

Task Order No. 832

USAID Contract No. PCE-I-00-96-00002-00

**Egyptian Environmental Policy Program  
Program Support Unit**

**Tranche 2, Objective 2**

***Red Sea Mooring Strategy***

***Philip A. Jones, Marine Solutions Co., El Gouna***

April 2002

PSU-62

for  
**U.S. Agency For International Development  
Cairo**

by  
**Environmental Policy & Institutional Strengthening  
Indefinite Quantity Contract (EPIQ)**

**A USAID-funded project consortium led by International Resources Group, Ltd.**

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## Fact Sheet

<b>USAID Contract No.:</b>	PCE-I-00-96-00002-00
	Task Order No. 832
<b>Contract Purpose:</b>	Provide core management and analytical technical services to the Egyptian Environmental Policy Program (EEPP) through a Program Support Unit (PSU)
<b>USAID/Egypt’s Cognizant Technical Officer:</b>	Holly Ferrette
<b>Contractor Name:</b>	International Resources Group, Ltd.
<b>Primary Beneficiary:</b>	Egyptian Environmental Affairs Agency (EEAA)
<b>EEAA Counterpart:</b>	Eng. Dahlia Lotayef
<b>EEPP Policy Objective:</b>	Provide protection for the Egyptian Red Sea coral reefs, islands, and linked ecosystems of importance
<b>Work Assignment Supervisor:</b>	Dr. Jan Laarman

## Preface

Through competitive bidding, the U.S. Agency for International Development (USAID) awarded a multi-year contract to a team managed by International Resources Group, Ltd. (IRG) to support the development and implementation of environmentally sound strategic planning, and strengthening of environmental policies and institutions, in countries where USAID is active. Under this contract, termed the Environmental Policy and Institutional Strengthening Indefinite Quantity Contract (EPIQ), IRG is assisting USAID/Egypt with implementing a large part of the Egyptian Environmental Policy Program (EEPP).

This program was agreed-to following negotiations between the Government of the United States, acting through USAID, and the Arab Republic of Egypt, acting through the Egyptian Environmental Affairs Agency (EEAA) of the Ministry of State for Environmental Affairs, the Ministry of Petroleum's Organization for Energy Planning, and the Ministry of Tourism's Tourism Development Authority. These negotiations culminated with the signing of a Memorandum of Understanding in 1999, whereby the Government of Egypt would seek to implement a set of environmental policy measures, using technical support and other assistance provided by USAID. The Egyptian Environmental Policy Program is a multi-year activity to support policy, institutional, and regulatory reforms in the environmental sector, focusing on economic and institutional constraints, cleaner and more efficient energy use, reduced air pollution, improved solid waste management, and natural resources managed for environmental sustainability.

USAID has engaged the EPIQ contractor to provide Program Support Unit (PSU) services to EEPP. The PSU has key responsibilities of providing overall coordination of EEPP technical assistance, limited crosscutting expertise and technical assistance to the three Egyptian agencies, and most of the technical assistance that EEAA may seek when achieving its policy measures.

The EPIQ team includes the following organizations:

- Prime Contractor: International Resources Group
- Partner Organization:
  - Winrock International
- Core Group:
  - Management Systems International, Inc.
  - PADCO
  - Development Alternatives, Inc.
- Collaborating Organizations:
  - The Tellus Institute
  - KBN Engineering & Applied Sciences, Inc.
  - Keller-Bliesner Engineering
  - Conservation International
  - Resource Management International, Inc.
  - World Resources Institute's Center For International Development Management
  - The Urban Institute
  - The CNA Corporation.

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## Contents

BACKGROUND OF RED SEA MOORING BUOYS .....	1
ASSESSMENT AND MAPPING OF CURRENT STATUS OF MOORING SYSTEM AND CRITERIA FOR INSTALLATION OF NEW MOORINGS .....	4
MANAGEMENT OF MOORING LOCATIONS .....	6
MOORING DESIGN AND TECHNICAL CONSIDERATIONS .....	7
POSSIBILITIES FOR PARTNERSHIPS .....	8
FINANCING AND COST RECOVERY RECOMMENDATIONS.....	11
PUBLIC AWARENESS AND ENVIRONMENTAL EDUCATION.....	13

## Background of Red Sea Mooring Buoys

In 1992, fifteen of the larger diving centers in Hurghada set up the Hurghada Environmental Protection and Conservation Association (HEPCA). HEPCA continues to operate as a nonprofit, Non-Governmental Organization (NGO) within the Red Sea Governorate.

The primary concern of the Association is the protection and conservation of the marine ecology and the underwater environment. The founders were concerned that the tremendous boom in recreational diving tourism and the general large-scale development of Egypt's Red Sea as a tourist destination was destroying the coral reefs surrounding Hurghada.

In addition to initiating a public awareness and education campaign on the fragile ecosystem, the installation of fixed moorings in the rapidly-developing Hurghada area was a priority in the organization's early days. An early HEPCA document states: "The deployment of permanent moorings offers quick and effective means of protecting coral reefs from anchor damage; it also helps build community support for reef conservation and management." Prior to the establishment of HEPCA, individual dive operators themselves had rigged a few mooring systems of their own design and at their own expense.

To this end, HEPCA set about in the early 1990's the goal of installing 100 subsea mooring systems. Nearly US\$50,000 was raised towards this goal, with nearly 60% of this figure coming from contributions of the Hurghada diving centers themselves. The rest came from the collection of membership fees, voluntary diver donations, and the sale of posters and other promotional materials.

After careful research, the association decided upon two types of mooring anchors, the "Manta Ray<sup>®</sup>" and the "Halas" system (Figure 1), both of which are widely used on coral reefs and marine sanctuaries throughout the world. John C. Halas, inventor of the Halas mooring system and an employee of the Florida Key Largo National Marine Sanctuary, came to Egypt in the mid- 1990's to train divers and to assist in the installation of the first mooring buoys in Hurghada, with only the cost of his travel and accommodation covered. A prominent SCUBA equipment manufacturer, ScubaPro/Benelux, specially produced and donated 100 mooring buoys, which were imported into Egypt by the Tourism Development Authority; 70 of the buoys were used in Hurghada, and 30 in Safaga.

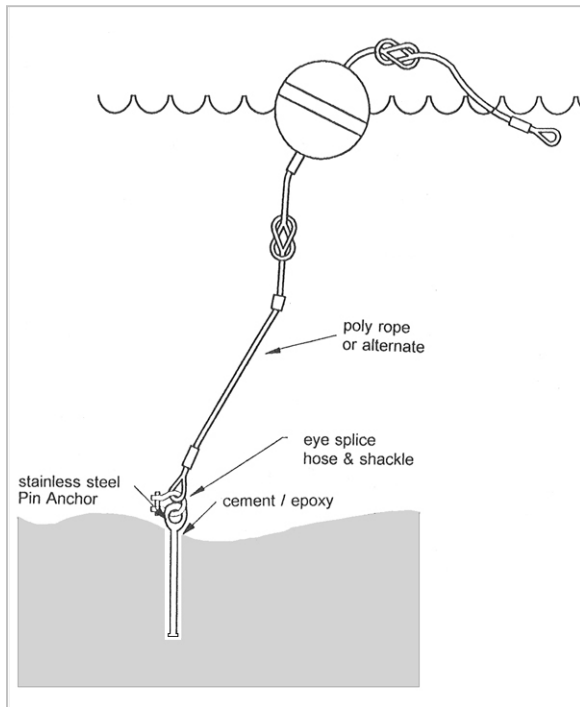
HEPCA further received several large coils of plastic rope, stainless steel cables, and chains and shackles for the securing of the mooring buoys to the anchors. It also received pre-spliced lengths of plastic rope for use as pick up lines. These were financed by the Ministry of Tourism, several donations by Egyptian businessmen, and funds raised by HEPCA.

In a report at the end of 1993 by HEPCA's technical advisor, it was noted that 76 anchors and 48 buoys had been installed, but the goal of the installation of 100 anchors was not achieved due to budget limitations. In addition, informational fliers regarding the proper use of mooring buoys was printed in Arabic, English, and German and was distributed to dive centers and boat captains (Figure 2).

Soon after the buoy installation, HEPCA became aware of a problem of disappearing buoys. It was found that the "indestructible" buoys were prone to cracking and then filling with water, causing them to sink to the bottom. Many were also damaged and destroyed by incompetent boat captains, or were stolen or removed by unknown parties. The association

undertook to solve the problem by filling the remaining buoys with industrial two-component foam which would enable the buoys to float despite the cracks in the plastic moldings. A further report in February 1995 concluded that there were a minimum of 50 fully-operational mooring buoys in place between September 1994 and January 1995.

**Figure 1 One type of mooring (Halas system) used in Red Sea**



Over time, it became clear that the installation of moorings alone did not prove to be an effective means of protecting the reefs, as there was no real enforcement of laws or regulations regarding their use. As a result, boats continued to anchor on reefs and more buoys disappeared through misuse of the moorings. Efforts began to also focus on further legislation for protection of the Red Sea, as well as means of enforcement and training.

With the establishment of the EEAA Red Sea Rangers in Hurghada, and some penalties being implemented to boats anchoring on the reefs, attitudes to mooring on the reefs and using the buoys started to change.

**Figure 2 Bilingual informational flyer (front and back sides) produced by HEPCA and USAID about the mooring system**

IN 1995, HEPCA became part of a USAID-funded program, the USAID Ecotourism Initiative for the Red Sea coast of Egypt. USAID supported the placement of an additional 200 mooring systems through HEPCA, which took responsibility for their installation and maintenance. To date the project has installed over 500 moorings at dive sites along the Red Sea coast of Egypt, from Northern Hurghada down to the deep South and offshore islands. Many informational and public awareness materials were also produced during that time.

In December 1999, USAID ceased to fund HEPCA. HEPCA has struggled to continue to provide mooring installation and maintenance with alternative funding sources, which were inadequate for the task at hand. Of the moorings installed by HEPCA in the southern zone, some reports suggest that over 80% are unusable for various reasons. Moorings in the Hurghada area are in need of maintenance, as many buoys are missing or ropes snapped, and many sites are in need of additional moorings. Limited funding from the Red Sea Governorate reinvigorated HEPCA late in 2001, and at the time of this writing many stakeholders, including HEPCA, diving centers, diving safari boat operators, and the EEAA are seeking to cooperate to come up with a mooring plan that will meet the needs of both users and conservationists.



## Assessment and Mapping of Current Status of Mooring System and Criteria for Installation of New Moorings

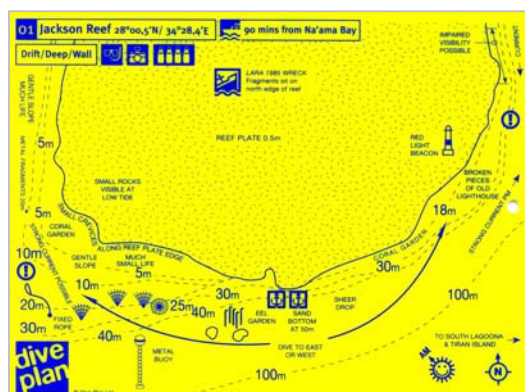
The basis of a mooring strategy needs to come from an accurate assessment of the following:

- The current number of day boats and safari (overnight) boats operating in the area
- Where the boats are departing from and where they will go, *i.e.*, pre-determined destinations
- Expected developments and trends affecting usage of sites (*e.g.*, development of the southern area of the Egyptian Red Sea)
- What the average demand on each site is, including new sites (how many boats, how many divers and snorkelers on average?)
- The number of existing moorings at each site and their condition and maintenance needs
- The estimated diver carrying capacity of each existing or new dive site

HEPCA, the Red Sea Association for Diving and Watersports (RSADW), and the Governorate offices can most likely provide rough numbers for the first two questions. In addition, each boat is required to keep a “boat book” which lists the numbers and names of divers for each trip; this log is the basis for the amount of fees paid, and is expected to be a reasonably accurate record of the numbers of divers and boat trips.

The issue of current load/demand on each site can be determined by enlisting the support of dive operators who have boats out on these sites daily. Experienced dive guides can be “deputized” by EEAA and trained to fill out a simple form. The form could include information on the number of boats at the site, seasonal variations in weather and usage, sea conditions, how many moorings are currently present, what type of moorings, and their conditions.

**Figure 3 Dive map showing mooring locations**



HEPCA and the Red Sea Rangers can provide information as to how many moorings have been installed at each site and their location, so the guides will know where to look for damaged mooring systems to report on their status. Also, these deputies will be asked to give their experienced opinions of the optimal maximum number of divers at the site. In other words, at what point does a merely crowded diving experience become dangerous either to the environment of the site or to the divers themselves?

Standardized maps to mark the location of the moorings should be prepared (Figure 3 is an example), and can also include dive site plans. Presently, many dive centers have their own maps drawn by individual staff and dive guides, with as many variations. It would be

possible therefore to search for the best done of these maps, and hire the guide whose maps are both artistic and accurate to create a complete set of standardized maps. The maps should have the GPS positions of the moorings marked, as well as a dive plan. Once standardized the maps could then be reproduced in various forms, such as one to be sold to visiting divers as a form of revenue and as a souvenir, and others to be used as 'on boat' briefing charts with mooring location clearly marked. The official "HEPCA Dive Guide" produced previously lacked clearly marked mooring locations. Using such standardized maps, deputized dive guides can be involved in keeping track of the ongoing maintenance needs of the moorings.

Once the basic data have been collected, a consultant expert on carrying capacities of coral reefs can be engaged to estimate the carrying capacity (*i.e.*, the maximum number of diver-days a site can withstand without environmental damage) of each site.

## Management of Mooring Locations

Results of periodic monitoring of reefs and island dive sites by the EEAA Rangers, combined with suggestions of dive guides, can yield recommendations for temporary site closures. Individual dive sites should be closed for some period of time when it is determined that environmental degradation has occurred because of overuse, or because the sites are seasonally as nursery grounds for valued marine species.

As far as the offshore islands are concerned, the Brothers Islands and Carless Reef should be closed both seasonally—in winter—and on bad weather days during the remainder of the year, as conditions during these periods are unsafe for both divers and for good environmental practices. Under those conditions, moorings break and boats can get grounded in high winds and waves. It is also worth considering some sites as closed areas or limited use areas.

**Figure 4 The HEPCA/USAID training guide for vessel captains**



Management of the moorings must include training of the vessel captains in proper use and maintenance of the mooring buoys and lines. One of the leading causes of mooring damage is improper use of the moorings, including for examples, physical damage by ramming, and tying of too many boats to a single mooring. The captain training program that was instituted by HEPCA and USAID several years ago should be re-initiated; Figure 4 shows the training booklet that was developed by HEPCA using USAID funds in 1997. The guide was served as basis of classroom instruction in both general boat and handling and seamanship, as well as environmental sensitivity and mooring buoy use.

A fixed VHF channel operated by the EEAA or a radio station can keep dive and boat operators abreast of site closures and sea conditions. A fixed VHF channel can also work as an emergency channel, as well as a medium for reporting witnessed violations.

With such a large area of coastline and offshore reefs and islands to cover, there definitely needs to be an increase in the number of rangers and patrols. This would of course increase the level of awareness and decrease the number of violations but also increase the profile of the project amongst users. More boats would indeed be necessary to allow for a greater coverage of patrols in the field. Boats and rangers need to be based in the different areas such as Northern Hurghada, Safaga and the South.

## Mooring Design and Technical Considerations

A major consideration in the original design and current update of the mooring system is the length of vessels for which the moorings are designed. Originally, the moorings were expected to accommodate 1-3 vessels of about 16m in length (representing the typical dive boats in the Red Sea in the early 1990's). Over time, the moorings have become increasingly stressed because (1) many more boats are tying up to the moorings (6 to 7 are not unusual now), and (2) the average length of vessel has increased to 20 to 24 m for daily boats, and 28 to 30m for the increasing number of safari boats.

The Manta Ray embedment anchors (M/R's) and the Halas pin systems are still the best option for mooring anchors in coral reef environs and can be used in most types of substrate conditions found in the Red Sea (sand, hard coral rock, coral rubble, etc). For sand and coral rubble substrates M/R's should be used. For heavier boats or more exposed locations with rougher seas, the installation of two M/R's (largest size M/R available = MR-SR) is required. The M/R's should be placed 2-3 meters apart and bridled together with shackles, chain, and a fixed swivel for the mooring/buoy line.

Halas pins should be used on hard coral reef flats and reef tops. For heavier boats or more exposed locations with rougher seas the installation of two pins is recommended. The pins should be placed 1 to 3 meters apart and bridled together with shackles, chain, and a swivel (fixed at the center of the chain) for the mooring/buoy line. The pins can be manufactured and procured locally, and as they are much cheaper and install much more quickly than the Manta Ray anchors, they should be used whenever conditions permit. The diameter of the stainless steel rod used in the pins should be increased to 22mm.

U-bolts, the u-shaped anchors sold by mooring suppliers, are impractical under Red Sea conditions because the distance between the anchoring parts (the two legs of the U) are fixed. It is difficult to find a place at most reef sites that would allow for the correct substrate conditions to drill two suitable holes so exactly spaced.

For heavier boats or more exposed locations with rougher seas, ropes of greater thickness than has been used in the past are required; the size should be increased from  $\frac{7}{8}$  or  $\frac{3}{4}$  inch to  $1\frac{1}{2}$  to 2 inches in diameter. All ropes have to be floating type and must be UV resistant to hold up under the constant sun input.

Plastic fishermen's buoys can be used for the surface floats. They are smaller than the big, high-profile mooring buoys, but are adequate for floating the mooring line. The advantage is that they are significantly cheaper to replace. Based on past experience, mooring buoys require frequent replacement. Of course, larger lines will require larger buoys.

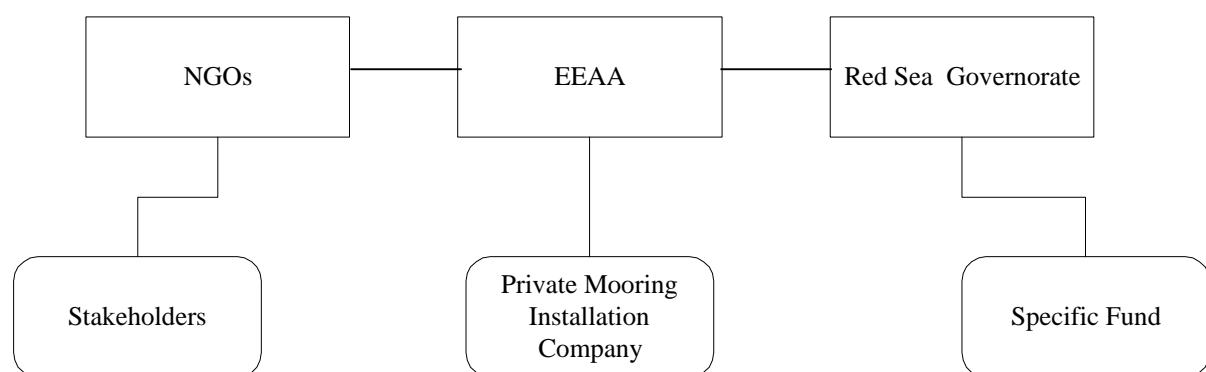
Alternative mooring systems, such as concrete-filled drums, concrete blocks, and putting chain around large coral heads, were initially used by early dive operators. They are not a viable alternative at this time, however, as the tonnage required for an adequate mooring for a typical safari boat or larger daily dive boat would mean a concrete block approximately the size of an automobile. For aesthetic and practical reasons, this is not a desirable scenario.

## Possibilities for Partnerships

Interested parties in the conservation of the Red Sea reefs and marine resources include (1) resort owners, investors, and developers, (2) dive centers and their individual personnel, (3) boat owners and operators, (4) non-governmental organizations (NGOs), (5) national, regional, and local governments, and (6) international donor and environmental activist organizations. All of these parties can contribute to a cooperative relationship with common goals.

The organizational structure of cooperative mooring program could use the NGOs (HEPCA and/or the RSADW), the national government (represented by EEAA), and the local government (the Red Sea Governorate) as the three principal organizational elements:

**Figure 5 Organizational Structure of a Cooperative Mooring Program**



An NGO such as HEPCA or the RSADW is the logical umbrella organization to represent stakeholders. This organization should set regulations and standards as well as create "Best Practices" guidelines for members. The NGO can also spearhead much of the public awareness activities, such as the production of educational materials, brochures, posters, etc., with the technical supervision and support of the EEAA Red sea Rangers. Part of this public awareness should include education of boat captains on proper mooring use, and on best environmental practices.

The EEAA, with the close cooperation of the Coast Guard and Red Sea Governorate, is in the best position to focus on patrolling and law enforcement. Patrolling for and responding to reports of environmental violations and monitoring the coral reefs and overall environment for health is the primary role of the EEAA in this scheme.

Installation of the moorings is best left to a private company for the following reasons:

- Standards of quality and expectations can be specified, with examples of materials to be used a requisite for contract
- A private contractor has a principle of ownership, and will not get paid if standards not upheld
- Frees up EEAA to focus on patrolling and environmental monitoring
- Frees up NGO to focus on maintenance of moorings, public awareness, and relations with stakeholders

- Both HEPCA’s and EEAA's experience of privately hiring commercial divers to do installations has not proven cost effective
- The installer can take responsibility for procuring equipment and materials, freeing up EEAA from lengthy and burdensome process

Cooperation is still needed in the installation process, however, as the installers could travel with their equipment to the sites on dive boats, and a representative from the EEAA (such as a Ranger) should accompany the field team to provide (1) quality control, (2) assurance that the mooring sites are accurately placed on the standardized map, and (3) accurate GPS coordinates taken at each installation. The installation teams should be equipped with an inflatable boat, so that ropes and buoys can be tied on by different team members than the installers of the anchors. Experience has shown that, on average, three Manta Rays, or three to five pins, can be installed in one day by an experienced team.

Maintenance of the mooring systems is differentiated from installation. Maintenance is a job best handled by the stakeholders (specifically the boat owners and operators) themselves, as it will have the following benefits:

- If the stakeholders do the maintenance, they will feel ownership and will be more inclined to use them correctly, as well as urge the strict compliance of other boats; the users in effect become self-policing
- Maintenance usually requires simple tasks such as retying a rope or replacing a buoy, and thus very little special training is needed
- Ropes and buoys can be supplied by the EEAA as needed to HEPCA, with the dive centers interacting directly with HEPCA and signing out for the required mooring maintenance items

There are boats at almost every dive site almost every day, so no special boats will be required for maintenance purposes.

The role of the Red Sea Governorate is to provide funding via the creation of a fund for mooring activities, fed by the special environmental fees and taxes levied on divers. Furthermore, the Governorate is a partner in law enforcement.

To summarize these roles:

NGO	EEAA Rangers	Red Sea Governorate
<ul style="list-style-type: none"> <li>• represents stakeholders</li> <li>• spearheads public awareness activities and materials</li> <li>• self-regulates compliance with best practices</li> <li>• collaborates with sponsors and fundraising</li> </ul>	<ul style="list-style-type: none"> <li>• channel and manage donor funds</li> <li>• patrols for environmental compliance</li> <li>• monitors environmental habitats, impacts</li> <li>• sets plan for site management, closures</li> </ul>	<ul style="list-style-type: none"> <li>• cooperates with enforcement of regulations</li> <li>• sets aside revenues from environmental taxes and fees to special mooring fund</li> </ul>

<b>NGO</b>	<b>EEAA Rangers</b>	<b>Red Sea Governorate</b>
<ul style="list-style-type: none"> <li>• coordinates mooring maintenance done by stakeholders/dive operators</li> <li>• updates mooring status</li> </ul>	<ul style="list-style-type: none"> <li>• contracts with private mooring installation company, oversees, provides quality control</li> <li>• manages mooring installation plan</li> </ul>	

## Financing and Cost Recovery Recommendations

Financing of mooring maintenance and installation is multilevel. The largest source of funding will most likely come from a fund managed by the Red Sea Governorate, generated by the environmental tax and protectorate fees. Part of this fund should be funneled into a separate, specific fund for moorings, with a grant given to the NGO managing maintenance, data collection, and public awareness from this fund. Part of this fund should also go to the EEAA for the purpose of mooring installation and a mooring contractor and other activities directly related.

The NGO can also legally carry out fundraising activities that donors and government agencies can not do, such as the sale of diving site guides and other material such as posters or maps and solicit and manage direct donations and grants. In the past, major companies have indicated their willingness to sponsor mooring activities by providing buoys, for instance, in exchange for their logo appearing on the buoys, or on printed materials. Fundraising activity and collection boxes are also good public relations opportunities.

**Figure 6 Sample divers' tags**



Another important introduction would be for small (approximately 4cm diameter) diver tags for the Red Sea Marine Park, like the plastic tags that originated at the Bonaire Marine Park in the Netherlands Antilles in the Caribbean Sea, and are now also used at Bunaken National Park in Indonesia (Figure 6). All divers get the tag when visiting (and paying to enter) those marine parks. The tags at those places are good for one year (but

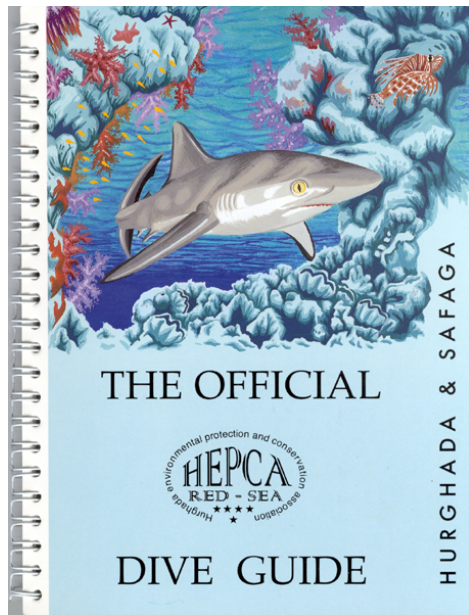
could be for different periods of time in the Red Sea), and works as both proof of payment and as a souvenir of which most divers are proud to show that they have contributed to. The tags are typically clipped onto a dive bag or BC, and are a lasting reminder of the diving experience that most divers appreciate and are willing to pay for.

A well-produced Dive Guidebook (Figure 7) with reef and mooring maps can be a source of revenue (as well as serve as an environmental education tool) by selling the reproduction rights to dive centers, who can to produce the books with their own logos and advertising materials. As with the diver tags, these books would be lasting mementos of the Red Sea diving experience.

Boat captains should be required to attend workshops once a year to keep them updated on new mooring locations and mooring practices. Incentives such as certificates, badges, hats, or T-shirts should be provided. As there are upwards of 600 boat captains in the Red Sea Governorate, this requires that workshops be given at least 2 times a month. Attendance at the workshop will also provide an opportunity to deputize captains as auxiliary rangers, and they can then serve as powerful peer influences in getting boat captains throughout the region to comply with best mooring practices.

**Figure 7 Current HEPCA Diving Guide**





While diving operators will participate by (1) providing boats, (2) supplying customers who pay fees and taxes, and (3) paying membership dues to one or more NGOs, it is still essential that other large stakeholders that benefit from the diving conditions somehow contribute to its upkeep as well. A simple solution would be to charge hotels and resorts a percentage of the monthly rental fees of their diving centers. For example, if the fictitious Sunken Treasure diving center pays LE25,000 per month in rent to Pirates' Cove Holiday Resort, Pirates' Cove would be required by decree of the Governor to pay 2% of this revenue into the specific environmental fund or to the responsible NGO directly. Imposing an airport tax for all visitors would also spread the burden of caring for the environment to a larger spectrum of those who benefit from a better environment.

For the last two years there has also been in existence an 'Environmental Tax' which has been levied on Dive Centers in the Red Sea Governorate by the local authorities. Every water sports and dive center must pay LE 3.50 for each diver per day and LE 2.00 for each snorkeler per trip. Each center must keep a log of the number of divers/snorkelers on a daily record sheet and also in an 'official' book that is purchased from the Red Sea Governorate offices in Hurghada. This is then collected more or less on a weekly basis by local government representatives.

Any such environmental or mooring funds should have transparent accounting methods and should report on revenues and expenditures. Surveys have shown that many of the stakeholders, and many of the visitors to the Red Sea, are willing to contribute monies for environmental conservation, *provided* that they are convinced that the monies are demonstrably well used.

A key sustainable funding component would be to preserve and restrict access to the best, most pristine diving sites and then generate more revenue from them. This can be done by closing them periodically and then charging more money to dive there. By generating more money out of less divers, less damage will be done to the sites. Closure of sites for a season or a year generates excitement about their reopening, and divers may return to dive on sites that were closed on an earlier diving trip. Pristine sites in the south are the primary candidates for the closure system.

## Public Awareness and Environmental Education



Public awareness is key to the success of a mooring strategy. Fundraising provides an inherent opportunity for public awareness, so it follows that the NGO representing the stakeholders in the mooring strategy take the lead in public awareness activities. Sponsors can be cultivated and publications produced, activities undertaken with donations and sponsorships. As interaction with stakeholders and the public is a central role of the NGO, the leader of this organization should be personable and centered on cultivating relationships, with strong communication skills.

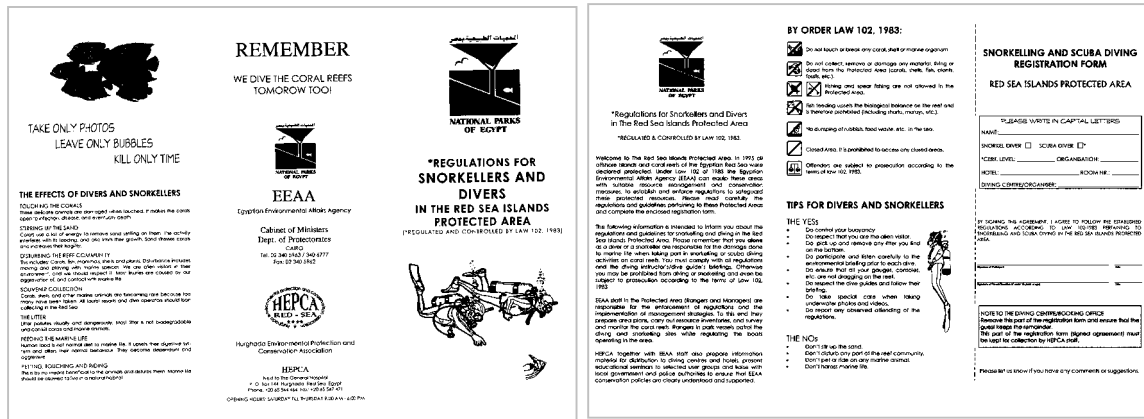
Visible markers of environmental protection efforts, such as stickers (Figure 8), posters, badges, etc., provide evidence that such an effort exists and help people see where their money is going. Simple items such as a donation box where badges or stickers are available in exchange for a small donation go a long way in spreading awareness. Large stickers or alternative media with pictograms outlining the rules of the sea should be highly visible on boats, dive centers, and sign posts throughout the region.

Trifold brochures that are printed on both sides of standard A4-sized paper and folded in three parts (Figure 9) are very cost-effective means of producing public awareness materials for wide distribution. These have been used in the past and have been successful in bringing the environmental conservation message to visitors and the local populace alike. They can and should be produced in several languages.

Hotel staff are another target of increasing public awareness. They routinely do grounds clean up of their own resorts, and understand proper disposal of hotel garbage, and it is important for them as members of the community to continue proper garbage disposal outside of the resort. Special attention and training should be given to 'beach boys' who are dealing with the public everyday and are in a unique position to educate and even prevent

**Figure 8** Adhesive awareness sticker used in the EEAA South Sinai Protectorates

Figure 9 Three panel brochure with regulations for snorkelers and divers



regularly occurring environmental infringements, such as taking corals or shells from the beach, and standing on the reef during swimming and snorkeling. The ready availability of inexpensive fliers such as described above would be a key component of this strategy.

The public awareness component of a typical Ranger's activities in the United States, Australia, or other world wide locations is substantial; as much as 40% of Ranger activities in the Florida Keys National Park are devoted to public contact and awareness raising. The EEAA Rangers should adopt a similar functional role, and are in the best position to do public outreach and awareness through at-sea visits (concurrent with enforcement), public speaking, and school programs.