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# CONSERVATION OF BIODIVERSITY IN THE SANGO BAY AREA, SOUTHERN UGANDA

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## ABSTRACT

A series of biodiversity and socio-economic surveys carried out in the Sango Bay area of southern Uganda revealed high biodiversity values for some taxa in some sites. Use of this biodiversity and reliance on it by local communities was widespread. Biodiversity scores were given to all species and these were coupled with remotely-sensed data on land cover types to produce a biodiversity map for the area. On the basis of this map, zoning for different land uses is being proposed for the Sango Bay area. The implementation of the zoning plan should be in the form of an integrated conservation and development project.

## INTRODUCTION

Our study of the part of southern Uganda which we refer to as the "Sango Bay area" (SBA; defined below) was motivated by a number of factors, which we enlarge upon below:

- There was enough information about the SBA to suggest that it had a rich diversity of habitats.
- Extensive areas close to Lake Victoria, including hundreds of square kilometres in the SBA, are flooded, seasonally or permanently; and wetlands of many types are, as yet, poorly protected in Uganda.
- Because much of the lower-lying ground is sparsely inhabited, we supposed that the idea of an "integrated conservation and development project" (ICDP) had a better-than-average chance of success.

Our study area included the area lying between the main Kampala-Masaka-Mutukula road and Lake Victoria, from Lukaya to the Tanzanian border. The SBA lies in the eastern parts of Rakai and Masaka Districts and covers some 2,500 km$^2$. Sango Bay itself is in Lake Victoria. It gave its name to the nearby forests from which timber was exported across the lake earlier in the century.

Previous knowledge of the area included a general survey of the Sango Bay forests (Howard, 1991), a detailed study of the forest birds (Friedmann & Williams, 1969), and studies of Lake Nabugabo (e.g. Greenwood, 1965; Ogutu-Ohwayo, 1993). However, these give little indication as to what might be found by more thorough studies. We were not alone in these thoughts, and

were particularly fortunate in having a parallel study of land use in the area, based upon analyses of remotely-sensed data and related field work (Fuller *et al.*, 1995).

Studies by the Forest Department and a wetlands inventory team in the Ministry of Natural Resources also included some sites in the SBA (Davenport & Howard, 1996; Omoding, 1996). There also were on-going studies of water birds (Arinaitwe, 1995). Taken together with our own work, these studies provide sufficient knowledge to draw some realistic conclusions about the importance of conservation in the SBA, and give insights into how it might be included in land use planning.

## METHODS

### Biodiversity studies

Preliminary visits to the area, together with early results from the Darwin Project, indicated that much of the higher ground inland from Lake Victoria was cultivated. Closer to the lake are extensive areas of swamps and grasslands, with a series of forests. The human population density here is relatively low averaging about 100 persons/km$^2$ (Uganda Government, 1991). We therefore chose most of our study sites in these lower areas, but over a wide range of habitats. We expected to exchange data with other projects and so did not, for example, sample the main Sango Bay Forest Reserve.

A total of 10 wetland and 12 dryland sites were studied. At each site, a team of biologists undertook quantitative work on the plants and animals within an area of up to one square kilometre, chosen as representative of a particular habitat. Simple methods were used, in order to obtain adequate data in a limited time. Table 1 shows the main taxa groups sampled in wetlands and drylands, and the methods used. Systematic sampling was augmented by opportunistic records. More detailed descriptions are given in the main report, "The Biodiversity of the Sango Bay Area" (MUIENR, 1996).

The data yielded estimates of the total number of species (species richness) and the occurrence of a species at only one or a few sites (uniqueness) for each taxon at each site. For species richness the jackknife estimate and regression methods were used to give the possible maximum number of species in each site. The site with the most species was given a score of 5, the next 4, and so on. The results are shown in the upper part of table 2. A slightly different criterion was used for species uniqueness. A species recorded at only one site was given a rank of 3, if at only two sites, the rank of 2 and 1 for species found at three sites. The total ranks were then added; the top site scored 5, and next 4 and so on. The results are shown in the lower part of table 2. This enabled the sites to be ranked for both criteria and then overall.

A total of 1000 species of plants, 78 species of mammals, 431 species of birds, 31 species of amphibians, 279 species of butterflies, 67 species of dragonflies and 44 species of fish were recorded from the drylands, and/or wetlands of the Sango Bay area. According to IUCN (1996), only two bird species are in the Red List of Globally Threatened Species. These are the Blue Swallow (*Hirundo atrocaerulea*) and the Papyrus Gonolek (*Laniarius mufumbiri*) listed as Vulnerable and Near Threatened respectively. Only one mammal species, the African Elephant (*Loxodonta africana*) is listed as Vulnerable (IUCN, 1996).

### Socio-economic studies

In parallel with the biodiversity studies, communities around the study areas, and those using the various habitats and consulted. A questionnaire survey was carried out, together with oral interviews.

*Table 1. The main groups of plants and animals sampled in dryland and wetland sites, and the methods used. Opportunistic records were also collected.*

| Main groups sampled | Drylands | Wetlands |
|---|---|---|
| Vascular plants | Quadrats along transects | Quadrats |
| Dragonflies | | Transects along ecotones |
| Butterflies | Baited traps and timed transect walks | |
| Fish | | Nets of various sizes and interviews |
| Amphibians | | Counts of fixed time length, hand picking and sound recording |
| Reptiles | Opportunistic, recording supplemented by local records | |
| Birds | Timed species counts, mist-netting and opportunistic observations | As for drylands |
| Mammals | Trapping, mist-netting, direct observations of animals droppings, footprints and other signs | As for drylands |

## RESULTS AND DISCUSSION

The Sango Bay area has a population of about 300,000 (Uganda Government, 1991). A sample of 200 households was used in the surveys. Sixty percent of the respondents were male and forty percent female.

Fifty two percent and thirty-five percent of the respondents were between the ages of 16–30 and 31–45 respectively. The rest were above 45 years. The land tenure systems in the area are Mailo land, leasehold, freehold, customary and communal ownership. Of the main land cover types, as recognised by the Darwin Project, all the natural and semi-natural types were sampled. They were then allocated biodiversity ratings of high, medium and low, based upon the results in table 2.

Altogether, there is a rich variety of habitats in the area, supporting many interesting species. Some, such as the endemic fish of the Nabugabo lakes, are globally threatened (Ogutu-Ohwayo, 1993), and many others are uncommon or rare. One unusual feature is the presence of more than 30 species of montane plants and several species of birds that occur nowhere else below about 1500 m, above sea level (Katende & Pomeroy, 1998). (The Sango Bay forests are at an altitude of about 1140 m, just above the lake, and subject to extensive seasonal flooding). This is strong evidence in favour of the area having been a Pleistocene refuge and suggests that with more searching other unusual species are likely to be found. Figure 1 is a biodiversity map for the main land cover types based upon the results in table 2.

The natural ecosystems provide many materials for the people of the area, as well as water and grazing lands. The principle uses made of the natural areas are summarized in table 3, together with an indication of their sustainability at present use rates.

The majority of the people occupying the more natural areas, or using their resources, are essentially subsistence farmers, pastoralists and fishermen. The major constraints to improving their way of life are the absence of produce markets, low levels of education, poor farming methods and lack of extension services.

*Table 2. Site rankings, based upon criteria of species 'uniqueness and richness'.*

| Habitat | | Wetland sites | | | | | | | | | | Dryland sites | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site codes | | AP | BI | BS | DS | GS | LK | KG | MS | NK | NN | AC | AS | MI | BA | KI | KS | KT | KY | MG | NA | NG | PS |
| Scores for spp. | LCT | Wt | Pt | - | - | - | Wt | Ps | - | Ts | Ps | Ac | Sg | MT | FR | FR | Sg | Fd | Sg | MT | FR | Ss | MT |
| richness (Ri) | Plants | 5 | 0 | 3 | 0 | 4 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 3 | 0 | 0 | 0 | 1 | 2 | 0 |
| | Mammals | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 5 | 2 | 0 | 0 | 0 | 2 | 4 | 0 | 0 | 0 |
| | Birds | 5 | 0 | 1 | 4 | 3 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 5 | 0 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 0 |
| | Amphibians | 3 | 5 | 4 | 3 | 2 | 2 | 0 | 0 | 1 | 2 | - | 1 | 0 | - | 0[a] | - | - | - | - | 0[a] | - | - |
| | Butterflies | - | - | - | - | - | - | - | - | - | - | 5 | - | 1 | 4 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| | Dragonflies | 5 | 2 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0[a] | 0[a] | - | - | - | - | - | 0[a] | 0[a] |
| | Fish | 0 | 0 | 0 | 3 | 4 | 3 | 4 | 0 | 2 | 5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Total | | 18 | 7 | 8 | 13 | 13 | 9 | 6 | 2 | 4 | 8 | 8 | 1 | 13 | 11 | 3 | 7 | 2 | 4 | 4 | 1 | 2 | 0 |
| Scores for spp. | Plants | 5 | 0 | 1 | 2 | 4 | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 2 |
| rarity (Ra) | Mammals | - | - | - | - | - | - | - | - | - | 4 | 3 | - | 5 | 2 | 0 | 3 | 0 | 0 | 0 | 4 | 2 | 0 |
| | Birds | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 5 | 0 | 0 | 3 | 0 | 0 | 0 | 2 | 0 | 0 |
| | Amphibians | 3 | 4 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 4 | 0 | 4 | 2 | - | 5[a] | - | - | - | - | 3[a] | - | - |
| | Butterflies | - | - | - | - | - | - | - | - | - | - | 5 | 0 | 0 | 2 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | Dragonflies | 5 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0[a] | 3[a] | - | - | - | - | - | 0[a] | - |
| | Fish | 0 | 0 | - | 2 | 4 | 0 | 3 | 0 | - | 5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Total | | 13 | 7 | 5 | 5 | 8 | 1 | 6 | 4 | 0 | 13 | 12 | 7 | 14 | 9 | 12 | 9 | 0 | 1 | 0 | 12 | 2 | 2 |
| OVERALL TOTAL | | 31 | 14 | 13 | 18 | 21 | 10 | 12 | 6 | 4 | 21 | 20 | 8 | 27 | 20 | 15 | 16 | 2 | 5 | 4 | 13 | 4 | 2 |

0 = no score - = no data [a] = streams in drylands

**Key**

**Site Codes**: *Wetland sites:* AP = Airstrip ponds, BI = Bikira swamp, BS = Byante stream, DS = Diimu lakeshore, GS = Goma lakeshore, LK = L. Kayanja, KG = L. Kayugi, MS = Malembo shoreline, NK = Nakigga, NN = Nabugabo north; *Dryland Sites*; AC = *Acacia* woodland, AS = Airstrip savanna, BA = Bale forest, KI = Kirala swamp, KS = Kayanja savanna, KT = Kitasi forest, KY = Kyotera south, MI = Mityebili, MG = Malembo grassland, NA = Namalala forest, NG = Nabugabo grassland, PS = *Phoenix* savanna.

**Land Cover Type (LCT) Codes**; AC = *Acacia*, FD = Degraded forest, FR = Forest, MT = Medium height grass/Thicket, Pt = Papyrus swamp/Tall grass, Ss = Short grass/Papyrus, Sg = Short grass, PS = Papyrus swamp, Ts = Tall grass/swamp, Wt = Water.

*Table 3. The percentage of respondents (local people) using some of the more important natural resources in the Sango Bay area. The sample size was 200.*

| Activity | % |
|---|---|
| Grazing | 12.9 |
| Fuelwood | 50.0 |
| Building material | 21.0 |
| Collection of water | 80.3 |
| Charcoal burning | 0.6 |
| Hunting | 7.5 |
| Fishing | 12.9 |
| Mulching material | 29.9 |

**Future options**

We think that it should be possible for some 'rural' development to take place in many of the areas of higher biodiversity whilst conserving much of that biodiversity for continued use by people. It should therefore be possible to develop an ICDP for parts of the SBA. However a cautious approach is needed; ICDPs have been proposed for a number of areas in sub-Saharan Africa, with mixed results (Barret & Arcese, 1995). Indeed, there have been cases where such schemes have actually had adverse effects on conservation (e.g. Oates, 1995).

Although Uganda has yet to implement a land-use policy for rural areas, there are signs that the government is becoming more concerned about misuse of land (NEIC, 1994). Old legislation on burning and stocking rates is largely ignored (Tukahirwa, 1992). Nevertheless, we expect that all land will eventually be zoned for various purposes, so that our proposals will become integrated into a national system.

Uganda's new wildlife legislation allows for the zoning of conservation areas. The highest category is that of Nature Reserves in which conservation of natural resources is the only form of land use permitted. We suggest that some of the forests and wetlands in the SBA deserve this status. Around these Nature Reserves, and incorporating much of the wetland and dryland areas of medium and high biodiversity, as 'Buffer' or 'Multiple Use' Zones (figure 2). Here, sustainable activities such as grazing of cattle, firewood collection, collection of building and mulching materials, brewing and thatching materials, hunting and collection of water for domestic purposes should continue, but with such restrictions as to make them sustainable. Thus, stocking levels on grazing lands will be prescribed and permits for harvesting materials issued. Also, monitoring of the off-take on fixed percentages coupled with general awareness campaigns to sensitize local communities on the importance of sustainable utilization of resources.

We expect that the control of land use in the Buffer Zones will be made the responsibility of the local District and Parish Councils, who will have the necessary powers to determine the type of use and amount of the off-take for each family depending on the size and needs of particular families. Sustainable use of the land in the Buffer Zones will contribute to the local economy but will not be sufficient to improve living standards for a growing population. To make this possible, it is essential to prevent the ICDP being seen as anti-development. Investment in agriculture could bring substantial improvements. Furthermore, should any ecotourism be developed in the area, some of the benefits accruing should go directly to the local communities. The area is easily accessible from Kampala and has potential for a range of recreational activities.

All of these factors need careful planning, and we are proposing that this be done as an ICDP in order to achieve the best compromise.

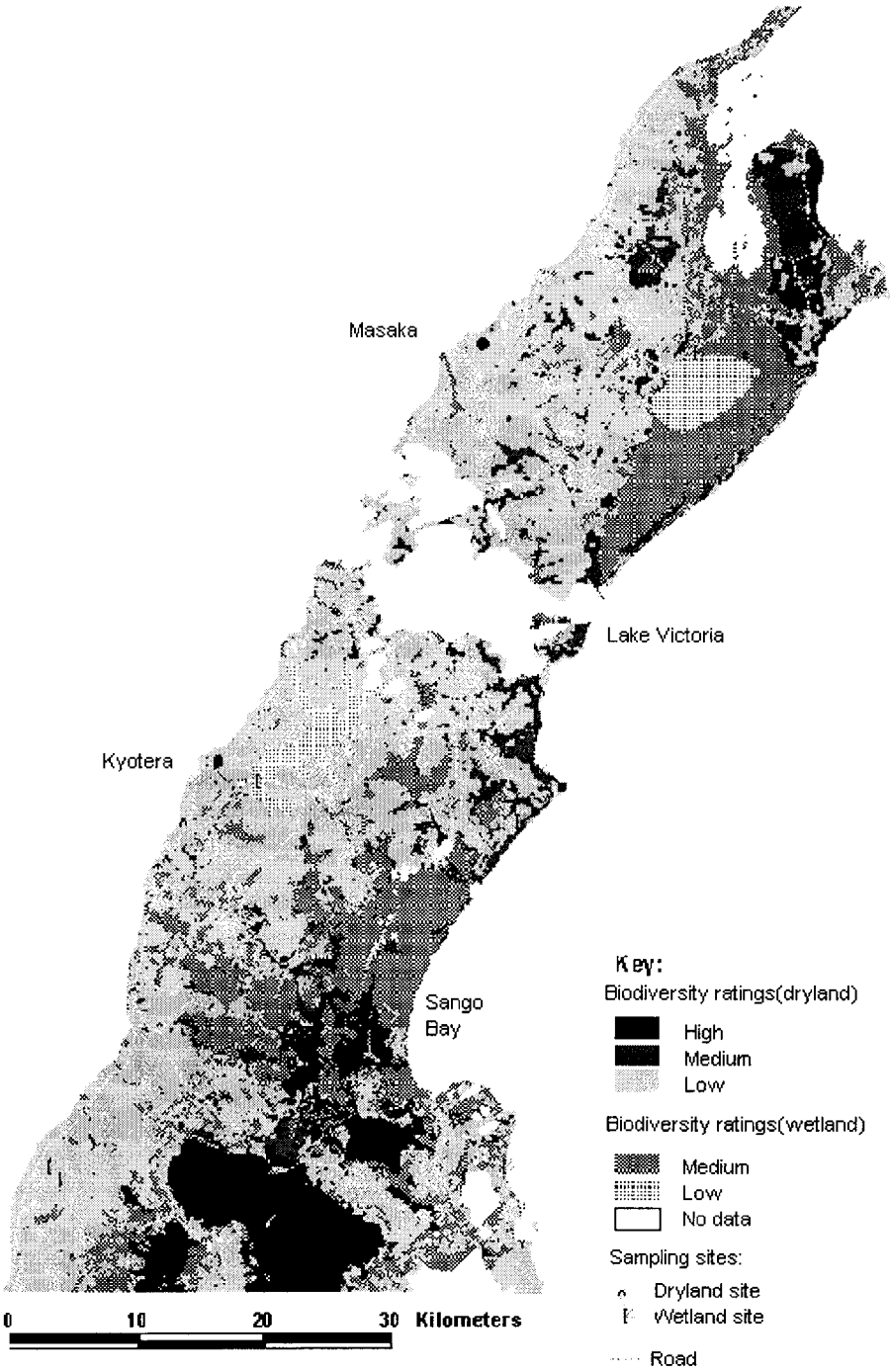


*Figure 1. Biodiversity ratings, derived from the data in table 2, applied to the Land Cover Units (Fuller et al, 1995). The lemon shaped area in the upper part is Lake Nabugabo. The black patches in the lower part are the Sango Bay forests.*

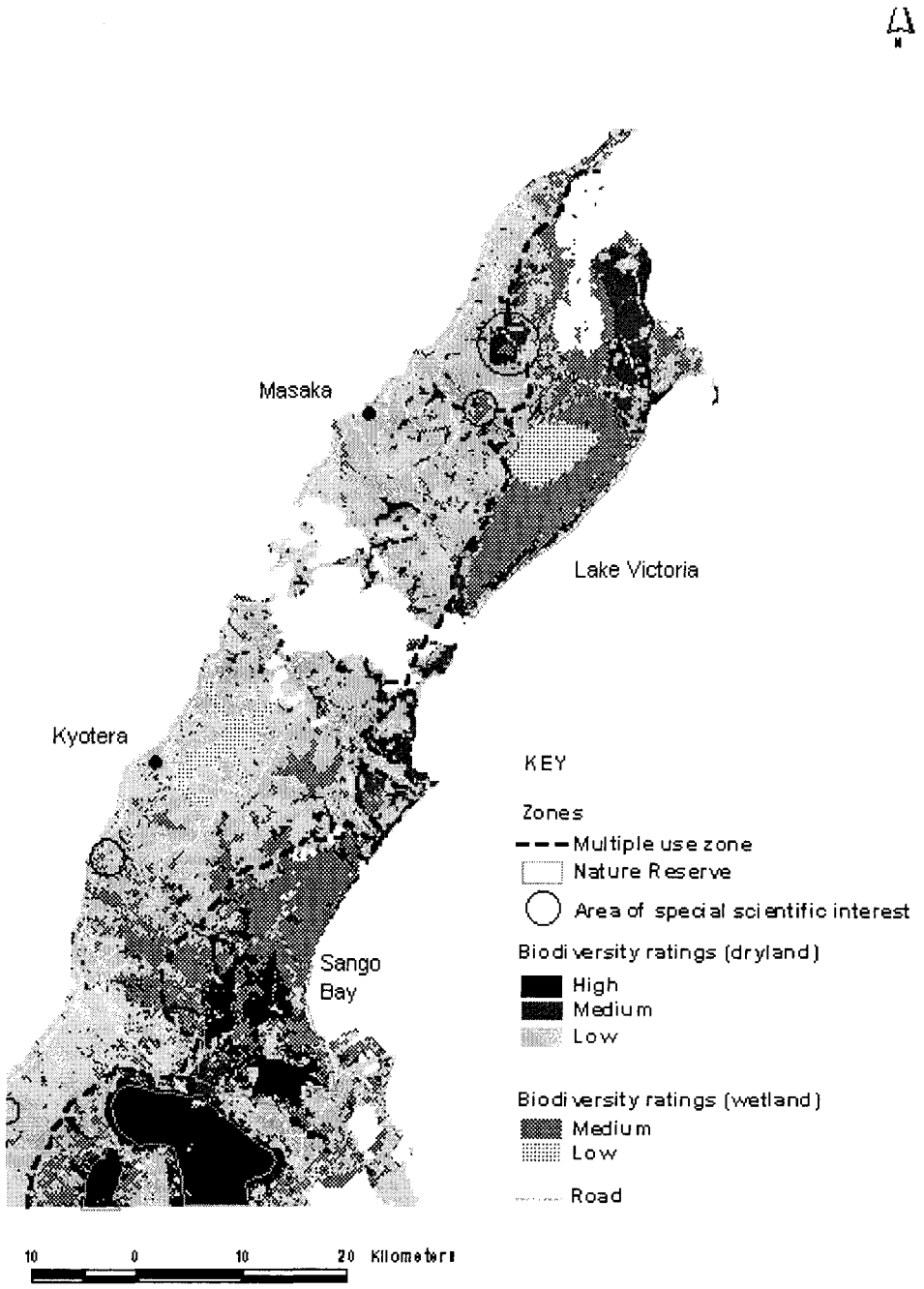


*Figure 2. Proposed zonation: based upon the sustainable use of resources and their conservation.*

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