



# Biodiversity Conservation at the Landscape Scale

A Program of the Wildlife Conservation Society Supported by the USAID/EGAT Global Conservation Program

## Glover's Reef Living Seascape: Safeguarding Marine Resources and Rural Livelihoods in Belize

### Annual Report

October 2003 – September 2004

#### I. Summary of Activity Status and Progress

##### a. Introduction/Summary

The Glover's Reef Living Seascape project aims to conserve the outstanding biodiversity and natural beauty of Glover's Reef Atoll. It is one of the globally significant landscapes included in WCS' GCPII/USAID portfolio of conservation sites, and the first coral reef site to be adopted under the WCS Living Landscapes program. This program seeks to develop and test wildlife-focused strategies that will resolve conflicts between people and wildlife that threaten important wild places and the biodiversity they support. The approach is threats-based and highly participatory. Key threats to the Atoll's biodiversity include unsustainable fishing, lack of alternatives for fishermen, impacts of global climate change, nutrification and high turbidity of the Atoll's lagoon, lack of support for the marine reserve by some stakeholders, insufficient information for strategic conservation management, and lack of long-term financing. The objectives of the project are specifically geared towards reducing these threats through the development and implementation of a multi-partner conservation strategy.

The Glover's Reef Living Seascape project remains on track for most of the activities planned for this reporting period. Significant progress has been made on almost all aspects of the project's three objectives, namely to develop and adopt a participatory strategy to reduce threats to marine life at Glover's Reef, to develop and implement sustainable and adaptive mechanisms to strategically address threats across the seascape, and to learn and teach best practices in the Glover's Reef Seascape and beyond. Under the first objective, a major achievement was the completion of the threats assessment, which was carried out in consultation with the stakeholders. During this process the stakeholders were also introduced to the living seascapes program. The assessment was considered so successful by the participants that assistance with a similar exercise has been sought from LLP NY coordination Unit and project staff for two additional atoll sites, Turneffe Islands and Lighthouse Reef. A second important achievement under this objective was the selection of the suite of seascape species for the atoll, which was completed by both scientific expert and stakeholder participation. An additional outcome of this selection process is a draft set of recommendations to refine the method for application to tropical marine sites.

Under the second objective, several training activities were completed including two capacity building workshops for the Glover's Reef Advisory Committee. These led directly to two Committee meetings being held, and a third scheduled for October 2004, signaling that the Committee is active once again

and meeting on a regular quarterly basis. We will need to sustain this level of interest and enthusiasm, and foster a strong working relationship between the reserve management staff and the Committee members. A WCS Research Fellow also led a training workshop for reserve biologists on monitoring of commercially fished species within marine protected areas.

Another notable achievement was the launching of the fisheries data collection program for the Atoll. This involved a survey of fishermen in the main fishing communities that target the Atoll, designing the data collection system, and training data collectors. The activity also served as a catalyst to improve and strengthen the data collection system of the Fisheries Department, particularly in relation to the training offered to the Department's data collectors. A challenge to this program, however, will be to gain the trust of fishermen and to ensure their involvement in collecting catch data. Limited progress was made in relation to establishing a co-management arrangement for the marine reserve, as the government has placed a moratorium on such agreements until its protected area policy and system plan are in place. Nevertheless, we have taken the opportunity of actively participating in this planning process by providing data from research conducted at Glover's Reef to the government's Task Force appointed to oversee the National Protected Area Policy and System Plan project. This will include the human landscape maps for the Atoll that have resulted from the threats assessment.

In relation to the third objective, we will be carrying out threats assessments for the other two atolls using the methodology developed for Glover's Reef, as mentioned earlier (to be held in Sept and Oct). We have also documented lessons learned from the species selection process, which will be disseminated as a bulletin under the WCS' Living Landscape Program.

#### **b. Highlights**

- **Completion of the Threats Assessment.** Identifying the threats facing the atoll, through a participatory process, has supplied the foundation for the project. The implementation of future activities will focus on reducing these threats. These will be examined in a logical sequence through finalizing the conceptual model, and choosing high priority activities or interventions that are feasible, measurable and cost effective.
- **Selection of the Seascape Species.** The suite of seven seascape species has been chosen with the input of international and local expert opinion and has been endorsed by the Advisory Committee comprised of stakeholders. These species will be the lens through which interventions are planned and will form the basis of the conservation monitoring program. Their status will reflect the level of success of the conservation strategy being implemented.
- **Training and Revitalizing the Glover's Reef Advisory Committee.** Prior to the start of the project, the Glover's Reef Advisory Committee was virtually dormant; its last meeting was held in May 2004. With the impetus provided by the training workshops, the Committee appears to have been given a new lease. Two meetings have been held which had high attendance, a high level of participation, and positive contributions to improving the management of the marine reserve resulting from the discussions.
- **Fisheries Data Collection Program.** A fundamental requirement for fisheries management is accurate data on levels of catch and effort. This type of data was not available for Glover's Reef and thus it has not been possible to determine whether sustainable levels of fishing are being conducted in the General Use Zone of the marine reserve. Establishing a catch and effort

data system for the Atoll is therefore a major step forward in informing management. This system could also be used as a model for other similar sites such as the Lighthouse Reef Atoll.

**c. Table of Activity Status**

<b>Activity Number</b>	<b>Activity Title</b>	<b>Status</b>	<b>Page number for more information</b>
<b>Obj. 1</b>	<b>Develop and adopt a participatory strategy to reduce threats to marine life in the Glover’s Reef seascape</b>		
1.1	Complete threats and stakeholder analyses	Completed	4
1.2	Complete a Seascape Species Analysis	Completed	5
1.3	Identify high priority interventions	Delayed	6
<b>Obj. 2</b>	<b>Develop and implement sustainable and adaptive mechanisms to strategically address threats across the seascape</b>		
2.1	Implement Seascape Conservation Strategy	On track	7
2.2	Provide technical support and training	On track	7
2.3	Strengthen and expand stakeholder support for the Seascape Conservation Strategy	On track	9
2.4	Introduce innovative co-management arrangements	Delayed	10
2.5	Develop new and strengthen ongoing long-term monitoring programs	On track	10
<b>Obj. 3</b>	<b>Learn and teach best practices in the Glover’s Reef Seascape and beyond</b>		
3.1	Document the lessons learned	On track	11
3.2	Extract and share best practices	On track	11
<b>Obj.4</b>	<b>New York Coordination Unit Strategy: Guide the design and testing of wildlife-focused planning, implementation, and evaluation tools for effective conservation at a landscape scale, and promote learning across sites and beyond</b>		
4.1	Provide technical assistance to site-based conservation	On track	13
4.2	Design, implementation, and testing of decision support tools	On track	13
4.3	Catalyze cross-site and cross-organizational learning, and communication	On track	14
4.4	Application of Living Landscapes Program tools beyond core sites	On track	15
4.5	Ensure coordination and communication services for the program	On track	17

**II. Detailed Description of Progress**

**a. Key short and long-term program objectives for the reporting period (October 2003 – September 2004)**

Glover’s Reef Atoll is an integral part of the Belize Barrier Reef system, one of the world’s outstanding coral reef systems. WCS has a long-term commitment to this site, having established a marine research station at the Atoll in 1995. The project will build on the in-depth practical conservation knowledge of WCS’ long-term field program at the site, facilitating the implementation of strategic site-based conservation tools developed through its Living Landscapes Program. We also aim to refine this planning approach as to the manner in which it is applied to tropical marine areas.

In the short-term, or over the first two years of the project, we are focusing on collecting the information required for developing the conservation strategy for the Atoll seascape. Activities include the participatory threats assessment, conceptual modeling, selecting the seascape species,

building the human and biological landscapes, developing monitoring frameworks and finalizing the conservation strategy. In parallel with these planning activities, we are also concentrating on building partnerships, carrying out training for various stakeholder groups, strengthening support for the marine reserve, and gathering management-related data on fisheries, reef health, and the status of the grouper spawning aggregation.

Over the longer term, in five years and beyond, our objective is to carry out adaptive management, making necessary adjustments to the reserve's management programs, preparing development guidelines for the Atoll's islands, completing a socio-economic survey of the atoll, putting in place a sustainable financing program, monitoring the status of our seascape species, and facilitating a co-management arrangement for the marine reserve.

## **b. Activity Description**

### **OBJECTIVE 1: Develop and adopt a participatory strategy to reduce threats to marine life in the Glover's Reef Seascape.**

#### **Activity 1.1 Complete threats and stakeholder analyses through a series of focused meetings in consultation with the Glover's Reef Reserve Advisory Committee.**

WCS staff in Belize conducted a review of three publications that documented the results of previous threats assessments for the region. These included the WWF Ecoregional Conservation Planning for the Mesoamerican Caribbean Reef, the Mesoamerican Barrier Reef System's Threats and Root Causes Analysis (prepared by Paul Dulin, Juan Bezaury, Melanie McField, Manuel Basterrechea, Bessy Aspra de Lupiac and Jonathon Espinoza), and UNDP's Threats Assessment for the Belize Barrier Reef World Heritage Site. A summary of each document was prepared and distributed to members of the Glover's Reef Marine Reserve Advisory Committee (GRAC), as background material on general threats to Glover's Reef Atoll. A summary of the Glover's Reef Living Seascape project was also distributed to inform members of the project and its objectives. This material was sent to members along with an invitation to the threats assessment/ human activities workshop that was held in Belize City in February 2004. Several experts, including four fishermen and our partners from Green Reef, WWF and TNC, were also invited to the meeting. At the workshop, participants were provided with a one-page summary of threats drawn from the three primary documents, which were categorized according to habitat loss, species depletion, pollution, and invasive exotic species. This summary served as a quick reference guide and was used as a starting point for the discussion.

A total of 27 participants were invited, and 19 attended the meeting. The workshop was led by WCS LLP NY Coordination Unit staff member Dr. David Wilkie, with the assistance of the GIS expert in the WCS Marine Program, Dr. Caterina D'Agrosa, and WCS local staff. Introductory presentations were given on the Glover's Reef Seascape and the Living Landscape Program at WCS. Workshop participants then identified the major human activities that influence the productivity and diversity of marine resources on the atoll, and went through a process of ranking the threats caused by certain activities. The top four threats identified were coral bleaching, over fishing, damage to coral by boats and divers/snorkelers, and pollution from agricultural and aquaculture runoff. Participants were then divided into working groups to map the location of these threats on large maps provided. This workshop formed the basis for an LLP technical bulletin on how to conduct a threats assessment (Participatory Spatial Assessment of Human Activities Technical Manual).

A workshop report is attached as Appendix 1. Copies have been distributed to each participant, and the maps produced during the workshop have been digitized (current versions of these maps are shown in section A7 of Appendix 2). These ‘human landscape’ maps will be used along with the ‘biological landscape’ maps to determine areas of potential conflict, and thus help to identify the main interventions that need to be included in the conservation strategy for the Glover’s Reef Atoll Seascape.

Furthermore, the maps of human activities/threats will be shared with the National Protected Areas Policy and System Plan project of the Government, providing data on threats, a component of the marine protected area gap analysis.

### **Activity 1.2 Create a “roadmap” for conservation intervention by completing a Seascape Species Analysis.**

With the assistance of Dr. Samantha Strindberg from the LLP and Dr. Caterina D’Agrosa from the Marine Program, a two-day workshop was held to conduct the selection of the seascape species for Glover’s Reef. This was held in Belize City at the end of April. A group of eight international and national experts met for the first day of the meeting to analyze the available data and to identify a suite of species. Background material on the approach, species selection, and draft selection data, including a preliminary list of candidate species, was sent to a broader group of 16 experts for their review prior to the meeting. The draft selection data had been compiled in advance by WCS Belize City staff with the guidance of LLP staff, at a meeting held in Belize City in November 2003. The data were subsequently revised based on the results of the February 2004 threats assessment workshop.

During the workshop the experts were first given presentations on a historical overview of Glover’s Reef, progress to date with respect to this new Living Seascape Project, the Seascape Species Approach, and the process of selecting a suite of species. This was followed by a review of the data required for selecting the Seascape Species, which includes lists of the candidate species, habitat types, jurisdictional units, ecological functions, and selection criteria data indicating the (1) socio-economic importance of each candidate species, (2) the habitat types and jurisdictional units it requires (heterogeneity), (3) the area it needs, (4) the ecological functions it performs in the ecosystem, and (5) its vulnerability to threats in the seascape. Based on the aggregate score across those five selection criteria for each species, and the manner in which the species complement one another with regard to the habitat types and jurisdictional units they cover, as well as the threats they encounter, seven candidate species were chosen. The Hawksbill turtle (*Eretmochelys imbricata*) with the largest aggregate score was the highest ranked species and automatically included in the suite. Nassau grouper (*Epinephelus striatus*) was added due to its complementarity in terms of the marine habitats not covered by the Hawksbill Turtle and also because it is one of the candidate species most impacted by spear or hand-line fishing. To cover the terrestrial or caye habitats, the Osprey (*Pandion haliaetus*) was selected, and to draw attention to the three major threats to corals, namely (1) coral bleaching, (2) chemical run-off from land development, aquaculture and agriculture, and (3) direct physical damage, the Star coral (*Montastrea spp.*) was chosen. The experts added the Caribbean Reef Shark (*Carcharhinus perezi*) to the suite, due to its importance as a top predator and ability to act as a good indicator of ecosystem health. The Queen conch (*Strombus gigas*) was included as a representative benthic species, due to its critical decline caused by overfishing, and also because the fishing method (free diving) used to harvest this species would require different interventions in terms of the implementation of fishing regulations or management. The final species, the Black-spined sea urchin

(*Diadema antillarum*), a keystone species, was added as a 'special element'. It was added because it has experienced a dramatic population decline due to disease (but is now recuperating) and due to its keystone species function as a herbivore that helps maintain the coral community (Since the decline of this and other herbivorous species the Atoll appears to be suffering from an overgrowth of algae, which tend to smother the coral, thus affecting the entire community.). These impacts of lack of herbivory, along with the recovery of the urchin, were deemed critical to monitor.

During the first day of the workshop participants also highlighted the ways in which the Species Selection Approach, which was originally designed for terrestrial landscapes, may need to be amended to be fully applicable to a seascape.

On the second day of the workshop the species experts were joined by seven members of the Glover's Reef Advisory Committee. Presentations were again given on Glover's Reef and an overview of the Species Selection Approach. The suite of seven potential species selected by the experts, along with the rationale for their choice, was then shared with GRAC members for their review and feedback. The suite met with a response from the GRAC; members appreciated the concept of a suite of umbrella species and recognized the value of focusing on a small set of representative species. The participants then mapped the distribution and habitat preferences for each species in the suite.

The GRAC participants also reviewed the digitized maps of the human landscapes resulting from the threats assessment workshop held in February and a few adjustments were made.

A detailed report of the workshop can be found in Appendix 2 (including the revised human landscapes). Work continues on refining and digitizing the species maps or 'biological landscapes' drafted at the workshop.

### **Activity 1.3 Identify high priority interventions**

The original conceptual model has been revised in light of the data generated by the threats assessment and species selection workshops. To facilitate monitoring of the project's progress and to more clearly demonstrate the links between direct and indirect threats and the proposed interventions in relation to the suite of seascape species, three sub-models have been added to the master conceptual model, namely for (1) Nassau grouper, Conch and Caribbean Reef Shark, (2) Hawksbill Turtle and Osprey, and (3) Black-spined Urchin and Star Coral. Preliminary interventions have also been identified in relation to each sub-model (Appendix 3). These actions, however, will be refined once the species or 'biological' landscape maps have been completed and can be overlaid with the 'human' landscape maps to determine conflicts and/or opportunities that may not yet have been revealed. This will be completed through a review by the group of experts (on an individual basis via email as it is very difficult to get all the experts to a meeting) during the second year of the project.

During this period, investigations continued with the monitoring of the recovery of the spawning aggregation site on the northeast corner of the Atoll. The site was declared a spawning aggregation marine reserve in December 2002, and closed to fishing. WCS Research Fellow Dr. Enric Sala conducted his fifth year of counts of Nassau groupers at this site and recorded a decline from 2,400 groupers in the 2002/2003 season to 1,700 in the 2003/2004 spawning season. He also carried out a reconnaissance of the site using a remotely operated vehicle and discovered that the groupers are aggregating at much greater depths than ever before recorded, as deep as 250m. This is important, because the groupers may actually be spawning at these depths, although this has not yet been

observed; and because the size of the spawning aggregation may actually be much larger than earlier recorded by SCUBA divers.

WCS Conservation Scientist Dr. Tim McClanahan also continued his experiments on the impact of algal removal and nutrient enrichment on the patch reefs of the atoll. This research will help us better understand the underlying reason for the high level of nutrients and algal growth that occur and thus guide us in developing strategies to mitigate their impacts on corals. The results may lead to recommendations to change the location of the Conservation Zone to an area that has lower levels of nutrients and healthier coral reefs.

The refined conceptual model and three additional models for the seascape species can be seen in Appendix 3.

**OBJECTIVE 2: Develop and implement sustainable and adaptive mechanisms to strategically address threats across the seascape.**

**Activity 2.1: Implement Seascape Conservation Strategy in cooperation with Glover's Reef Marine Reserve staff and Advisory Committee.**

During this year the Seascape Conservation Strategy has been under development and therefore implementation will take place later in the project. In preparation for the realization of the strategy, several priority actions have been initiated to help ensure our success in achieving the conservation targets: Providing technical support in management and monitoring (particularly of the status of seascape species), strengthening stakeholder support for the marine protected area, pursuing co-management possibilities, and supporting Integrated Coastal Zone Management (ICZM) policies within the Seascape, all detailed in the activity sections below.

**Activity 2.2: Provide technical support and training to the Glover's Reef Marine Reserve staff, the Belize Fisheries Department, and the CZMAI to improve management of the reserve and enforcement of fisheries and land-use regulations**

In coordination with the Fisheries Department, the agency responsible for marine reserves, two training workshops were carried out for the members of the Glover's Reef Advisory Committee (GRAC). The Committee, which is officially appointed by the Fisheries Administrator, is charged with ensuring regular review of the management plan; making recommendations on reserve regulations; reporting on matters impacting the reserve; advising on matters related to reserve administration, education, research, and enforcement activities; providing advice on applications for permits relating to the reserve; and assisting in the development of sustainable financing mechanisms. GRAC is comprised of representatives of landowners on the atoll, tourism operators, fishing co-operatives, local authorities, government agencies, and the conservation NGO community. Although GRAC has been in existence for several years, it has been very inactive and ineffective in providing support and advice to the Glover's Reef reserve management staff. The staff includes a reserve manager, a biologist and two rangers. GRAC is responsible for providing advice and assistance to the reserve staff in several aspects of management, including revising the management plan, recommending legislation, strengthening enforcement activities, and developing sustainable financing mechanisms for the reserve. The objective of these workshops was to help revitalize the Committee and to help members to focus their efforts effectively and work as a team.

A consultant was hired to facilitate both workshops, which were held in Belize City. The first workshop, held on the 1<sup>st</sup> April, was on leadership and conflict resolution and 11 of the 16 Committee members attended. Participants first reviewed the terms of reference of the Advisory Committee. The roles of the Committee and the management team were clarified, and members renewed their commitment to participate fully. Members who represent organizations also agreed to address the concern of adequately sharing information arising from GRAC meetings with their membership.

The session on leadership skills followed with participants considering the types of skills GRAC will need in order to fulfill its role. Members need to be effective leaders as they are responsible for presenting the views and interests of their communities or organizations, and providing feedback from the Committee to their respective groups. During the session on conflict resolution participants were supplied with information on avoiding conflict, and resolving conflict through negotiation, mediation and adjudication. Participants also carried out a role play exercise in resolving a conflict at Glover's Reef. As the Committee members have a wide diversity of interests, skills in conflict resolution will be required to resolve disagreements that will inevitably arise, for example between fishermen and tour guides or fishermen and researchers.

Members participated well and with enthusiasm, and by the end of the workshop they seemed very motivated. To capitalize on this motivation, it was agreed that the second workshop should be held as soon as possible. Members also agreed that the topic should be on holding effective meetings.

The second workshop was therefore held on the 19<sup>th</sup> May 2004. Twelve of the sixteen GRAC members attended. During the first half of the day, the facilitator covered topics such as the purpose of meetings, the objectives, and the roles of the chairperson, secretary and general membership. The rules of procedure for Committee meetings were also developed and included elements such as quorum for meetings, decision-making, alternates for members, etc. During the afternoon an actual meeting of the Committee was held so that members could apply the approved procedures. The representative from the Fisheries Department was chosen as Chair and WCS was selected as Secretary. This meeting was the first held in over a year, but it was agreed at the workshop that meetings should be held at least quarterly.

A second meeting was held on the 8<sup>th</sup> July 2004 in Dangriga, and 12 of the 16 members attended. A few weeks before the meeting was held, Committee members were provided with minutes of the meeting, copies of the reserve's quarterly report for January – March 2004 and operational plan for January – June 2004, and a draft of the reserve brochure. At this meeting there was excellent participation and several important matters were discussed, such as a review of the operational plan for July – December 2004, review of the draft reserve brochure, and provision of advice to the Fisheries Administrator in relation to sport fishing fees and the registration of tourism boats operating within the reserve.

The next meeting is scheduled for the 7<sup>th</sup> October 2004 and, weather permitting, will be held at the reserve headquarters based on Middle Caye, Glover's Reef. As part of this meeting, Committee members will be given a tour of the reserve, giving them a first-hand view and appreciation of the challenges the reserve staff faces on a daily basis.

**Activity 2.3: Strengthen and expand stakeholder support for the Seascape Conservation Strategy – e.g. fishermen (divers for lobster, conch and finfish, as well as handline fishers), Atoll residents, and tourism operators, as well as mainland communities that are highly dependent on the health of the reef (Hopkins, Sarteneja and Dangriga).**

The primary activity for this reporting period was the development of a fisheries data collection program for Glovers Reef. Following several discussions with fisheries experts in WCS and Belize, the terms of reference were finalized. An agreement was then signed with the Caribbean Regional Fisheries Mechanism (CRFM) Secretariat to carry out the activities as described in the terms of reference. This organization has worked for many years in Belize in support of the Fisheries Department in catch data collection and is very knowledgeable about the Belizean fishing industry. It has developed training material and a database for the Caribbean region which we felt would be advantageous to our project. The involvement of CRFM in the activity was also endorsed by the Fisheries Department.

The first part of the contract was to carry out a frame survey of fishing activity on the atoll. This included a boat inventory, mapping fishing areas and collecting information on fishing grounds and activities. Meetings were first held with fishermen in Sarteneja and Hopkins and also with Northern and National Co-operatives in Belize City, to inform them about the project. The data were then collected via surveys conducted in Sarteneja, Dangriga and Hopkins. The results of the survey provided information on the characteristics of the captains and crew of vessels operating at Glover's Reef, the boats, the fishing gear used, the general fishing operations and practices, and the fishing areas. Data were also collected on the catch, such as estimates of landings, the times of the year when particular species are caught, and marketing of catch. Details of the results of this study are included in the report "Glover's Reef Marine Reserve Frame Survey Report".

The second part of the contract focused on the development of the data collection plan for gathering catch, effort and biological data for the atoll. Based on the results of the frame survey, the main elements recommended are:

- To collect catch and effort data from the fishing co-operatives for lobster, conch and finfish. These will be collected by the data collectors from the Fisheries Department and then shared with WCS.
- To sample catch data from sailboats on the atoll for lobster, conch and finfish and collect biological data. These will be collected by WCS technical staff, in co-operation with the fishermen.
- To collect finfish catch and biological data in Hopkins from skiffs operating on the atoll. These will be collected by a villager in co-operation with the fishermen, and under supervision of WCS technical staff.
- The data will be stored in an Excel spreadsheet, which can then be exported to the CARIFIS database at a later date. CARIFIS is the Caribbean Fisheries Information System that is used by the CARICOM countries of the region.

A trial run for testing the implementation of this system was carried out at Glover's Reef and Hopkins Village in August 2004. All data collected by WCS will be shared with the Fisheries Department.

Under the terms of the contract, a training workshop was also held. This was carried out in two parts: A training session was conducted for the data collectors at the Fisheries Department, and a second

training workshop was held for WCS staff who will be collecting data on site at Glover's Reef and supervising the data collection at Hopkins. WCS staff were supplied a copy of the manual on the collection of biological data for lobster, conch, finfish, and fish species identification, the data forms to be used, and they will also be provided with basic supplies and survey equipment such as measuring boards, calipers and scales. A workshop was also held in Belize City to present the plan to the various stakeholders and partners, such as the Fisheries Department, CZM Institute, and Belize Audubon Society.

Details of the catch data collection system are documented in the report "Glover's Reef Marine Reserve Data Collection Plan". This system should capture data on virtually all the catch taken from the General Use Zone of the Glover's Reef marine reserve. The original intention was to also train fishermen in the collection of catch data, but fishermen in the three communities surveyed were not interested in participating. Over time, however, it is expected that fishermen will see the benefits of having accurate catch data and will become more active in the program.

The terms of reference is attached as Appendix 4. Draft copies of the frame survey and fisheries data collection plan are attached as Appendices 5 and 6, respectively.

**Activity 2.4: Introduce innovative co-management arrangements with stakeholders to foster buy-in for conservation action.**

Pursuing a formal co-management agreement for the management of the Glover's Reef Marine Reserve amongst the Belize Audubon Society, WCS and the Fisheries Department has been postponed as the government has issued a moratorium on all new co-management arrangements for protected areas until a National Protected Area Policy and System Plan is completed. This process is currently underway and expected to be finalized in mid 2005. As part of this policy and system plan, specific guidelines for co-management agreements will be developed.

In relation to informal arrangements, we have initiated discussions with one landowner to provide data on nesting turtles on Long Caye. This arrangement, however, needs to be confirmed by the reserve staff and data collection forms need to be provided. This will be discussed further through the Glover's Reef Advisory Committee at their meeting scheduled for October 2004. In addition, a landowner is donating supplies for the installation of seven mooring buoys near his island and atoll residents are assisting in enforcement activities by contacting reserve rangers on a regular basis to inform them of suspected illegal fishing activities. Resort owners have also offered the loan of snorkeling gear for student groups visiting the atoll on field trips.

**Activity 2.5: Develop new, and strengthen ongoing sustainable long-term programs to track reef health (e.g. coral cover, algal abundance, and coral species diversity), water quality, and population status of commercially and ecologically important reef species (e.g. groupers, sharks, snappers) by Reserve staff and staff of key agencies such as the Fisheries Department, CZMAI, and other NGOs involved in reef management.**

WCS Research Fellow, Dr. Charles Acosta, conducted a three-day workshop in early June in the LAMP (Long-term Atoll Monitoring Program) monitoring protocol. The workshop was held at the WCS research station on Middle Caye, Glover's Reef and five reserve biologists attended. The biologist participants were chosen in consultation with the MPA Coordinator at the Belize Fisheries Department, and were from the Half Moon Caye Natural Monument (managed by the Belize Audubon Society), Hol Chan Marine Reserve, Glover's Reef Marine Reserve, Gladden Spit Marine Reserve

(managed by Friends of Nature), and the South Water Marine Reserve. Local project staff made the travel and accommodation arrangements.

The training covered monitoring of fishery-independent data, including morphological data on the commercially fished species of spiny lobster, queen conch and five selected species of finfish, namely Nassau grouper, black grouper, hogfish, mutton snapper and queen triggerfish. Participants were provided with copies of the LAMP manual and data sheets (Appendix 7). The sampling design has been expanded to include a wider coverage of habitats in the Conservation and General Use zones at Glover's Reef (see Figure 1). The first round of monitoring using this new design was carried out in August 2004. The data collected has been entered in the database provided by Dr. Acosta, and it will be shared with the Fisheries Department and the staff of the marine protected area. The second LAMP monitoring is scheduled for October 2004.

### **OBJECTIVE 3: Learn and teach best practices in the Glover's Reef Seascape and beyond.**

#### **Activity 3.1 Document the lessons learned from the application of the Living Landscapes approach to priority setting within a marine site.**

During the threats assessment/human activities and seascape species selection workshops, local project staff along with LLP core program staff documented lessons learned and aspects of the Living Landscapes approach that possibly need to be adapted for the approach to be fully applicable to a marine site. Examples include (1) consideration of trophic level in the selection process, as this is particularly important in the marine realm, (2) the importance of historic numbers of species when considering its current vulnerability, (3) the need to redefine the area criterion as marine species can be dispersed over very large areas especially during larval stages, and (4) the need for the threats assessment process to be as specific as possible (i.e. types of fishing should be identified rather than including all types under one simple threat of 'fishing', as interventions are likely to be tailored to specific threats).

LLP staff will be drafting the bulletin to include these aspects as specific recommendations to practitioners who wish to apply the approach to a tropical marine site.

The seascape species selection workshop also demonstrated that a mix of scientific expert opinion along with stakeholder input can lead to a successful consensus on the conservation process.

Two local project staff attended the LLP annual meeting in January 2004. This provided the opportunity for the Belize staff to learn in much greater detail about the application of the Living Landscapes approach and the requirements for the steps in the process, such as identifying conservation targets, building the human and biological landscapes, and developing monitoring frameworks.

#### **Activity 3.2 Extract and share best practices, in terms of management and monitoring.**

We were able to share an experience with our partners of what proved to be a very successful best practice in terms of conducting a threats assessment. We had invited our partners from the Belize Audubon Society, the Coastal Zone Management Institute, and the World Wildlife Fund to the workshop and they were impressed with the process we used to conduct the assessment for Glover's

Reef. They expressed interest in carrying out a similar process for Belize's other two atolls, Lighthouse Reef and Turneffe Islands.

Capitalizing on this strong interest and opportunity, LLP staff member Dr. David Wilkie identified funds from the Conservation Measures Program to carry out threats assessment/human activities workshops for these two atolls. With assistance from the LLP and WCS local staff, the CZM Institute, which is the secretariat for the Turneffe Islands Advisory Committee, will hold the workshop for this Committee in late September. Also with our assistance, the Belize Audubon Society, which has management authority for two marine protected areas on Lighthouse Reef, will conduct the workshop for its Lighthouse Reef Advisory Committee in mid October. These workshops will be held according to the process described in the Human Activities Assessment Technical Manual.

The data generated by the threats assessment meeting, in particular the maps of the threats (section A7 in Appendix 2), will also be shared with the National Protected Area Policy and System Plan project for Belize. WCS is assisting in the gap analysis for both terrestrial and marine areas and the threats data will form part of our contribution to this national initiative.

**OBJECTIVE 4: New York Coordination Unit Strategy: Guide the design and testing of wildlife-focused planning, implementation, and evaluation tools for effective conservation at a landscape scale, and promote learning across sites and beyond**

The NY-based Coordination Unit (CU) of the program is designed to develop and test wildlife-based, landscape-scale approaches to biological conservation across multiple sites. To ensure the widespread utility of these new conservation approaches, the program is testing them within landscapes that encompass a diverse array of land-uses, resource-use issues, and jurisdictional arrangements. To develop new approaches, facilitate and harmonize testing and implementation among these core sites, and capture the synergistic benefits of diverse experiences, a central coordination unit is charged with designing and managing the program. This unit guides development of landscape-scale conservation strategies, tools and techniques; assists in the design and development of cost-effective intervention and monitoring programs at these sites; promotes cross-site learning; and ensures communication among the sites, WCS staff (central and field), USAID (DC and missions), and the larger conservation community.

The New York CU team consists of a program director, two landscape ecologists, an outreach/communications coordinator, socio-economic monitoring specialist, biological monitoring specialist, two geographic information systems (GIS) analysts, program coordinator, and administrative assistant. Four of these positions are new WCS investments to the program this year, indicating increased WCS commitment to the development and use of landscape tools for site-based conservation. These new positions also indicate a shift in responsibilities, increasing our ability to extend the tools we are developing to a larger array of conservationists.

During FY 2004, the Coordination Unit in New York achieved most of its objectives for the year. Although the majority of the CU work is embedded in objectives 1-3 of this and other site-specific reports, the following section highlights some of those achievements that are not fully captured in these sections.

## **Activity 4.1 Provide technical assistance to site-based conservation**

Coordination Unit support to field site operation has been reported in detail in previous sections of this report.

## **Activity 4.2 Design, implementation, and testing of decision support tools**

### **Activity 4.2.1 Living Landscapes Program Technical Manuals**

The Living Landscapes Program promotes the implementation of effective conservation projects by encouraging practitioners to: (1) be explicit about what we want to conserve, (2) identify the most important threats and where they occur within the landscape, (3) strategically plan our interventions such that we are confident that they will help abate the most critical threats, and (4) put in place a process for measuring the effectiveness of our conservation actions, and using this information to guide our decisions. Towards this end, LLP has launched a series of manuals that provides guidelines and step-by-step instructions for field practitioners. These will cover topics that include how to: select landscape conservation targets (landscape species), identify and map key threats, prepare a conservation strategy (conceptual model), and develop a monitoring framework. The manuals will be available in English, Spanish, and French.

To date, we've designed and piloted two manuals: one concerning participatory spatial assessments of human activities, and another focusing on how to build conceptual models for a project Belize (see Appendices 8 & 9 for latest versions<sup>1</sup>)<sup>2</sup>. We've distributed these within our GCP sites, and more broadly within WCS. In the next few months, after final revision, the manuals will be distributed more widely to our GCP partners and the wider conservation and development community. The threats assessment and mapping manual has already attracted external attention and is the basis for LLP providing technical assistance to the Coastal Zone Management Authority and Institute of Belize, the Belize Audubon Society, and World Wildlife Fund to conduct threats assessments of, respectively, the Turneffe Atoll, Lighthouse Reef and the barrier reef system in. Manuals on building monitoring frameworks, selecting conservation targets, and on intervention priority-setting are currently in draft form and will be field tested and finalized within the next six months.

### **Activity 4.2.2 Landscape species approach (LSA) progress**

Based on the experience of the several WCS sites that have selected Landscape Species as strategic conservation targets, the landscape ecologist and the biological monitoring specialist are coordinating the revision of the logic for selecting species and the accompanying selection software. We expect to complete a major revision of the software (version 2.0) in November 2004 and distribute it to all sites planning to select landscape species.

The program has made significant progress in implementing the Landscape Species Approach, and a number of sites have generated biological and human landscapes, and developed a strategic monitoring program. There is still work to be done most importantly to develop a defensible process for setting population targets and combining this with estimated area requirements and habitat preferences to characterize the size and configuration of landscapes sufficient to conserve each landscape species – and thus the other species that they represent.

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These are also available by email from [llp@wcs.org](mailto:llp@wcs.org) or on our website [www.wcslivinglandscapes.org](http://www.wcslivinglandscapes.org).

Finally, the assumptions underlying the LSA have yet to be tested from a theoretical standpoint. Towards this end, the Landscape Ecologist and other program staff tackled the question as part of the Annual meeting (See Activity 4.3.1). The results from the exercise that selected landscape species from a 30-year enforcement data set collected in Ghana were presented to the group. As mentioned in the last annual report, the preliminary results suggest that landscape species are among the most vulnerable to human threats, and that successful conservation of landscape species will protect other, less sensitive and less area-demanding species. The meeting participants proposed a number of additional tests and they will be further fleshed out and will form part of the ongoing LSA design process.

### **Activity 4.3 Catalyze cross-site and cross-organizational learning, and communication**

#### *Activity 4.3.1 The Third Living Landscapes Program Annual Meeting*

The Third Annual Meeting of the Wildlife Conservation Society Living Landscapes Program took place at Chico Hot Springs, MT from January 10-18 2004, bringing together expanded LLP staff from the field and New York. The number of core sites for the Living Landscapes Program has expanded from three sites to the current twelve (which includes the six USAID/GCP-funded sites): Yasuni in Ecuador; Ndoki-Likouala in Congo; Madidi in Boliva; Maya Biosphere Reserve in Guatemala; the Eastern Steppe of Mongolia; Glover's Atoll in Belize; Greater Yellowstone in USA; Northern Plains of Cambodia; the Adirondacks in USA; San Guillermo in Argentina; and Coastal Patagonia. Each site (with exception of Ecuador and Patagonia) was represented by one or two staff members.

The program has done significant design and implementation work on selected conservation planning tools (conceptual models for projects, threats analyses, landscape species analyses, monitoring frameworks), and the meeting provided a venue for all the projects to share experiences and weigh in on the development of the remaining conservation tools (setting priorities within our "conservation landscapes" and/or determining target levels for "healthy, functioning populations"; sorting out priorities for interventions; determining how to operationalize monitoring programs). Proceedings of the meeting were compiled and distributed to participants. A copy is available upon request.

#### *Activity 4.3.2 CMP: leadership, design, writing and audits*

WCS continues to play a leadership role in the direction and activities of the Conservation Measures Partnership. WCS is working with CMP on: (1) piloting conservation audits, (2) evaluating the challenges to and benefits from accounting systems that allocate spending to conservation actions and not simply goods and services purchased, (3) developing a user-friendly system for identifying appropriate indicators for measuring conservation impacts, and (4) pilot testing tools that help project's implement the CMP open standards for the practice of conservation. Craig Groves (part-time CU staffer) participated in the design and implementation of two multi-partner pilot conservation audits (led by WWF International) and David Wilkie (the socio-economic monitoring specialist) is organizing a pilot multi-partner, peer-review audit of the GCP Glover's Reef project in FY05.

#### *Activity 4.3.3 Cross-organizational Learning Initiative*

David Wilkie chaired the GCP Cross-organizational Learning panel during the first year of its implementation. Funded through a separate Associate Award under the current Cooperative Agreement, the initiative gives GCP partners the opportunity to plan and implement joint activities that promote learning.

#### *Activity 4.3.4 Synthesis of Lessons from site-based conservation*

##### 4.3.4.1. Analysis of the ecological risks and the economic and administrative feasibility of legalizing the commercial trade in bushmeat

In response to the Government of Gabon's stated interest in legalizing the commercial trade in wildlife as a way to regulate the trade and generate tax revenues, LLP staff in collaboration with WCS Gabon and the Ministry of Wildlife and Hunting undertook an analysis of the ecological risks and the economic and administrative feasibility of such a proposal. Results, based on a comprehensive national survey of bushmeat trade and consumption, showed that even a 25% tax on the sale of bushmeat would be insufficient to cover tax collection costs, let alone the additional costs of enforcing the new tax laws. A paper describing the analysis is in press in the *Journal of International Wildlife Law and Policy*.

##### 4.3.4.2. Local engagement in conservation survey

The design for surveying a suite of WCS projects in the hope of teasing out guiding principles for engaging local people to promote effective conservation of wildlife and wildplaces is largely complete. A survey instrument has been drafted, and a review of the literature to determine what guidance is offered to conservation practitioners to engage local people in wildlife conservation is in progress. The survey work should be complete within the next six months. Analysis of the survey results and literature will produce a set of principles that other WCS project staff can use as a decision support tool to guide how they might engage local people in conservation at their site.

#### **Activity 4.4 Application of Living Landscapes Program tools beyond core sites**

As we highlighted in the last Annual Report, the initial work supported by USAID/GCP continues to provide the foundation for a growing number of sites using WCS/Living Landscapes Program tools around the world, and the multiplier effect of USAID/GCP support has been significant.

##### *4.4.1 Training workshops in the use of LLP tools*

Over the past few months, we have conducted a number of workshops at various field sites around the world that have centered on the use of conservation tools developed by the program. Adrian Treves (the outreach coordinator), and Kart Didier (the Landscape Ecologist) ran threats assessment workshops in Madagascar and Patagonia, Argentina. Adrian Treves also ran a joint landscape species selection workshop for field practitioners in Democratic Republic of Congo, Uganda, and Rwanda. Each of the above workshops included participants from national governments and NGOs of each of the countries cited. In each case, we have been gratified by the interest and commitment shown to the use of these tools by conservationists from other institutions, and look forward to conservation results that will stem from their use.

David Wilkie ran a workshop that entailed a spatially explicit threats assessment of Glover's Reef, Belize with local fishers, city council representatives, tour operators, fisheries cooperative members, biologists, government staff and NGO staff. Based on the results of this successful workshop, the Belize Audubon Society, WWF, and Belize Coastal Zone Management Authority and Institute have requested that we lead similar workshops for two other atolls in the Belize Reef system - Turneffe and Lighthouse Reefs, and the Barrier Reef as a whole. Outside funding has now been secured for these

workshops and they will be run jointly by WCS, Belize Audubon Society, WWF, and CZMAI during September and October, 2004.

Similarly, Amy Vedder (program director) and David Wilkie led a workshop in Tefe, Brazil during April, with a series of eight Amazonian-Andes projects focusing on design of conceptual models and monitoring frameworks for their projects (six projects in addition to 2 GCP sites, two of which are managed by Brazilian NGOs). The approach was highlighted in an article published in the Economist (June 17 2004) (see Appendix 10 for a copy of the article).

#### *4.4.2 Gap Analysis in Bolivia*

The Bolivian Government has embarked on a national level GAP analysis exercise to determine the effectiveness of the country's protected area system and to see if other vital areas should be set aside to ensure comprehensive conservation. In addition to an analysis of representation of different vegetation types in the protected area system, as well as an identification of biodiversity and endemism areas to be carried out by a consortium led by FAN, a leading Bolivian NGO, collaboration with the WCS Bolivia program will strengthen the focus on Landscape Species which are not valued by models based on diversity.

The exercise will involve the use of WCS's Landscape Species Approach for two different, but related purposes. First, existing protected areas will be evaluated to determine if they require further connectivity to ensure that wildlife needs are met. Second, an overall analysis will be done to identify national-scale Landscape Species and the scale of conservation activities necessary for their conservation (combinations of new protected areas, enlarged protected areas, functional corridors, regulation outside these reserves that promote conservation of the identified species, and international cooperation as determined necessary). The involvement of the WCS Bolivia Program in this important exercise and the application of the Landscape Species Approach by the government represents a significant endorsement of the utility of the Landscape Species Approach that WCS-Bolivia and the Living Landscapes Program have developed. Already there is interest expressed by conservationists in Argentina and Canada in using these national-scale techniques.

#### *4.4.3. Sharing of conservation tools among conservation NGOs*

We are pleased to see that many elements of conservation planning tools being used or proposed by other conservation organizations are similar to those developed by the Landscape Species Approach. A number of our bulletins have been cited in a recent publication of the World Wildlife Fund: *From the Vision to the Ground: A guide to implementing ecoregion conservation in priority areas*<sup>3</sup> that outlines steps for conservation planning at priority sites within ecoregions. Our LSA concept of spatially mapping biological landscapes and human (social) landscapes, and then integrating the two to create a conservation landscapes is very much in line with those proposed by WWF as a means to identify conflicts and priorities for conservation action. Similarly, Conservation International in their proposed strategy for designing biodiversity conservation strategies - *Conserving the Earth's Living Heritage* - note the importance of "Landscape Species" as important tools for conservation planning and targets for conservation action, and advocate for the use of "conceptual models" to explicitly demonstrate how conservation actions are designed to abate key threats and thus conserve the targets of our conservation actions. These examples are further indication of the value of

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<sup>3</sup> [http://www.worldwildlife.org/science/pubs/vision\\_to\\_ground.pdf](http://www.worldwildlife.org/science/pubs/vision_to_ground.pdf)

developing strategic wildlife-based tools for planning and implementing large scale, site-based programs, and sharing these tools both within WCS and more broadly across the conservation community.

#### **Activity 4.5 Ensure coordination and communication services for the program**

During this reporting period, all USAID reporting deadlines were met in a timely fashion. Annual Performance Monitoring Plans were prepared by field staff, and submitted by the program coordinator. Yemi Tessema (program coordinator), Amy Vedder, and David Wilkie collaborated in the preparation and attendance of annual GCP meeting in March.

Hard copies of the bulletins, resource CDs, and other information on sites and the program were distributed upon request as well as at workshops led and attended by program staff. Electronic copies of the materials were also made available on our website.

### **III Appendices**

1. Belize Threats Assessment and Mapping - Highlights
2. Glover's Reef Seascape Species Selection Workshop – Belize City, 21<sup>st</sup> – 22<sup>nd</sup> April 2004
3. Glover's Reef Conceptual Models (draft)
4. Terms of Reference – Development of a Catch and Effort Fisheries Data Collection Program
5. Glover's Reef Marine Reserve Frame Survey Report (draft)
6. Glover's Reef Marine Reserve Data Collection Plan (draft)
7. LAMP manual
8. LLP Technical Manual 1: Participatory spatial assessment of human activities-a tool for conservation planning
9. LLP Technical Manual 2: Creating Conceptual Models-a tool for thinking strategically
10. Economist article – Peering at the future

**Figure 1:** The revised sampling design for the collection of monitoring data on the commercially fished species of spiny lobster, queen conch and five selected species of finfish, namely Nassau grouper, black grouper, hogfish, mutton snapper and queen triggerfish. The solid light purple lines delimit a deeper stratum with 11 sampling locations (red numbers points) and a shallower stratum with 22 sampling locations covering a wide variety of habitat types in the Conservation and General Use zones.

