taking part in the project operate in estuaries in the North Sea, in the Wadden Sea and up to 100 nautical miles offshore in the German Bight. These waters vary between marine, brackish and freshwater. Test conditions vary and include, for example, ships which have contact with sea bottom and those which do not; fouling pressures which range from high to low; and a range of speeds from slow moving ships to fast coastguard vessels (5, 12 and 19 knots).

Results

The project is still at a fairly early stage of development. However, preliminary results suggest that some of the biocide-free paints provide promising alternatives to organotin paints. Although fouling still occurs to some degree, this can easily be remedied by sailing the ship at high speed or by mechanical cleaning. However, results vary depending on the ships' operating conditions and more research needs to be carried out to match anti-fouling systems with local conditions.

All the tested silicone-based coatings seem to be fairly effective. Although fouling does develop to a certain degree most of the organisms do not strongly adhere. As most of the ships under investigation are slow moving vessels, the area covered by micro- or small macrofouling organisms reaches up to 80 per cent, but fouling organisms can be easily removed with a sponge and/or hydroblasting. Fast moving vessels like those of the Coast Guard are subject to much less fouling than slow moving ships. On all silicone-based coatings the adhesion force of barnacles was substantially reduced in comparison to surfaces such as epoxy resins. All the silicones not exposed to strong mechanical forces remained intact during the duration of the trials.

As anti-fouling coatings seem at first sight to be severely fouled, the question of acceptance by ship owners is crucial for the paint companies. It needs to be made clear that these paints do not work in the same way, and are thus not directly comparable, to biocide leaching paints. In fact, fouling organisms cannot adhere strongly and are thus removed by water currents on fast vessels or by cleaning on slow moving ships.

Encouraged by the fairly good performance of most of the coatings, those ships with stripes of effective coating will be investigated for a further three years. The aim is to test the durability of the coatings during the winter seasons and to determine if the durability and effectiveness can be maintained for up to four years. In addition, ships with greater operational ranges will be included in the trials. On these ships the complete hull will be coated with non-biocide containing paints. As more paint companies are moving into the field of non-toxic anti-fouling paints, two additional vessels will be coated with stripes to test recently developed products.

Lessons learned

Scientists, working with other stakeholders, can play a leading role in finding technological solutions to threats to the marine environment They should be encouraged and supported in this. In this case study, a range of stakeholders came together for several meetings to discuss the project outline, time-schedule, interim reports and view-points of each stakeholder with respect to the future of non-biocidal coatings. The scientists can see the results of their research being applied in a very positive way.

Technological solutions must, however, be acceptable to those who are expected to use them. In this case, there was a risk that ship owners might not accept the alternative treatments as these led to a certain amount of fouling. However, this was not considered a major obstacle as long as fouling could be removed cost-effectively without removing the coating.

Technological innovations may be more rapidly accepted if there is an economic incentive. In the TBT case, paint companies are keen to bring new coatings on to the market to improve their image, and to maintain sales, given the negative publicity surrounding TBT.

This case study has been prepared using information provided by Patricia Cameron of WWF Germany and Dr Burkard Watermann of LimnoMar.

For further information contact:
Patricia Cameron
WWF-Fachbereich Meere & Küsten
c/o Ökologiestation
Am Güthpol 11
28757 Bremen
Germany

Tel: +49-4-21-65-84-616
Fax: +49-4-21-65-84-612
E-mail: info@wwf.de
Web site: http://www.wwf.de

Dr Burkard Watermann
Limno Mar

Tel: +44-40-678-99-11
Fax: +44-679-92-04
Email: LimnoMar@aol.com

Strengthening the role of farmers

Preserving Traditional Shrimp Farming in Hong Kong

Farmers, particularly in many parts of Asia, have been practising traditional coastal aquaculture for thousands of years. These systems have usually been small-scale, using low inputs and relying on natural tidal action for water-exchange and stocking. The gei wai shrimp farms in northwestern Hong Kong are a rare survivor of this approach and now provide an example of how traditional practices can be integrated into conservation programmes.

Introduction

Although shrimp farming is a traditional activity in many parts of Asia, it has recently undergone changes that have major implications for both the conservation of biodiversity and the long-term sustainability of the harvest. Increased demand for shrimp has led to a more intensive and often more environmentally damaging form of aquaculture.

As *Agenda 21* notes, traditional forms of production can:

> *take place in close contact with nature, adding value to it by producing renewable resources, while at the same time becoming vulnerable to overexploitation and improper management.* (32.1)

While the world fish catches have levelled off or declined, aquaculture is booming. The last two decades have witnessed a rapid expansion of shrimp farming, particularly in Asia, which has been driven primarily by demand for shrimp from consumers in the North.

'Farming' the sea may in some cases have the potential to take pressure off wild stocks. However, aquaculture projects have created their own set of problems. This is particularly true of some shrimp farming projects that have devastated already fragile coastal ecosystems. Impacts include large-scale mangrove destruction, coastal erosion, pollution of surface and ground water (including salinisation of vital coastal freshwater aquifers and release of antibiotics) and in some cases the introduction of exotic species. The full range and magnitude of the environmental and socio-economic impacts have yet to be fully documented and understood. The few cost-benefit analyses performed to date have indicated that the cost of natural resource depletion and degradation and environmental damage far outweigh the direct economic returns from the industry.

Intensive badly managed shrimp ponds also create pollution problems. Disease outbreaks are common and are probably linked to high stocking densities and high nutrient input from feed, faeces and other organic waste. This necessitates the use of medication to control outbreaks. The impact on wild populations is unclear. When aquaculture in China failed in 1993 due to disease, the volume of wild

caught shrimp also decreased by 90 percent. Pond drainage, the method used to harvest the shrimp, often results in polluted sludge which has accumulated at the bottom of the pond being dumped in local streams and estuaries. As a result of these methods of production, it is unusual for ponds to have a commercial life of more than 5-10 years, and alternative uses for abandoned ponds have yet to be found.

Over the last few years the shrimp industry has recognised the environmental problems associated with its practices and is concerned that a boycott might be imposed on products from intensive, badly managed shrimp farms. As a result, the industry, NGOs and shrimp farmers themselves are looking at alternatives.

There are, in fact, few aquaculture operations that could not be made more sustainable by introducing production methods based either on traditional practices or on technological innovation. These include strict controls on the release of wastes; careful siting of farms, especially away from coastal mangrove areas; encouragement of the use of indigenous species; improvements in feeding practices; the development of closed systems so that wild species populations are not exploited for broodstock; and consideration of social impacts.

In much of Asia farmers have been constructing coastal fishponds along the shores of estuaries for centuries. The spring tides carry shrimp larvae, fish fry and their food into the ponds through sluice gates. The fish and shrimp are then fattened on the food provided naturally in the shallow ponds. Although yields from these traditional shrimp culture systems are relatively low, there are other benefits: expensive feeds are not needed nor is expensive equipment to aerate the ponds or to exchange the water.

The Mai Po *gei wai* shrimp farms in Hong Kong offer one example of a less damaging shrimp aquaculture system based upon traditional practices. They do not require further clearing of mangroves, and form part of a broader conservation strategy. However, these aquaculture systems are themselves facing environmental problems from pollution and siltation caused by coastal and interior forest loss.

Activities

The 2000ha mosaic of wetlands which make up the Mai Po marshes in northwestern Hong Kong include the tidal mudflats of Deep Bay (one of the most polluted water bodies in Hong Kong), mangroves, reed-beds, traditional inter-tidal shrimp ponds (*gei wai*) and fish ponds. The *gei wais* form the heart of Mai Po which, apart from being a source of income for the farmers, is also of high conservation value and an example of the "wise use" of a wetland. This is because stocking and feeding of shrimp is done naturally, and there was minimal destruction of the coastal mangroves when the ponds were constructed. This is in contrast to other countries where even traditional shrimp farming systems have led to the clearance of huge expanses of mangroves. In 1995, a 1,500ha area of the Mai Po wetland was designated as a wetland of international importance under the Ramsar Convention due to the large number of migratory waterbirds that use the site. Some 380ha of this form the Mai Po Nature Reserve.

Local fishermen established the *gei wai* shrimp farms in Mai Po in the mid-1940s. Each *gei wai* supported a family who, apart from producing shrimps (principally *Metapenaeus ensis*), would also farm fish and oysters. In addition sedges (Cyperaceae) in the channels were harvested for fuel, matting and building purposes, and the mangroves were coppiced for fuel-wood.

A decline in productivity, due to increasing levels of organic pollution in the adjacent Deep Bay, led to the fishermen gradually abandoning the ponds. Many shrimp farms, traditional or intensive, have failed due to urban and industrial pollution. In the early 1980s, a local NGO (WWF Hong Kong) undertook to

run the *gei wais* in conjunction with the Hong Kong Government in order to maintain the traditional land use and to conserve the remaining stands of mangroves and reedbeds inside the pools. The *gei wais* are now within the Mai Po Nature Reserve and, where ponds are still productive, the traditional management practices continue. In ponds where shrimp production is not possible because of pollution, the areas are managed for wildlife.

There are currently 24 *gei wais* in the Mai Po Nature Reserve. Each is an average of 10ha in size, with channels running around its perimeter and across its centre, which act as sheltering areas for the shrimp. Between the channels are stands of mangrove that were originally maintained for fuel-wood. Stocking of the *gei wai* takes place in autumn by flushing shrimp larvae into the pond from Deep Bay through a sluice gate. Once inside, the larvae feed on detritus and plankton in the pond. By April of the following year, the shrimp are large enough to be harvested. Opening the sluice gate at night when there is a low tide carries the shrimp out. As the water flows out of the pond, a funnel net is placed across the gate to trap the shrimp.

On a single night, over 20kg of shrimp can be harvested from a *gei wai* and, since only a fraction of the shrimp are caught, each pond can be harvested many times from April to October, when the season ends. Fish are also cultivated in the *gei wai* since fish fry also enter the pond during stocking. Species include grey mullet (*Mugil cephalus*) and Tilapia (*Oreochromis spp*). Fish harvesting takes place in late autumn/early winter by draining the pond and then netting the fish trapped in the large pool of water that remains.

Results

The creation of the Mai Po Nature Reserve has preserved one of the only areas of traditional shrimp farming left in China. Furthermore, the sixth largest stand of mangroves in China, which covers 6 per cent (17.5ha) of the total area of Deep Bay, has also been protected, as have the 46ha of reedbeds, which are now the largest remaining area in Hong Kong.

The Mai Po *gei wais* are a valuable resource for promoting extensive traditionally managed shrimp farming that does not involve further clearing of mangroves and that forms part of an overall conservation project. The *gei wais* carry out an important educational function with over 40,000 people, one third of whom are students on special school visits, visiting the Mai Po Nature Reserve annually. The *gei wais* are used to raise awareness amongst visiting students and members of the public about the value of marine conservation that is integrated with this natural method of shrimp farming.

Wildlife has also benefited from the preservation of the *gei wais*. The most serious problem affecting the Mai Po *gei wais* remains the high levels of organic pollutants in Deep Bay. Water from Deep Bay is used to flush and stock the ponds. Flushing with highly polluted water continues to reduce the *gei wais* ability to function effectively. Despite this, those *gei wais* that are not commercially viable can still support many non-commercial, more pollution-tolerant fish and shrimp species. As a result, the management of these areas has been altered to provide feeding habitat for piscivorous waterbirds. This is also in line with the aims of the nature reserve. In January 1996, for example, over 68,000 migratory waterbirds wintered in the Mai Po and Inner Deep Bay Ramsar Site.

Lessons learned

It is important to preserve traditional farming practices that can demonstrate more sustainable forms of aquaculture within a broader conservation context. The rapid expansion of ill-conceived, unsustainable

aquaculture systems and the resultant environmental problems provides a powerful incentive to seek viable alternatives based either on tried and tested traditional methods or on new technologies. While important lessons can be learned from past experience, what may have worked in the past may not work today for social, environmental or financial reasons.

Equally, it makes more sense to preserve areas were land change has already taken place rather than encourage systems were new land has to be constantly turned over to production – and thus environmental alteration. Thus, although the Mai Po *gei wais* cover only a relatively small area, and their traditional management has been sustained by an environmental NGO, they are an important remnant of the once predominant aquaculture system in the area. However, the fact that the farms continue to survive only because of NGO support also suggests that more sustainable forms of shrimp culture need to be integrated into a broader approach to coastal conservation.

Environmentally sound aquaculture operations that are not fully financially viable may be able to generate additional revenue through a visitor programme. This would have an additional benefit in increasing consumer awareness. Increasing consumer awareness in the North could itself be translated into demand for a more sustainable shrimp harvest and discussion of the impacts of an ever-increasing consumer demand for shrimp products. The role of the Hong Kong *gei wais* in attracting visitors and explaining the issues is an important contribution.

Traditional systems may also provide valuable experience for restoration projects. The Mai Po *gei wais*, being part of a wider conservation effort, could provide a possible blueprint for restoring abandoned shrimp farms in areas where intensive unsustainable production has come and gone. Such efforts would be best applied within a broader restoration programme.

Pollution is a major problem facing many fisheries and aquaculture projects. In Hong Kong, the visitors to the Mai Po Nature Reserve can clearly see the problems caused by pollution and how this affected the traditional production methods being used by the shrimp farmers more than any other factor. Increased education on the problems associated with urban and industrial production may well help ensure the public demand for cleaner, healthier environments.

The case study draws on the work of many people, and on the following published papers. Young, L (1997); Mai Po. In: Katz, M (ed) *Biodiversity and wetland conservation*, Ramsar Convention Bureau, Gland, Switzerland; Young, L (1997); Mangrove conservation and shrimp aquaculture. In Darvell, B W (ed*), Challenges in a crowded world. Proceedings of the First International Symposium on Marine Conservation*, Hong Kong 26-27 October 1996, Hong Kong Marine Conservation Society; Cha, M W, L Young and K M Wong (1997); The fate of traditional extensive (gei wai) shrimp farming at the Mai Po Marshes Nature Reserve, Hong Kong; *Hydrobiologia* 352: 295-303, Kulwer Academic Publishers

For further information contact:

Mangrove Action Project
4649 Sunnyside Ave. N. #321
Seattle WA 98103
USA

Email: mangroveap@olympus.net
Web-site: http://www.earthisland.org/ei/

WWF Hong Kong
GPO Box 12721
No 1 Tramway Path
Central
Hong Kong

Tel: +852-2526-1011
Fax: +852-2845-2734
Email:wwf@wwf.org.hk
Web: http://www.wwf.org.hk

The Shrimp Tribunal
1200 New York Avenue, N.W., Suite 400
Washington, D.C. 20005
USA

Web-site: http://www.earthsummitwatch.org/shrimp

Farming of Giant Clams Provides Low-cost Income Generation and Food for Coastal Villages in the Solomon Islands

*Giant clams are the largest bivalve molluscs in the world and live in tropical seas in the Indo-Pacific. All but one species (*Tridacna crocea*) are on the IUCN Red List of Threatened Animals as a result of over-collection for food and commercial purposes, and poaching by foreign fishing vessels. The conservation and management of giant clams in the wild has benefited from the development of clam farming in the South Pacific largely carried out by village-based initiatives.*

Introduction

In Pacific countries, with their limited land and freshwater resources, clam mariculture is seen as a way of diversifying narrowly based economies. It can provide food and employment for small-scale farmers and fishermen without impacting too heavily on traditional lifestyles and can earn foreign exchange. Clam mariculture can also provide clams to restock depleted coral reefs and increase populations of the rarest species.

Several village–based initiatives in the Solomon Islands illustrate one of the key objectives of *Agenda 21* which aims:

> *To encourage a decentralization decision-making process through the creation and strengthening of local and village organizations that would delegate power and responsibility to primary users of natural resources. (32.5 (a))*

Clams are the largest bivalve molluscs in the world. They are also an important source of food. Giant clams have formed part of the diets of pacific islanders and coastal dwellers in the tropical Indo-Pacific region for thousands of years. They continue to be harvested for their meat and shells for both subsistence and commercial purposes and, more recently, for live specimens for use in the aquarium trade. There are no detailed figures on current subsistence use but it has been estimated at about 200 tonnes of meat a year. There are small, largely unquantified, domestic markets for meat for local consumption in most countries within the distribution range of giant clams.

Eight of the nine giant clam species (family *Tridacnidae*) are on the IUCN Red List of Threatened Animals (half as 'Vulnerable' and half as 'Lower Risk-Conservation Dependent') and some species are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Wild stocks of the larger species (*Tridacna derasa* and *T. gigas*) have declined dramatically in recent years as a result of over-exploitation for their meat and shells, and populations have become extinct in many areas.

Research over the last 12 years has shown the potential for farming clams, resulting in considerable interest and investment in this activity. As with some other valuable marine food species, mariculture may prove to be one solution to ensure the continued supply of clams.

Although it is a relatively recent development compared with the culture of other marine molluscs, clam mariculture is of particular interest, both because of the threats to wild clams and because farming is relatively easy.

Since the late 1980s it has been technically feasible to spawn mature giant clams and to raise larvae and juveniles to maturity in captivity. The growth rates of some species are much faster than previously believed (up to 10cm/year for *T. gigas*) and their symbiotic relationship with algae makes them the world's first self-feeding farm animals. The breeding and rearing techniques are relatively easy, and the ocean grow-out phase is technically simple. Clam mariculture requires little capital investment and is suitable for local communities. Furthermore, the period and timing of harvesting is flexible as clams can be stored *in situ*. Clams occur naturally at high densities and therefore many can be stocked in a small area. Clam mariculture does not require the continued capture of broodstock or the taking of seed from the wild, and is potentially less damaging than many other forms of marine farming.

In many Pacific countries, access to giant clam stocks is controlled by traditional reef tenure systems which have evolved over many years, and clams are subject to traditional fishing rights along with other fishery resources. The support of local people and their involvement at all stages in management has thus been important. Village-based clam mariculture projects have been set up in the Solomon Islands, Tonga and the Philippines, and are being introduced in several other countries.

Giant clam farming is particularly suitable to villagers living near coral reefs as there is very little impact on the coral reef environment. Farms can be designed to be economically viable at the village level, and production potentially has a number of different markets, including sale of giant clams for food, aquaria and shellcraft.

Activities

In the Solomon Islands, a programme to assess the viability of village farming and restocking of a variety of giant clam species has been running since the mid-1980s. Co-ordinated by the International Centre for Living Aquatic Resources Management (ICLARM) Coastal Aquaculture Centre (CAC) in the Solomon Islands and is based on the establishment of mutual co-operation between participating villagers and researchers. Between 1989 and 1996 small-scale trials were established in 52 coastal villages.

The objectives of the village farming projects are to:

- Identify optimum growing conditions and husbandry methods for five species of giant clams in coastal villages.

- Obtain robust estimates of growth and survival of five species of giant clams from a wide range of coastal village farming sites.

- Train village farmers and key regional fisheries personnel in the efficient and profitable culture of giant clams.

- Develop markets for giant clams in the seafood trade and aquarium industry.

- Maintain genetically diverse Fl broodstock of five species of giant clam as the basis for future hatcheries throughout the Asia-Pacific.

- Supply giant clam larvae, and training in the rearing of giant clams, to countries in the Asia-Pacific region where these have been overfished or extinguished.

- Transfer methods for propagating and growing giant clams to the private sector in the Pacific.

- Develop cost-effective methods for restocking giant clams.

It is hoped the project will provide a firm basis for a sustainable increase in the productivity of coral reefs through the farming and restocking of giant clams. It will also yield important information on the commercial viability of small-scale village farms for giant clams. At the conclusion of the project, ICLARM will be in a position to provide advice to national agencies on the nature of markets for giant clams, and the costs and benefits associated with farming and restocking. The maintenance of adequate broodstock, and the delivery of larvae and grow-out technology to a variety of countries, will facilitate the continuation and expansion of giant clam farming, and the re-establishment of wild stocks throughout the Asia-Pacific.

In 1997 production from CAC's nursery resulted in the distribution of 70,000 giant clam 'seed' to coastal villagers. In addition, one Solomon Islander received a grant to construct his own clam hatchery and receive training in the larval rearing of giant clams. The distribution of 'seed' has been complemented with a series of training courses and workshops for village-based participants both at the main hatcheries and at village nursery sites.

Results

Clam mariculture has proven to be successful in the 52 villages and revenue has been generated from several sources. *T. derasa* has proved to be the most successful species in terms of growth and survival, and has been proved to be the greatest revenue earner from sales to the aquarium market. There are efforts to test the seafood markets for this species in Asia.

Many of the hatcheries and village-based grow-out operations also produce clams for restocking depleted reefs. It is too early to judge the success of giant clam "farming" in terms of conservation, but by supplying the clam meat market and by partially fulfilling demand for aquarium specimens, exploitation of wild stocks may be reduced. Public awareness of the need for sustainable management of giant clams and coral reefs has certainly increased, particularly through the development of village- and community-managed clam farms.

The mariculture system is continuing to be improved and developed, and improvements in the production system are being made following research and development. For example, the production results of the village-based farms so far have also highlighted the importance of protecting clam seed immediately after delivery to grow-out sites. They have also indicated that the most critical stage for village farming of giant clams is during the initial weeks and months following seed distribution.

Lessons learned

Aquaculture and mariculture projects can contribute to sustainable management of marine species and to the improved livelihoods for coastal communities. Giant clam mariculture has undoubtedly played a major role in increasing public awareness of the need for sustainable management of giant clams and coral reefs. It is also being promoted as an alternative or supplementary livelihood in coastal communities which, if successful, could help take pressure off other fisheries.

Motives for local farmers' participation in the village trials range from conservationist concerns to the commercial interest of small-scale entrepreneurs. The farms that have been particularly successful are those run by family units.

The success of innovative community-based mariculture projects, such as giant clams, may depend on sufficient training and outreach to ensure that participants understand the principles involved and the methods to be used. The success of the community projects in the Solomon Islands depends on careful husbandry by farmers, in particular to ensure that predation is controlled. Where villagers have not tended their clams carefully enough, total mortality can result. Regular site visits from fisheries extension officers or hatchery staff to check on progress and encourage farmers are helpful in keeping farmer activity at required levels. In the Solomon Islands, CAC staff visit village sites every three months. It is thought that greater long-term involvement may be necessary, however, if village farms are to meet their full potential. Participants and sites must also be very carefully selected to ensure that the former are committed and the latter are ecologically suitable. Participants must be prepared for a constant, although low level, labour input for several years, until clams reach marketable size.

This case study has been based on a report by Sue Wells prepared for the IUCN Species Survival Unit: *Giant Clams: Status, Trade and Mariculture, and the Role of CITES in Management*, 1997, as well as various documents provided by ICLARM.

For further information contact:

Coastal Aquaculture Centre
PO Box 438 Honiara
Solomon Islands

Tel: +677-29255
Fax: +677-29130
Email: ICLARM-Solomon@cgiar.org
Web: http://www.cgiar.org/iclarm/