INVESTIGATING REEFS AND MARINE WILDLIFE IN THE BAHAMAS
Dear Volunteers,

The 2013-2014 field season represents the third year of our project in the Bahamas and, on behalf of all the project scientists and field team leaders, I would like to thank you all for supporting the project. During this field season we ran a full schedule of four teams. All the teams were very successful, and our knowledge about the mangroves and patch reefs of Eleuthera continues to grow. The patch reefs continue to surprise us in terms of how different they can be as we move around the study area. This is particularly true for grunts, and volunteers tasked with counting these species had to go beyond the call of duty on some reefs where many thousands of fish were present - indeed some reefs had more grunts on them than the combined total of all fish counted in the previous 2 years!

The database now contains surveys of 145 individual patch reefs, and we have been able to get to some new mangrove areas, which gives us a uniquely detailed database to analyse. These analyses are now underway, and two key data sets have been acquired this year. First, we have purchased detailed satellite data for the whole project area, which will allow us to study the habitat types that surround each reef and calculate other important variables. Second, all the video quadrats have been analysed, which will allow us to see if factors such as coral cover are important influences on fish populations. By linking together all the data collected by the project, we should have some exciting results to share in 2014.

During June and July 2013, some volunteers helped us catch juvenile parrotfish for a lab experiment on their behaviour when exposed to different predators. Analyses of this data set is ongoing, but the initial results suggest that parrotfish bite rates on algae are reduced when the invasive lionfish is present, but not when native predators are present. This represents a potentially exciting - but worrying - finding that lionfish do not only eat native fishes, but also change their behaviour.

During 2013-14 we were pleased to welcome a group of students funded by the The Durfee Foundation, and were also visited by the Foundation’s Programs and Operations Manager. We were also delighted to be able to continue to have Bahamian research fellows participate on the teams. They certainly gave the other volunteers a new perspective on Bahamian life, conservation, and culture. I am also pleased to tell everyone that the project will continue to operate beyond March 2015 through a collaboration that will see the Cape Eleuthera Institute take the lead role in running the volunteer teams. Exciting times ahead! Thanks to everyone for a great field season, and I look forward to keeping you up to date in the future.

Regards,

Dr. Alastair Harborne, University of Queensland
Investigating Reefs and Marine Wildlife in The Bahamas

2013 FIELD REPORT

Background Information

LEAD PI: Alastair Harborne
REPORT COMPLETED BY: Alastair Harborne

PERIOD COVERED BY THIS REPORT: June 2013 - May 2014
DATE REPORT COMPLETED: 2014-05-10 04:45:13

CHANGES TO:

PROJECT SCIENTISTS: FTL Kristal Ambrose has moved roles within the Cape Eleuthera Institute and is therefore no longer involved with the Earthwatch teams, but new FTL Lewis Eaton (Lewis.Eaton@uws.ac.uk) joined for the June and July 2013 expeditions to focus on the laboratory study.

RESEARCH SITE: No
RESEARCH SITE LATITUDE / LONGITUDE: No
PROTECTED AREA STATUS: No
SECTION ONE: Scientific research achievements

TOP HIGHLIGHT FROM THE PAST SEASON
We continue to be amazed by the variety of patch reefs around Eleuthera, but perhaps the most exciting findings from this year’s teams are the results from the lab experiment studying the behaviour of parrotfishes. Parrotfishes are important grazers of seaweed on reefs, and allow corals to flourish. During the summer of 2013, our experiment showed that parrotfish appear to take fewer bites on algae when lionfish are present, compared to when a native predator or non-predator is present. The introduced lionfish is causing concern because of its predation of native species, but our data also seem to suggest that native species are also changing their behaviour, which could have important impacts on the health of Caribbean reef ecosystems.

REPORTING AGAINST RESEARCH OBJECTIVES

Figure 1. Map of surveyed mangrove site locations (n=8). The eight surveyed sites include Airport Flats, Broad Creek, Fourth Creek, Kemps, Mangrove Island, Page Creek, Poison Creek, and Starved Creek.

OBJECTIVE 1: MANGROVE SURVEYS
During 2013 - 2014 data collection has focused on the patch reefs, but we have continued to expand the mangrove database. During July 2013 we surveyed an extensive mangrove area that contained large numbers of fishes, and we suspect it will have an important influence on fish populations on the reefs. We also surveyed a mangrove area near Rock Sound in March 2014, which supported fewer fishes. We have now surveyed 8 mangrove sites (Figure 1). The mangrove data will be analysed in 2014 to assess the relative importance of each creek and mangrove area as a nursery, and how they affect fish populations on the patch reefs.
Figure 2. Map of the 145 surveyed patch reefs.

OBJECTIVE 2: PATCH REEF SURVEYS
As for mangrove surveys, patch reef work has continued during the 4 teams that have gone into the field. The database has continued to expand, with 145 individual reefs surveyed (Figure 2), and data analysis has commenced and will continue in 2014. Although there are no quantitative results to share at this time, significant progress has been made assembling the final data set.
Figure 3. High resolution satellite imagery mosaic of study area.

Firstly, the project has acquired high-resolution satellite imagery of the study area that will allow us to make a habitat map (Figure 3). This map will be vital for providing additional information to help analyse the data. For example, we suspect that the area surrounding each patch reef (e.g., reefs may have more fishes if they are surrounded by seagrass beds that provide foraging habitat). A habitat classification scheme has also been developed for the study area.

Secondly, during each patch reef survey, we take video footage to quantify coral and algal cover. Between January - April 2014, all this footage has been analysed. We are now able to see if fish populations are affected by the 'health' of the reef (e.g., high coral cover, low algal cover).

Training of volunteers has continued to be successful, with volunteers able to learn how to accurately identify, count, and size fishes. We anticipate being able to analyse data accuracy by volunteers soon.

We have also made progress watching the video of transient predators visiting patch reefs, and anticipate being able to publish results from this study in 2014. These results will also be used to interpret fish population data of other species on the patch reefs.

OBJECTIVE 3: SUB-LETHAL CHANGES TO PARROTFISH BEHAVIORS (AQUARIA)
Following Dr. Kath Sloman and Dr. Rod Wilson refining the protocol for this experiment, it was run in the summer of 2013. The volunteers were involved in capturing fish for this experiment, which was led by FTL Lewis Eaton.

OBJECTIVE 4: SUB-LETHAL CHANGES TO PARROTFISH BEHAVIORS (PATCH REEFS)
We have made limited progress with this objective, but now we have the results of the aquarium experiment. This will inform the planning of research for this objective. We anticipate further data collection in 2014-15.

CHANGES TO RESEARCH PLAN OR OBJECTIVES
The objectives have remained the same, but we have realised that we can conduct additional analyses. Because of the detailed database on corals, algae, and sponges on each patch reef, we can assess what factors influence the benthic communities of the patch reefs. For example, there may be more coral in high current areas where bleaching may be less significant.
SECTION TWO: Impacts

PARTNERSHIPS
The project is a partnership between the University of Exeter, the University of Queensland, the University of the West of Scotland and the University of Cranfield. These universities support the time of the PIs, and the University of Exeter is managing funds for the project. Field Team Leaders have been provided by the University of the West of Scotland and the Cape Eleuthera Institute (CEI). Bahamian research fellows have been identified through links between CEI and local schools. The Durfee Foundation provided funding to support 8 students on team 3 in 2013-14. The satellite imagery was purchased through a collaboration (partial payment from each group) with Chris Haak at the University of Massachusetts.

CONTRIBUTIONS TO CONVENTIONS, AGENDAS, POLICIES, MANAGEMENT PLANS
- International
  None at this stage.
- National or regional
  None at this stage.
- Local
  Work is in partnership with the Cape Eleuthera Institute and Island School.

DEVELOPING ENVIRONMENTAL LEADERS
The project has now supported 9 Bahamian research fellows, who participated as full volunteers within the team. These fellows have all been very complimentary about the project, and I believe that it will increase their interest in marine conservation and the chances of them becoming environmental leaders in the Bahamas. The scientific training and survey work undertaken by the volunteers, particularly the teen teams, has helped them understand reef ecology, threats to reef health, the process of scientific research and the need for data to better inform reef conservation. The groups have also been exposed to the sustainable lifestyle possibilities that are actively encouraged at CEI.

ACTIONS OR ACTIVITIES THAT ENHANCE NATURAL AND/OR SOCIAL CAPITAL
One of the aims of the research is to aid more effective conservation planning in the area, leading to more sustainable catches for local fisherfolk.

CONSERVATION OF TAXA
1) Nassau grouper, Epinephelus striatus 2) Regionally threatened, IUCN Red List ‘Endangered’ 3) Project aims to better understand the habitat preferences of sub-adults, and links to juvenile nursery areas.

CONSERVATION OF HABITATS
1) Mangrove and coral patch reefs. 2) By highlighting key mangrove creeks and patch reefs we aim to have them included in a marine reserve, so maintaining (or possibly improving) their ecological state. 3) Area currently unknown. 4) Ecological state previous poorly documented.

ECOSYSTEM SERVICES
The key ecosystem service that should be maintained, and potentially restored, by recommendations from this project is capture fisheries. One of the focal species of the project is a critically important fishery species (Nassau grouper). While this species is relatively rarely fished in mangroves or on patch reefs, their role as a nursery means that they are vitally important in the life cycle and population dynamics of this grouper, and hence the catchable adults on forereefs. This is also true for other species including snappers and grunts. In addition the project will highlight the need to conserve both mangroves and patch reefs that also provide the ecosystem services of sand production (from fishes and calcareous benthic organisms), shoreline protection (mangroves), and recreation/ecotourism (snorkelling and diving on reefs).
CONSERVATION OF CULTURAL HERITAGE
The archipelagic nature of The Bahamas means that local communities have strong connections and, therefore, recommendations leading to conservation of coral reef seascapes will maintain this general cultural heritage.

IMPACTING LOCAL LIVELIHOODS
A key project aim is to provide recommendations for the conservation of nursery habitats and, therefore, increase the abundances of many fish species that will include those that are economically important for fisheries. Such increases in abundances can lead to higher and more consistent catches for fisherfolk, an important livelihood in The Bahamas. The establishment of a marine reserve on Eleuthera (guided by project recommendations) also has the potential to provide new livelihoods to members of the local community (wardens, dive guides, accommodation of tourists).

LOCAL COMMUNITY ACTIVITIES
The volunteers interact with local people working at CEI and the Island School. Groups have also visited local restaurants and tourist sites. The project continues to host Bahamian research fellows (from across The Bahamas). More active engagement with local communities is planned in the future, when project results are available. For example, CEI and the Island School has strong links with local schools and the project will engage with the local community through these links.

DISSEMINATION OF RESEARCH RESULTS
Scientific peer-reviewed publications
None

Grey literature and other dissemination
None

SECTION THREE: Anything else

PROJECT FUNDING
The project is supported by all the partner universities providing facilities to the PIs. The University of Exeter is also managing UK funds for the project. CEI also provides discounted rates for EW groups. In addition, CEI will become increasingly central as they become the lead group for this project from June 2015. This increased role for scientists at the study site increases the chances of the project becoming sustainable in the longer term. Currently the project is 100% reliant on Earthwatch funds for in field expenses. It is also anticipated that once results are available, this may lead to further proposals to other funding agencies.

IS THERE ANYTHING ELSE YOU WOULD LIKE TO TELL US?
The next field report will be exciting as we should have lots of results to report!

ACKNOWLEDGEMENTS
Thanks to Earthwatch for funding the project, and the enthusiasm and hard work of the volunteers. We would also like to thank the funders who allowed the Bahamian research fellows to join the teams. We are also grateful to The Durfee Foundation for supporting 8 student volunteers during July 2013.
APPENDICES

Team 3 team members

Team 3 in mangrove
Team 4 boat group