

EARTHWATCH INSTITUTE FIELD REPORT

Project Title:

SOUTH AFRICA'S HIDDEN SPECIES

Principal Investigators:

Dr Michelle Hamer; Professor Robert Slotow; Dr Dai Herbert

Position / Affiliations:

Dr Hamer: Co-ordinator - Inland Invertebrate Initiative; Senior Lecturer – University of KwaZulu-Natal; Prof Slotow: Associate Professor – University of KwaZulu-Natal; Dr Herbert: Chief Curator Malacology – Natal Museum.

Research Sites:

South Africa, KwaZulu-Natal: Mkhuze Game Reserve (27.60°S 32.22°); and Phinda Game Reserve (27.79°S 32.33°E).

Local Management Status of Research Sites:

Mkhuze Game Reserve: managed as part of the Greater St Lucia Wetland Park World Heritage site.

Phinda Game Reserve: privately owned conservation area.

Key Research Objectives:

- Produce an annotated inventory of selected invertebrate taxa in the two reserves, including information on level of endemism, threat status, and locality and habitat information for each species.
- To investigate sampling methods and strategies including change in fauna over seasons and between years in order to contribute towards the development of a monitoring strategy.
- To provide baseline data for future monitoring of various management practices, and to understand impacts of threats such as climate change and habitat alteration by elephant populations.
- To investigate invertebrate indicators for use in biodiversity monitoring.
- To investigate vegetation types as a surrogate for invertebrate communities in conservation planning in savanna.

Data Collection and Results:

a. Data collected:

Number of sites surveyed to date: 30 (20 this season, although this includes repeated surveys of some sites)

The vegetation of these sites has been surveyed prior to the invertebrate survey. Each site comprises an approximately one hectare area, and in each the following sampling techniques are used: two 10x2m quadrats that are actively searched; two 20x20m plots that are searched; 2 sets of random searching over

the site; two 50x6m transects to sampling flying insects; 20 sets of tree beating; two sets of sweep netting; 10 colour pan traps and 10 baited butterfly traps. All material collected to date has been processed which includes sorting, labelling, preliminary identification and entry into a database. Much of the material is currently with taxon experts for identification to species level. This sampling has yielded the following results to date:

- Number of records: 17 579
- Number of identified species: Lacewings & antlions: 22; Butterflies: 90; Dragonflies: 12; Terrestrial Molluscs: 43; Millipedes: 28; Fruit chafers: 28; Grasshoppers: 23; Earthworms: 1; Spiders (families Thomisidae, Oxyopidae, Araneae): 98; Scorpions: 6.

b. Progress towards achieving original objectives:

- Preliminary inventories have been compiled for millipedes, molluscs, neuropterans, three spider families; butterflies; fruit chafers; and scorpions. Identification guides for the millipedes and molluscs of the area have been developed.
- A draft manuscript examining the effectiveness of using volunteers to sample invertebrates has been written, as has a comparison of sampling methods and their effectiveness.
- A draft manuscript has been written investigating the use of different diversity measures in conservation planning, and another on vegetation type as a surrogate for invertebrate diversity.
- 24 vegetation types have been surveyed to determine invertebrate community structure in relation to vegetation.
- Common vegetation types have been surveyed in two different years, and most have been surveyed at least in November and January, with three surveyed in March as well.

c. Preliminary results:

- The diversity of invertebrates recorded in this study has proven to be far higher than anticipated across most taxa. The following examples indicate the lack of knowledge of the invertebrate fauna of the region. Molluscs were presumed to have been adequately surveyed for Mkhuze, but this project has increased the number from 20 to 35 species. This includes records of three species of carnivorous slugs of the genus *Chlamydophorus*, previously not known from the area, and in the case of two of the species, rarely collected, and thought to occur only in forests. Two species of millipedes were previously known from the area, and this has been increased to 28 species, including two orders not previously recorded from north-eastern KwaZulu-Natal.
- No significant difference between the sampling effectiveness of project staff and volunteers was found.
- Analyses of sampling techniques has shown duplication of the fauna sampled in plot sampling and random searching, and this can now be rationalised, but the two methods for sampling butterflies have been shown to sample different components of the fauna. The extent to which the sampling has collected all species has been determined for different taxa, and while it appears that we have already sampled all species for some groups, this is not the case for most taxa.

- Vegetation types that have high plant diversity and that are conservation priorities do not always have high invertebrate diversity. Unique Sand Forest for example, has low diversity for the focus invertebrate taxa. The reason for this is still unclear. While savanna is considered to be relatively uniform with most tree species being widespread across Africa, invertebrate species at the study sites have more limited distributions, and communities are not uniform across similar vegetation types. Soil type and geology appear to be important in influencing mollusc diversity, but the important factors are likely to differ for different taxa.

Significance / Benefits of Research

Invertebrates in South Africa and globally are currently generally excluded from conservation planning and biodiversity conservation and management activities. This is a result of the lack of appropriate data, and a lack of understanding of the significance of invertebrates and the extent of their diversity. This project aims to address these issues, by feeding into several current activities at various levels.

Local level:

- Highlighting unique, charismatic, and ecologically important invertebrate species, and making this information accessible to reserve managers will increase awareness and appreciation for invertebrates, and thus contribute to their conservation. Information can also be used in ecotourism activities, further increasing awareness amongst the public and also improving ecotourism activities at Phinda and Mkhuzi Game Reserves.
- Providing data on invertebrates of conservation significance and their localities in the reserves will increase the conservation status of the reserves, and assist with conservation of these species.

National level:

- A National Conservation Assessment is currently being undertaken in South Africa. This prioritises areas and biomes, but includes only limited invertebrate data. An understanding of what factors contribute to or influence invertebrate communities and at what scale invertebrate communities change does not currently exist, but is critical for effective biodiversity conservation planning. The data from this study will be provided to conservation planners at national and provincial organisations for future updates of the assessment.
- The data will be provided to KwaZulu-Natal Wildlife for use in their land-use planning section. This section is responsible for flagging species and areas that are important for conservation in the application process for permits for land use change, which includes agriculture, ecotourism development, road construction and mining. Species' distributions can be modelled and distributions extrapolated if sufficient data exist on those factors that influence distributions. This should result in the protection of endemic and threatened invertebrate species over a wide area of KwaZulu-Natal.

International level:

- The National Biodiversity Strategy and Action Plan is currently being developed for South Africa, and for various other countries, including several in Africa. Monitoring of management practices and impacts of threats such as climate change, increased elephant populations, and sustainable use of natural resources is a key strategy in most of these Plans. In order to effectively monitor biodiversity invertebrates must be considered, but it will be impossible to monitor all species. The selection of key taxa, and the use of effective and efficient sampling methods for these taxa is critical. The project will contribute to the development of monitoring procedures for invertebrates, which can be used over a large part of Africa which is covered by savanna vegetation.

Local / National and International levels:

- The research is also being used for capacity development at various levels. Undergraduate students from two campuses of the University of KwaZulu-Natal are involved in laboratory processing of material, and young research assistants and postgraduates from other projects in KwaZulu-Natal assist with the expeditions. One international MSc student registered at the University of KwaZulu-Natal is working on the data for her thesis. Eight African Fellows from various countries in Africa were involved in the project as Team 2 in 2004.

Contributions to issues of sustainability

In the medium to long term the project will contribute to issues of sustainability. Outside of protected areas, northern KwaZulu-Natal is undergoing rapid and widespread land use change. Large tracts of pristine vegetation are being ploughed for commercial pineapple farming, for genetically modified cotton and for maize. In addition, the extent of rural settlements and subsistence agriculture is increasing. Invertebrates are critical for soil fertility, for processing the dung of livestock, for pest control and for pollination of many crops. The total eradication of natural habitats will result in the breakdown of these ecosystem functions. The data generated will contribute to the conservation of some habitats and species, contributing to the sustainable development of the region. In addition, ecotourism is seen as a potential source of income for local communities, but without adequate management and protection, ecotourism areas inside and outside of protected areas are unlikely to be sustainable in the long term. Data generated by the project should contribute to the protection and management of important ecotourism / biodiversity areas in the region.

Dissemination of results:

Scientific papers: In process:

1. Lovell, S., Hamer, M., Slotow, R. & Herbert, D. A comparison of sampling methods for invertebrates in savanna habitats.
2. Lovell, S., Hamer, M., Slotow, R. & Herbert, D. The use of volunteers in invertebrate diversity surveys.

3. Lovell, S., Hamer, M., Herbert, D., & Slotow, R. The value of diversity measures in conservation planning and management – a case study of Mollusca and Diplopoda in a savanna ecosystem.
4. Lovell, S., Hamer, M., Slotow, R. & Herbert, D. Surrogacy and conservation planning: an evaluation of the use of vegetation types as a surrogate for invertebrate communities in the savanna biome.

Presentations:

Given: 1 April 2004: Earthwatch Europe public lecture series, Royal Geographic Society London. Open to members of the public, attended by approximately 200 people.