

Earthwatch Institute Field Report

This field report will be publicized on our weblink with the United Nations Environment Programme (UNEP) World Conservation Monitoring Centre (WCMC) at www.unep-wcmc.org. This website is available to the general public.

Project Title: Mangroves of Kenya

Principal Investigator (s): Mark Huxham (lead PI), James Kairo and Martin Skov

Position/Affiliations: School of Life Sciences, Napier University, Edinburgh

Research Site(s) Gazi Bay, Kwale District, Kenya

Gazi Bay is situated 50km south of Mombasa on the Kenyan coast (4°25' S, 39°30' E). It covers approximately 1.5 km² and is sheltered from the Indian Ocean by Chale Peninsula. A small, permanent river, the Kindongoweni, flows into the bay from the north. Our base during the research season is Gazi village which lies 1 km from the Bay. A map of the site and its location is given in Appendix 1.

Local Management Status of the Research Site(s) (e.g. National Park, RAMSAR Site, World Heritage Site, IBA etc.):

No special conservation status, although the site has been actively managed for mangrove resources for 20 years.

Scientific names of primary species being studied (if appropriate):

Our project involves the planting and management of four species of mangrove tree: *Sonneratia alba*, *Ceriops tagal*, *Avicennia marina*, and *Bruguiera gymnorrhiza*.

Key Research Objectives:

- 1) To test how the diversity of mangrove species in replanted stands affects a range of ecosystem functions.
- 2) To use controlled experiments to test the effects of replanted mangroves on sediment dynamics (in both low and high energy areas), and to measure how these effects change as the trees mature.
- 3) To collect data of direct relevance to practical restoration projects (such as the role of intercropping in enhancing productivity, and reducing disease), thus helping to inform future restoration efforts.
- 4) To measure the capacity of planted mangrove woods to sequester carbon dioxide, and thus help to mitigate climate change, and to explore whether this ecosystem function varies depending on the mix of species present.
- 5) To work with local people in establishing replanted mangrove plots, which will form part of a sustainably managed local resource.

Data Collection and Results

- a) Give a concise account of the data you have collected during the past field season.

The past field season was our first. As such, our primary objective was to plant our experimental plots of mangrove trees. We also wanted to collect baseline data (on biotic variables such as crab diversity and abundance, and abiotic variables such as sediment salinity, carbon content and granulometry) from our sites to allow monitoring of environmental change in the future.

- b) What progress have you made towards achieving your original objectives?

We made excellent progress this season. All of our 46 experimental plots are now established with baseline data collected from all of them.

- c) Please provide a summary of your results (even if they are preliminary).

Since this was the first year of a five year experimental study, we do not have results at this stage. However, we do have a good description of our study sites and information on the survival rates to date (after some 2-3 months) of our planted trees. We planted 6077 trees; currently the overall mortality rate is running at 5.2%, which is very good for the difficult first two months after transplanting. *Bruguiera gymnorrhiza* has shown the greatest mortality, whilst *Sonneratia alba* has shown the least. The success of the latter species may be due to the different site we used for planting.

Significance/Benefits of Research

- a) What is/are the significance/benefits of your research at the following levels?

- local (in the area of the research site)

All of our experimental plots will become mangrove resources for local people – who rely heavily on mangroves for a range of goods and services - once our study is completed. One of our PIs lives in the local village and has been managing mangrove rehabilitation projects there for many years; our work builds on and consolidates his previous efforts. Our work is helping to support a team of five local people employed to work on mangrove management, and providing additional occasional work (for example in preparing nurseries for future planting) for other villagers.

- national

Kenya is a country suffering from a severe shortage of woodland. Along the coast, mangroves are often the major woodland resource. As a result, there is an urgent need to develop better mangrove management plans. One of the PIs, James Kairo, has been asked to lead a group developing a national management plan. The plots that we are establishing will provide information of relevance to this plan.

- international

Mangroves suffer one of the fastest rates of destruction of any habitat; it is estimated that ~2% mangrove cover is lost annually. Hence their conservation and rehabilitation are global conservation priorities. Our work will contribute important information on how mangroves can be restored, and also considers the role of mangroves in stabilising coastlines and absorbing carbon dioxide. Both of the latter are issues of global significance in the face of climate change.

b) How do your findings contribute to issues of sustainability?

Our work contributes to sustainability in two main ways. First, we are conducting an experiment looking at how the species richness of an ecosystem affects the ability of that system to provide goods and services. This question is of fundamental ecological interest, but also underpins much of the discussion about the effects of species losses on sustainability; can ecosystems function effectively with fewer species in them? Second, we are engaged in a very practical way in enhancing the sustainability of the mangroves near Gazi, by planting more trees, and through this in providing information which will be of use to mangrove management in other parts of the world.

Dissemination of Results

As this is our first year, and we are working with species that take time to grow, we do not yet have results. We anticipate having our first scientific results in one year's time (when we will report on influences on mortality of planted trees), and results pertinent to our main hypotheses in 3 years' time.