Dear Volunteers,

The 2008 field season was a huge success! It was the first time some of the staff had been involved in the project and it was a steep learning curve for us all. But, with everyone's effort the end result was extremely positive.

During the three month field season, we only lost two days to rain and only a few transects could not be completed because elephants decided to spend some time on the transects! A few of you completed your transects despite bumping into black rhinos and the odd lion and leopard and still came out unscathed and smiling! All of the transects that you completed were repeated between 14 and 20 times, slightly more than has been done in previous seasons. This could never have been achieved if you had not been a part of the fieldwork. The transects in the Wilderness area that were walked by staff and other students were each repeated 5 times, which is also more than has been done previously. In total 514 transects were walked, covering 4093.4 km, producing 6218 different sightings and a total of 31770 animals! All in all, a MASSIVE and successful effort by everyone!

During November 2008, we held the annunal Animal Population Control meeting in Hluhluwe. The aim of this meeting is to debate population estimates, assess population trends and determine offtakes of each species for the following year. As you can imagine, this is a very important meeting and requires excellent information. The park managers were very impressed with the amount of data that you collected and with the estimates produced from your data. Most of the species seem to be doing very well, with their numbers increasing, however, kudu and waterbuck populations seem to be decreasing slightly. We are now collecting more detailed information on these two species and will be conducting a project this year to determine possible reasons for their declines.

The data that was collected during the 2008 field season is also being used in a detailed scientific paper being headed up by a post-doc student. She is looking at all of the Earthwatch game census data since 1998 to determine what is driving the trends in the various herbivore species within both the Hluhluwe and the iMfolozi sections of the park. The factors being considered are management removals, rainfall, predation and density dependence. This further highlights the importance of collecting good, long-term data sets, which we could not achieve on our own and is only possible with your assistance and that of the Earthwatch Institute.

Thanks very much to all of you for volunteering your time, legs, eyes and your experiences to come out and provide the information that we need to manage the park well. It was great getting to know you all and at the same time, getting a vital job done successfully and well.

Regards

Dave Druce

EARTHWATCH INSTITUTE ANNUAL FIELD REPORT

Project title: Walking with African Wildlife
Date completed: 9 March 2009
Completed by: Dr. Dave Druce
Period covered by this report: July to September 2008

Reporting on research objectives

1. Provide a summary of progress this year towards each of the objectives stated in your most recent research proposal.

Objective 1: Count the large herbivore component of game in Hluhluwe-iMfolozi Park.

This was very successfully completed during the field season. All the species that were being targeted were counted, although some of the less common species were not seen often enough to be included in the analysis. For the most robust analysis, species need to be seen approximately 60 times, however, in our analysis we also analysed waterbuck which had only been sighted 35 times. From this, we produced reliable estimates for 10 of the most common herbivore species (Table 1).

Almost all of the transects were repeat sampled more times than during previous field seasons. The transects completed by the volunteers were repeated between 14 and 20 times (higher than the 11 to 16 times stated in the project objectives), while the few transects traversing the Wilderness Area which were completed by staff and researchers in the park, were each repeated 5 times. The data that was generated was of a high standard and the high number of times that each transect was repeated gave good statistical robustness to the analysis.

The analysis was run slightly differently to previous years, however, we feel that this was a more accurate analysis than was previously carried out. The DISTANCE 5.1 sampling program that was used to analyse the data stratifies the area sampled based on different habitats. This year we divided the park into five strata based on differences in vegetation density, predominant plant species and topography, as opposed to the previous four strata that were used. The data was used to produce a report for the annual Animal Population Control meeting with the park management and ecological advice staff.

Objective 2: Use the data to establish long-term trends in herbivore populations and ensure these data are accessible to research projects.

The 2008 field season added another year of data to the growing database we have on game numbers every two years. Because of the number of years that data have been collected for, we are able to analyse trends in the numbers of individual species. Although most species' numbers are increasing, the numbers of waterbuck and kudu are decreasing (Table 1). Such insights have resulted in us initiating a project to attempt to determine what is affecting the waterbuck and kudu populations.

Table 1. Animal population trends since 2002.

SPECIES	2002	2004	2006	2008
Buffalo	3,430	3,553	4,072	6,082
Kudu	1,112	962	1,013	800

Nyala	7,607	5,995	5,697	6,640
White Rhino	1,802	1,476	2,090	2,038
Giraffe	423	613	687	793
Wildebeest	3,270	2,741	3,901	4,399
Warthog	3,543	2,055	1,997	2,049
Zebra	3,435	2,704	4,602	4,133
Impala	23,622	18,785	18,399	23,133
Waterbuck	618	402	340	210

In addition, another scientific paper is in the preparation stage. This paper attempts to determine reasons for the population demographics of various game species. All of the game census data collected by Earthwatch volunteers since 1998 are being analysed, along with game removals data collected by the game capture team and mortalities recorded by field rangers during their daily patrols. This will inform what affects these particular game species' numbers, such as management activities, predation, density dependence and/or rainfall.

A number of other research projects have requested and been provided with the game census data.

Objective 3: Do a comparative analysis of game numbers and assembladges within HiP compared to other similar areas.

This objective has not been completed yet. The aim of this objective was to determine if management should be concerned with the relatively high numbers of certain species such as impala and nyala. Part of this objective will be answered by the scientific paper looking at the long-term census data and reasons for the trends. Hluhluwe-iMfolozi Park is run on processed-based management, which means that all processes that would have been present in the past need to be here and operating as would have happened if the system had been open. Consequently, if certain species that have high numbers are constrained by predation and/or density dependence, then we may not want to take any action. Furthermore, wild dogs, which are endangered species, are doing the best they have ever done in the park. This may be due to the high availability of prey species such as impala and nyala. Continuous monitoring of their prey selection, may inform us of whether this is the case or not.

Project development

1. If you have removed or modified your original objectives please explain why below.

None of the objectives have changed. The collection of this data is vitally important to inform the Hluhluwe-iMfolozi Park management team. With the continued collection of this data over time, one is able now to determine trends as well as possible reasons for the trends. This is important, in that it allows one to determine the effects of various management actions on the various game species and/or how the populations regulate themselves or are regulated by other herbivores or predator.

2. What logistical or scientific challenges have you encountered in the past season and how will you address these during the next field season?

No scientific challenges were seen during the past season that need to be rectified. There were a number of minor logistical challenges that will be sorted out before the next field season. One of the main problems was the lack of a computer in the south camp for

volunteers to enter data. As a result, volunteers were not able to contribute to data entry and therefore, not able to take the process through to completion. We are in the process of acquiring another laptop which can be dedicated to this camp during the next expedition. We will also improve the solar power system, so that this laptop can be powered at the camp. A problem which was disruptive during the last field season was the movement between various camps in the south. We have already booked one of the camps for the next field season, so we should have stability in this regard next time. We are also in the process of seeing whether we can set up another camp closer to the centre of the south and closer to a guard camp, so that the logistics of dropping volunteers off at the transects and picking up and dropping off guards will be easier.

Non-technical summary of results

1. Give an account of the data collected and results (inputs and data) for the period covered by this report, mentioning any emerging trends.

Between 14 July and 23 September 2008, 44 Earthwatch Institute volunteers, 7 staff and 3 students collected sightings data on all herbivore species (with the exception of elephant and black rhino) in Hluhluwe-iMfolozi Park (HiP), KwaZulu-Natal, South Africa. Herbivores were counted along 24 cut and 10 uncut transects using the Distance sampling technique. Similarly to 2006, the uncut line transects in the Wilderness Area were walked using a GPS to guide observers. Four of these transects were walked by the Earthwatch volunteers and the other six by staff and students. One and a half days were spent briefing and training each group of volunteers in data collection assumptions and methods, GPS and rangefinder use, how to walk in the bush and react under different situations and some basic Zulu (the local language).

Each group of volunteers walked transects for 12 days, with each volunteer having the opportunity to walk a different transect each day. At each sighting of an animal, the GPS position of the observer, the species and number of individuals present, distance to the animal, bearing of the transect and bearing to the animal were recorded. These data were then entered into a Microsoft Access database and error-checked. Afterwards the data were entered into the Distance 5.1 computer program and a number of various analyses run to determine the most accurate estimate of each species for five strata (different vegetation density, predominant plant species and topography) within the park. The estimates from these strata were then combined to produce estimates for the Hluhluwe and iMfolozi sections separately and then for the park as a whole. Not all species that were sighted along transects could be used in the analysis as the total number of sightings for these species (such as grey and red duiker) were too low. The GPS positions for these species, will be used in further studies and as general records that these species still occur in the park.

Two days were lost to rain (one day in Hluhluwe and one day in iMfolozi), while on a few other occasions transects could not be completed because of elephants on the transects and volunteer illness. However, often during volunteer illness, temporary staff completed these transects. In total, 514 transects were walked, covering 4093.4 km and producing 6218 different sightings. The Distance analysis produced an estimate of 6082 buffalo, 800 kudu, 6640 nyala, 2038 white rhino, 793 giraffe, 4399 wildebeest, 2049 warthog, 4133 zebra, 23133 impala and 210 waterbuck for HiP. In general, all the species are increasing in number apart from kudu and waterbuck, whose numbers are slowly decreasing. This has prompted us to initiate a study to determine the possible reasons for this decline.

2. How do these data contribute to achieving **conservation impacts?** (e.g. actions based on results, management plans, site protection)

These data are used at the end of the field season to produce estimates of the most predominant herbivore species in the park. This allows the management team to determine how many individuals of the various species can be removed to assist in setting up new populations or supplementing populations in other conservation areas. They are also used in the years in between census years as part of a model which tracks and estimates the numbers of individuals within each species. This assists the management team in monitoring how the different species are doing over time and whether the park is being successful in protecting and increasing populations such as white and black rhino. Consequently, Earthwatch game censuses provide the baseline data necessary for animal population decision making within HiP to ensure that ecological processes are operating at the appropriate level, thereby ensuring the biodiversity objectives of the park. The continuous collection of data enables one to monitor populations over time to identify species in decline and initiate research projects to determine the causal agents.

3. What is/ are the **significance**/ **benefits** of your research at the following levels?

- Local (to the area of the research site)
    - Ensuring ecosystem integrity and species conservation
    - Producing information and analysis which is used to inform conservation management decisions (number of off takes, species conservation plans etc)
    - Informs species management strategies and policies
    - Providing information for long-term trend analysis
    - Providing baseline data used in multiple research projects
    - Providing employment and exposure for members from local community
    - Skills development of local people working on the project

- National / Regional
    - Ensuring HiP's contribution to national conservation targets is being achieved through sound protected area management.
    - Providing data that enables reporting on key species and conservation targets (E.g. black and white rhino status assessments required at national level)
    - Providing baseline data used in multiple research projects

- International
    - Ensuring the status of threatened species improves and boosting international conservation efforts for these species.
    - Providing baseline data used in multiple research projects

Communication of results

Printed:

Mandisa Mgobozi & Geoff Clinning. 2008. Animal Population Control Report, Hluhluwe-iMfolozi Park, 2008/2009. Unpublished Ezemvelo KZN Wildlife Report.

Dave Druce & Geoff Clinning. 2008. White rhino report 2008: iMfolozi sink count results and recommended white rhino removals for IGR and HGR. Unpublished Ezemvelo KZN Wildlife Report.

Sophie Grange, Norman Owen-Smith, Jean-Michel Gaillard, Mandisa Mgobozi & Dave Druce. In preparation. Population trends and patterns of mortality in an African ungulate community after large predator introductions.

Meetings and conferences:
Mandisa Mgobozi & Dave Druce. 2008. Earthwatch Institute and game counts in Hluhluwe-iMfolozi Park: "outcomes through partnerships". KZN Biodiversity Conservation Symposium, Queen Elizabeth Park, Pietermaritzburg, South Africa.

Abstract: As with all small, enclosed reserves, Hluhluwe-iMfolozi Park (HiP) needs to be actively managed, as ecological processes cannot take place as they would have in an open system. This is especially important in HiP, which basis its management philosophy on attempting to ensure that all processes that would naturally have taken place in the past are able to occur (process-based management). However, in order to do this, one needs to understand the ecosystem and its drivers. Part of this is understanding the trends in animal numbers over and what influences these trends. In HiP, biannual game censuses, using walk transects, are conducted between July and September. Thirty four transects distributed throughout the 960 km² park are walked and the results inputted into a long term database and analyzed using DISTANCE. The Earthwatch Institute assists greatly in this monitoring program. They source and provide four groups of 11 volunteers who come for 16 days at a time. This allows transects to be repeated up to 16 times over a three month period. These volunteers pay for the experience and in so doing cover the cost of setting up the transects, walking the transects and entering the data. Apart from the direct benefits of actually conducting and covering the costs of the work (which would otherwise need to be covered by Park Management and Eco-Advice), jobs are provided for eight extra staff during the three months and numerous other temporary staff who are involved in cutting transects and setting up camps. Over the years, the involvement of Earthwatch Institute has helped greatly in monitoring the numbers of various general game species within HiP. This allows analyses of long term population trends, this data also provides baseline data for many research projects that are conducting ecological studies in the park.

Educational Opportunities

1. Does your project directly or indirectly involve the following groups in your research topic?
   - Local communities Yes
   - Students Yes
   - Early career scientists Yes
   - Other groups

2. How does your research help these groups better understand and act towards the conservation of a sustainable environment? (Please provide specific examples of any activities you are aware of.)

The information that we are collecting is used when school groups from the local communities come to the park. Johan Ngobese, who has been involved with the game census program for a number of years, has now been promoted to iMfolozi Community Conservation Officer. He is able to get new information from us about the project and then pass on the outcomes to those from the neighbouring communities as well as school groups coming into the park, as well as describe from first hand experience the aims and methods of the project.

We have also made a presentation to 3rd year biology students from the University of KwaZulu-Natal. This involved explaining the management of the park as well as how

management makes informed decisions. The data collection, analysis and results of the game count data forms a major part of providing good information in order to make informed decisions. Other students and early career scientists who are at the research centre during the time of the game census are also given the opportunity to be involved in the project thorugh assisting with the transects that are walked in the Wilderness area.

3. Has your project contributed ot the completion of Masters' or PhD theses or degrees, or other educational research findings?

The data collected by the project has been used in varying degrees in many research projects based in the park. At the moment the greatest use of the data has been in a post-doc study currently being undertaken in HiP.

Acknowledgements

All volunteers who gave of their time, legs, eyes and money to ensure that this field season was one of the most successful ever.
All staff who put in much effort to ensure that all the logistics were taken care of.
All conservation staff and researchers who volunteered to guide and walk Wilderness transects.
The Earthwatch Institute for providing much needed logistic and financial support.