



**Flamingo Conservation and Ramsar Site Management at Lake Bogoria,
Kenya**

ANNUAL REPORT

01.04.03 – 30.03.04

Earthwatch Institute (Europe) &
University of Leicester

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Darwin Initiative for the Survival of Species

Annual Report

1. Darwin Project Information

Project Ref. Number	<i>162/12/003</i>
Project Title	<i>Flamingo Conservation and Ramsar Site Management at Lake Bogoria, Kenya</i>
Country(ies)	<i>Kenya</i>
UK Contractor	<i>Earthwatch Institute(Europe)</i>
Partner Organisation(s)	<i>University of Leicester (UofL), Lake Bogoria National Reserve (LBNR), University of Nairobi (UofN), National Museums of Kenya (NMK)</i>
Darwin Grant Value	<i>£175,791</i>
Start/End dates	<i>April 2003 to June 2006.</i>
Reporting period (1 Apr 200x to 31 Mar 200y) and report number (1,2,3..)	<i>1 April 2003 to 31 March 2004 Annual Report No. 1</i>
Project website	<i>Not yet established (William Kimosop, LBNR, setting up as ...gov. ke)</i>
Author(s), date	<i>Dr David Harper , Project Leader, University of Leicester; Robert Llewellyn-Smith, Earthwatch Institute (Europe) 30th April, 2004</i>

2. Project Background

The project is located at Lake Bogoria National Reserve, Rift Valley Province, Kenya. This is one of three central soda lakes in the series of lakes in the Eastern Rift that runs through Ethiopia, Kenya and Tanzania (Fig 1). These three lakes (Lakes Nakuru and Elmenteita are the other two) are the main feeding lakes of the lesser flamingo *Phoeniconaias minor*. Nakuru was Kenya's first Ramsar site: Bogoria was declared in 2000.

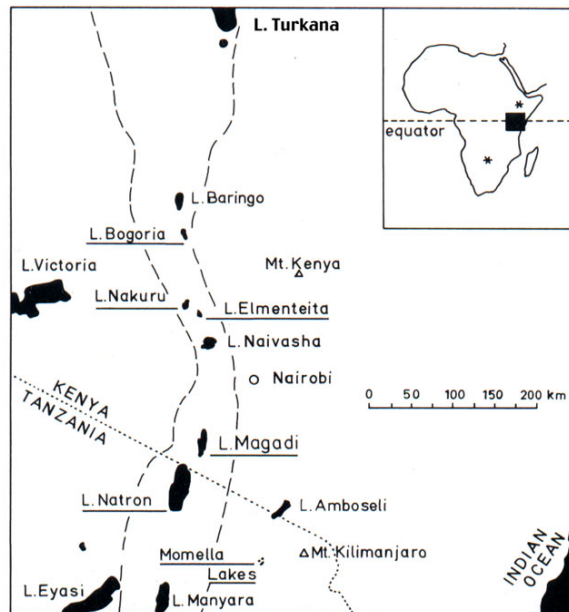


Figure 1. Lakes of the Kenyan Eastern Rift Valley. Saline lakes are underlined. From Harper et al, 2000.

In the mid-1990s two outbreaks of large-scale mortality among *P. minor* occurred and a third occurred in 1999-2000, which is believed to have killed about 200,000 birds (Harper et al., 2003).

This project was conceived with two main scientific objectives. The first is to understand the ecological stability of the lake assisting in establishing a sustainable monitoring programme, which includes understanding the causes of the mortality and to develop protocols that enable local staff to deal with outbreaks if they occur in future. The second is to assist the Reserve Senior Warden in the production of the Ramsar Site Management Plan. In parallel with the scientific objectives is a pyramid of educational objectives. At the apex is the postgraduate education of the Reserve Senior Warden to M.Sc. Below this is the training of Kenyan staff from the project partners in Ecology through a University of Leicester Distance Learning Certificate, practical training of 9 postgraduate Kenyans on an Earthwatch field team, 120 Kenyans of varied educational abilities on 6-day workshops and the provision of educational aids to as many as 1000 local schoolchildren in the importance of incorporating environmental conservation & sustainability into their daily lives.

3. Project Purpose and Outputs

Project Purpose

To identify the essential lake ecosystem properties that sustain key populations of water bird species and thereby ensure LBNR's management plan completion. To explain the mass movements of *P. minor* between Lake Bogoria and neighbouring lakes, and causes of unpredictable mortality of *P. minor*. To advise on measures to minimise the risk to the species.

Project Outputs

- Coherent explanation of effects of changes in external factors on the abundance of *P. minor*, cape teal and black-necked grebe populations at LBNR formulated, in the context of alkaline lakes' limnology.
- Causes of movements of *P. minor* between lakes and mass-mortality understood.

- Species health monitoring leg banding and tracking programmes established

This project complements, and expands upon an Earthwatch project which supports three field research teams each year at Lake Bogoria. These Earthwatch teams will continue to play a central role in the Darwin-funded project, which will also involve more regular monthly monitoring at three lakes in the Rift Valley – Lakes Bogoria, Nakuru and Elementeita, which are important feeding sites for the lesser flamingo (*P. minor*).

The project's logical framework is included in Annex 2. Project outputs in the first year are on track and contributing to the project purpose. Achievements and progress are summarised in Annex 1.

4. Progress

The project commenced in July 2003, with a very inauspicious start following the cancellation of all BA London to Nairobi flights for the preceding two months and the cancellation of the June-July Earthwatch project, which would have been the start-up for the scientific work. Nevertheless, the scientists' air tickets were already purchased, so the main Darwin objectives were initiated. These were:-

1. The first was fitting a satellite transmitter to *P. minor* by Dr Brooks Childress. One male was fitted with a satellite transmitter, along with three others funded by different grant sources and all have been successfully followed since then (seven birds are now being followed in total) yielding valuable data about movement frequency and the relative importance of stopping-off and feeding points.
2. The first workshop, on Aquatic Ecosystem Health (14-18 July), was then taught as planned by Dr David Harper & Professor John Cooper, to 29 Kenyans.
3. Following that, the 'Soda Lakes Survey' – a simultaneous investigation of the ecology of the three soda lakes was initiated by Dr Harper with Professor Mavuti (University of Nairobi), combining limnological analyses with lesser flamingo censuses. The survey was repeated in late-October, mid-December, late January and mid-March.
4. Thirteen local schools in the LBNR educational catchment were contacted and their needs evaluated. Mrs Maureen Harper is working closely with the WWF Lake Bogoria Community Project and with the Wildlife Clubs of Kenya to ensure that the material provided a) adds to existing conservation aids and b) is transferable to LBNR visitors (several thousand schoolchildren per year) as well as locals.

Progress against baseline timetable is largely to plan, with the exception of a delay in movement and installation of the mobile laboratory to Kenya, and the cancellation of the June/July Earthwatch project due to terrorism related insecurities (eg. cancellation of BA flights to Kenya). An additional output in February 2004 was further training provided to LBNR staff, in which the Deputy Warden was sponsored through Earthwatch's African Fellowship Programme to attend a project in Ghana.

Project's achievements during last year

Research: The research into lake and lesser flamingo ecology, conducted during three field research periods in July, November and March, focussed upon a) flamingo movement monitoring by satellite, b) flamingo distribution in relation to *Spirulina* densities and c) flamingo health. These detailed investigations, were supported by the Soda Lake Surveys, carried out 5 times in 9 months, which enable a larger

spatial perspective to be put on the relationships between flamingo and *Spirulina* in Kenya.

Training. The first workshop was held to promote the new concept of Ecosystem Health. Entitled *Aquatic Ecosystem Health*, its tutors – one a veterinarian, the other a limnologist – combined to put an holistic perspective onto the Lake Bogoria ecosystem. Potential participants were notified by email circulation to universities, voluntary NGOs and project partners and were chosen to represent a full cross-section of educational achievements. This enabled the tuition to work in small groups supervised by the tutors – for example the vet was able to supervise 4 concurrent post-mortems because 3 young Kenyan vets were part of the group; the limnologist was able to similarly split the group with young university staff investigating River Ecosystem Health. At the other end of the scale, several staff from the partner County Councils' reserve staff were only school leavers; the participatory nature of the Workshop meant that all benefited.

The U of L undergraduate certificate Distance Learning programme *Global Ecology & Wildlife Conservation* was commenced by four members of the partnership, representing four organisations and the students are progressing well.

The main difficulty encountered was the high perception of terrorism risk by the US and UK governments, which meant that in the 2 months running up to the project start in July 2003, Earthwatch teams were cancelled. Therefore, airfares of the Workshop scientists had to be met from the Darwin Project and additional expenditure was incurred in Kenya (e.g. accommodation), which would have been covered by an Earthwatch research team.

A slippage encountered, has been the delay in shipment of the Mobile Laboratory, caused just by a longer time in preparing the export and shipping documents than predicted. Nevertheless this created benefits in that 10, 3-year old Macintosh computers were added to the load from the University of Leicester (which switched its main provision from Mac to PC).

Each scientific part of the project has started to develop its own protocols to ensure continuity of methodology between different workers and continuation on project exit. These have been refined after review meetings conducted by Dr Harper with all partners in March 2004. These meetings have also started to propagate the methods to the partners so that similar methodologies will be used on project completion for the maintenance of the work (e.g. monitoring strategies at LBNR and LNNP).

The Workshop teaching was carried out by 2 expatriate tutors. The second one (April 2004) will be carried out as a partnership between 3 Kenyans (National Museums of Kenya) and 2 expatriates and it is intended to repeat this balance for the future workshops. The second workshop, entitled *Taxonomy for Biodiversity Conservation*, could have filled twice-over, so the topic will also be the subject of the 3rd Workshop in November 2004.

Major activities for the next twelve months are:-

ACTIVITY	TIMING & DURATION
3-lake Soda Lake Surveys, repeated 7 times by Partners	9 days each; mid-May, late-June, mid-August, early-October, end November, mid-January 2005, early-March 2005.
Workshop, 2 nd and 3 rd	April 11-17 2004; November 21-27, 2004
Earthwatch Research Fieldwork	April 21 st – May 6 th 2004, October 6 - November 18, 2004

5. Actions taken in response to previous reviews (if applicable)

N/A

6. Partnerships

The partnerships between the UofL with LBNR, KWS, UofN, NMK, worked extremely well in planning and executing the central core of the project – repeat survey of the flamingo distribution and density in the three soda lakes concurrent with limnological measurements. Effective census of *P. minor* requires more personnel than had been anticipated, however and thus it is more costly to conduct this on 3 lakes concurrently than had been anticipated. Accordingly the frequency has been reduced from the planned monthly, to every 6-8 weeks.

This survey brought three important new partnerships. The first was with the Lake Nakuru Water Quality laboratory, which is managed by the Nakuru Municipal Council (established by partnership with Japanese overseas aid (JICA) as part of a sewage treatment upgrade for the town in 1995). The laboratory staff are carrying out all the chemical and biological analyses.

The second was that clear links were established with the WWF Lake Bogoria Community Education project. The Darwin Project has facilitated WWF's ability to provide effective scientific support to LBNR in the future by a) enrolling staff at the workshop in July 2003 b) donating equipment to the staff in July '03 and March '04 to enable them to effectively count *Spirulina* and measure biomass as chlorophyll (c) donating a bird identification guide to the community library run by the WWF. Dr Harper met with the WWF East African Project Director and Freshwater Policy Officer in Nairobi in March 2004, which followed a meeting with staff in the WWF-UK office in December 2003 and with staff in the International HQ at Gland, Switzerland in January 2004 (both with William Kimosop, Darwin Scholar at that time and Robert Llewellyn-Smith, Earthwatch Institute). By March 2004 WWF staff changes had resulted in a new Project Ecologist, the 3rd in 3 years. This has posed logistical problems, for there has been an ecologist in post since 2001 and a well-equipped laboratory since 2003, but no development of skills, so limnological monitoring was not yet carried out consistently (March '04). Protocols and report forms for the monitoring of basic water quality and *Spirulina* ecology were written and shared with the WWF project. The WWF microscopes – a) a high-quality Austrian but with a focussing rack destroyed by mis-use b) a basic school-level Griffin with mirror light-gathering but no light source – were inadequate and the chemical instrumentation (spectrophotometer, oxygen, conductivity and pH meters) had no operator who understood them. This Project donated 2 Sedgwick-Rafter counting cells in July, and loaned a Zeiss compound microscope with internal light and 4 objective lenses (3x–100x phase-contrast) in March 2004, in order to enable monitoring of Lake Bogoria to commence effectively. The March-April 2004 Earthwatch team at Bogoria included the new WWF Ecologist in its programme, teaching him a) flamingo health techniques b) limnology & *Spirulina* monitoring and c) biodiversity monitoring using Odonata. A UK Biology B.Sc. graduate, Miss Amy Deacon, started a 4-month period of practical experience with the March Earthwatch team. She has also trained on the three projects and will be maintaining two of them – flamingo health and limnology – through to August 2004 with new colleagues coming out from UK in May and July. This will transfer the knowledge skills to both the WWF ecologist and the LBNR ecologist. (The latter is also following a Distance Learning course in Ecology as part of this Darwin Project).

The third new partnership was with Wildlife Clubs of Kenya. Dr & Mrs Harper held a start-up meeting with the Director in July 2003, to discuss activities and educational aids in the national (Kenyan) perspective. They held three meetings with the LBNR Warden, the WWF's Bogoria Project Director and Education Officer (although latter personnel changed during the year and meetings were re-held in March 2004) to discuss policies towards local schools. These are leading to the production of a Bogoria reserve booklet (see below) which will be nationally used.

Dr Harper visited Nairobi and Egerton universities in July 03 and March 04 to hold discussions with individual academics who have been, or are, directly involved with flamingo and soda lake research –

- Dr Gideon Motelin (Egerton Univ, Dept Animal Health), contracted by WWF in 1995-8 to investigate *P. minor* mortality in Lake Nakuru.
- Mr Jackson Raini, an ecological consultant who was the Project Ecologist for the WWF Lake Nakuru Project during the 1990s.
- Mr John Githaiga (Univ Nairobi PhD student 1995-9), investigating flamingo movements in relation to phytoplankton density in Lake Nakuru, dissertation submitted.
- Mr Steven Omondi (Egerton Univ, PhD student 2003-06) registered Univ Vienna, on soda lakes' nutrient ecology.

Dr Harper held talks with the Ecology Manager and owner of Soysambu Estate, Lake Elementeita and the warden of a new field studies centre there, Jersey Hall, about existing research/teaching and possible extension to that lake.

Dr Harper spent three days in the Lake Nakuru Water Quality lab, teaching phytoplankton identification to the staff and discussing the protocols for chemical analysis, which the staff carry out as part of the Soda Lake Surveys approximately every 6 weeks.

Dr Harper spent two days in Nakuru National Park, discussing educational policy and a potential Memorandum of Understanding with the KWS Research Ecologist.

7. Impact and Sustainability

The project has a very high profile in the County Council areas of Baringo and Koibatek (LBNR is managed jointly by the two local County Councils), due mainly by the promotional activities of William Kimosop, Senior Warden. It is also developing impact among the other biodiversity-conservation NGOs, through meetings and distribution of electronic flyers and workshop announcements.

The awareness of biodiversity conservation as part of a sustainable lifestyle is being increased by the school visits, which support earlier work by WWF. It is anticipated that the personalised approach to each school will complement the less specific but more 'professional' educational work and aids (posters etc) of WWF. The wider impact nationally will be provided by the educational aids (booklets) to be produced by this project in partnership with WCK.

The publicity achieved within Kenya by the first Darwin Workshop (see below) is adding to the impact of national bodies such as Wildlife Clubs of Kenya and Nature Kenya in raising the interest in and capacity for biodiversity conservation within local authorities in Kenya. The profile of local authorities in conservation in Kenya is low, because most has formerly been directed through the statutory, Kenya Wildlife Services. The close linkage between biodiversity conservation and sustainable livelihoods however, will result in a higher profile for local authorities and development of the linkages between the project and its two L.A. partners is ongoing with Dr Harper & William Kimosop. This is likely to have knock-on benefits in a wider area of Kenya through the Ministry for Local Government, which has now been visited twice by William Kimosop in briefing of the project activities.

The exit strategies for the project are already being evaluated with the partners. They fall into three sections – research, education and monitoring.

1. Post-project research is totally dependent upon external funding as Kenyan institutions have no funds for self-generated research. The most important strategy for that to be possible is to ensure that all work previously done in the subject area (flamingo mortalities, soda lake limnology) is in the public domain which has been evaluated by the scientific community as peer-reviewed work. Neither the 1990s flamingo mortality studies (WWF- and Fulbright Fellowship-funded) or the 1990s limnology studies (various funding

sources) have yet achieved this but the meetings held by Dr Harper described in this report have started this process. Two scientific publications have come from this project to date and discussions are underway to make further applications to UK and International funding bodies using the UK-Kenya partnerships built up.

2. Post-project Education hinges primarily around the material produced during the project having a long 'shelf-life' so that it can continue to be used with little additional financial input. Initiatives currently underway are:-
 - a. The 13 schools in the educational catchment have been invited to invent their own logo, featuring an animal or plant species and an account of what it means to the school. 9 have so far done this and the logos produced by the partnership. The logos are used to produce 1000 sheets headed notepaper for each school. This gives them an individual link with the Reserve biodiversity, which will be developed in the next initiative.
 - b. A booklet is being written, which will also be illustrated by the logos, about "Ecology of the Lake Bogoria Region". This is to be printed in Kenya for a) all local schools (multiple copies each school) b) WCK (to provide them with electronic file and start-up number of copies which they sell to make the reprinting and subsequent selling self-sustainable) and c) LBNR to sell at the entry gate (proceeds also to make the reprinting and subsequent selling self-sustainable). Proposed subjects (one per page) are:
 - Basic ecology explained
 - Why conserve nature?
 - Why is the lake soda?
 - What is special about flamingos?
 - What is special about Lake Bogoria?
 - What is special about the springs and swamps around Lake Bogoria
 - What is the food web of Lake Bogoria?
 - What happens at the lake edge?
 - The land around the lake
 - The land and the People
 - The Lake and the World
 - c. Some of this material will be used to produce a glossy, simple A5 folder Reserve leaflet. The project will produce the first 1000, leaving a pdf file with the Reserve so that the money raised by the sale of this batch will be used to reprint and make the venture self-sustaining..

3. Post-project monitoring is the main activity which will be maintained by the partners. Extensive discussions have been held with The Research Scientist of KWS, based at Lake Nakuru National Park, who will be responsible for taking over the lakes survey at Elmenteita and Nakuru in association with the Water Quality laboratory. The same pattern of discussion has been held with WWF/LBNR so that they have the physical and human abilities to take over the monitoring of Bogoria. Dr Harper in March 2004 either mended or replaced malfunctioning WWF equipment so that monitoring of *Spirulina* density and biomass (chlorophyll 'a') can now take place and this is being supervised April-July 2004 by Amy Deacon.

8. Post-Project Follow up Activities (max 300 words)

N/A

9. Outputs, Outcomes and Dissemination

Outputs not/partially achieved

Arrival and installation of mobile lab at LBNR did not occur in September 2003 due to delay in shipment of the Mobile Laboratory, caused just by a longer time in preparing the export and shipping documents than predicted.

Additional outputs

Delay in shipping the lab created benefits in that 10 3-year old Macintosh computers were added to the load from the University of Leicester (which switched its main provision from Mac to PC).

Training and development opportunity for deputy warden of Lake Bogoria National Reserve to attend an Earthwatch supported community based project in Ghana provided through Earthwatch's African Fellowship Programme.

In January 2004, William Kimosop, LBNR Warden (on a Darwin Fellowship at University of Leicester) visited staff at IUCN and Ramsar Secretariat in Gland, Switzerland and obtained additional information on Ramsar site management plan preparation techniques.

Useful meetings were held in Oxford in Dec. 03 and Feb. 04 between William Kimosop and an Oxfam expert in honey and Fair Trade, with a view to developing honey marketing and income generation potential in Lake Bogoria region.

Dissemination activities

Details of dissemination activities are covered in Paragraph 4, 7 and Table 1 below. Dissemination of the project in the host country will occur most actively through its educational role.

Table 1. Project Outputs (According to Standard Output Measures)

Code No.	Quantity	Description
2	2	2 Kenyans presently studying for Masters qualifications - William Kimosop and Laban Njoroge (National Museums of Kenya)
3	2	4 Kenyans currently working towards undergraduate certificates
5	2	2 Kenyans working full time on the project
6A	2	58 Kenyans attended two 1-week workshops over the last year
6B	2	Two 1-week workshops delivered
8	18	18 weeks scientific work on project by UK staff
9	1	Ecosystem management plan strategy recommendations and web-site design to William Kimosop in U of L. as part of his scholarship training
11B	2	2 papers already approved in peer reviewed journals – see Table 2.
14B	1	Brooks Childress attended national conference end March 2002, Edinburgh and presented interim findings
15A	2	Announcement of William Kimosop's Darwin Scholarship announcement in Kenya's Daily Nation newspaper. Darwin workshop article in NatureNet (Nature Kenya newsletter)
15C	7	Press and institution magazines

23	Funding from EW volunteers = £11,200 Value of mobile lab and donated equip = £77,000 UofL co-funding programme through value of Dr Harper salary LBNR Deputy Warden Fellowship to Ghana = £2,300
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Table 2: Publications

Type * (e.g. journal, manual, CD's)	Detail (title, authors, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £
*Newspaper article	Anon about project start-up, 3 rd October 2003	Leicester Mercury	Leicester Mercury, Leicester	
*Scientific newspaper article	Anon August 16 th 2003 'Learning more about Lessers'	C & A Birds	J.E. Cooper,	
*Scientific Newspaper article	Anon, 15/5/03 "Flamingos show individuality"	Times Higher Educational Supplement	D.M.Harper	
*Scientific Newspaper article	Cooper J.E. & Cooper M.E. 'Why are the flamingos dying?' 1 st December 2003 10-11	Veterinary Times	J.E. Cooper,	
*Scientific Newspaper article	"Increased flamingo mortality in Lake Bogoria Kenya; Darwin Initiative funding for conservation and management"	DWHC Newsletter, 2, October 2003, pg 8.	J.E. Cooper,	
*Scientific newspaper article	John Cooper "Workshop on Ecosystem Health held in Kenya"	World Veterinary Association Bulletin, 8/8/03	J.E. Cooper,	
*Scientific newspaper article	Ecosystem Health NatureNet, The Nature Kenya newsletter, Nov 03.	Nature Kenya	J.E. Cooper,	
Peer-reviewed scientific article	Harper, D.M. et al., 2003. Aquatic Biodiversity and Soda Lakes: Lake Bogoria National Reserve, Kenya	Hydrobiologia, Kluwer, Dordrecht, Netherlands	D M Harper, reprints	

12. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum)

I agree for ECTF and the Darwin Secretariat to publish the content of this Section

It was a significant achievement that the project was not 'blown off course' by the terrorist scare in mid-2003 and started with all its planned activities in July. The first activity – flamingo capture and fitting of satellite transmitter – was successful and seven birds are now yielding new information about flamingo movements (<http://www.wwt.org.uk/flamingo/projectnews.asp>).

This was followed by the first workshop, (which was over-subscribed, at 29 Kenyans, but ran smoothly). For the first time in Kenya, the new paradigm of 'Ecosystem Health' or 'Conservation Medicine' was fully discussed between animal health biologists, ecologists and practicing protected area managers.

The final activity was the concurrent survey of the three main soda lakes in Kenya. They have never been concurrently surveyed before for both limnological and ornithological parameters. The survey is now maintained on regular basis and will yield key data about flamingo numbers in relation to food supply, which will support the satellite tracking data.

The award of a Darwin Scholarship to Mr William Kimosop, Warden of Lake Bogoria National Reserve, allowed him to gain significant professional development benefits. This should increase his effectiveness as Warden, benefiting Lake Bogoria in the long term. Training carried out at the University of Leicester and surrounding activities will be detailed in a separate report(s) to ECTF/DARWIN.

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2003/2004

Project summary	Measurable Indicators	Progress and Achievements April 2003-Mar 2004	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose</p> <ul style="list-style-type: none"> • To identify the essential lake ecosystem properties that sustain key populations of water bird species and thereby ensure LBNR's management plan completion. • To explain the mass movements of P. minor between Lake Bogoria and neighbouring lakes, and causes of unpredictable mortality of P.minor. To advise on measures to minimise the risk to the species 	<ul style="list-style-type: none"> • Research findings on lake ecosystems/water bird species submitted to LBNR management committee and KWS each year of project. • Flamingo and lake data incorporated into global accessible websites, and local databases • Recommendations adopted into reserve and trans-national species management plans; implementation started by EOP. • Species (flamingo) and ecosystem (alkaline lakes) health concepts incorporated 	<p>Complete for Year 1</p> <p>Flamingo tracking information at http://www.wwt.org.uk/flamingo. William Kimosop working on Lake Bogoria website</p> <p>Work ongoing regarding Lake Bogoria Management Plan preparation</p> <p>As above. Flamingo health protocols under development. Also</p>	<p>See Paragraph 4 - main activities planned for year two.</p>

	into management plans.	collaboration underway between Dr Harper and Kenya Wildlife Service at Lake Nakuru.	
Outputs			
Coherent explanation of effects of changes in external factors on the abundance of P. minor, cape teal and black-necked grebe populations at LBNR formulated, in the context of alkaline lakes' limnology.	Physical infrastructure which has underpinned the fieldwork in place – mobile laboratory on-site with its computer worldwide web connections operational.	Work ongoing between Dr Harper, Shell Chemicals and WWF office in Kenya to get mobile lab in place	Anticipate lab in place in late May/April 04
Causes of movements of P. minor between lakes and mass-mortality understood.	Scientific quality output evaluated by peer-review of publications	Two peer reviewed publications already achieved (see 9. Table 2) and 4 newspaper articles. One article in East African Wildlife Society's magazine SWARA. Website newsflash on IUCN's home page.	
Species health monitoring, leg banding and tracking programmes established	<ul style="list-style-type: none"> • 300+ flamingos banded, 300+ blood samples taken and analysed for health parameters • Three years tracking data from seven birds recorded and interpreted 	Banding and blood sample work ongoing. Seven birds have been fitted with tracking devices. Data analysis and interpretation ongoing by Dr Brooks Childress. Flamingo tracking information at http://www.wwt.org.uk/flamingo	

Note: Please do NOT expand rows to include activities since their completion and outcomes should be reported under the column on progress and achievements at output and purpose levels.

Annex 2 – Logical framework

Project summary	Measurable indicators	Means of verification	Important assumptions
<p>Goal:</p> <p>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • the conservation of biological diversity, • the sustainable use of its components, and • the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose</p> <ul style="list-style-type: none"> • <i>To identify the essential lake ecosystem properties that sustain key populations of water bird species and thereby ensure LBNR's management plan completion.</i> • <i>To explain the mass movements of P. minor between Lake Bogoria and neighbouring lakes, and causes of unpredictable mortality of P. minor. To advise on measures to minimise the risk to the species.</i> 	<ul style="list-style-type: none"> • <i>Research findings on lake ecosystems/water bird species submitted to LBNR management committee and KWS each year of project.</i> • <i>Flamingo and lake data incorporated into global accessible websites, and local databases</i> • <i>Recommendations adopted into reserve and trans-national species management plans; implementation started by EOP.</i> • <i>Species (flamingo) and ecosystem (alkaline lakes) health concepts incorporated into management plans</i> 	<ul style="list-style-type: none"> • <i>Annual reports and recommendations from project to lake authorities and national agencies.</i> • <i>Databases available on the worldwide web.</i> • <i>Project final report and evaluation.</i> • <i>Reserve and species management plans incorporating project findings.</i> • <i>Adoption of flamingo health protocol as guide for other wild bird species.</i> 	<ul style="list-style-type: none"> • Current national political and economic conditions do not deteriorate to the extent that it is unsafe to work in Kenya. • Reserve authorities remain receptive to cooperation and support. • New government (Jan 2003) allows laboratory to be imported to Kenya free of import duty.
<p>Outputs</p> <ul style="list-style-type: none"> • <i>Coherent explanation of effects of changes in external factors on the abundance of P. minor, cape teal and black-necked grebe populations at LBNR formulated, in the context of alkaline lakes' limnology.</i> • <i>Causes of movements of P. minor between lakes and mass-mortality understood.</i> • <i>Species health monitoring leg banding and tracking programmes established</i> 	<ul style="list-style-type: none"> • <i>Physical infrastructure which has underpinned the fieldwork in place – mobile laboratory on-site with its computer worldwide web connections operational.</i> • <i>300+ flamingos banded, 300+ blood samples taken and analysed for health parameters</i> • <i>Three years tracking data from seven birds recorded and interpreted</i> • <i>Scientific quality output by evaluated by peer-review of publications</i> 	<ul style="list-style-type: none"> • Two workshop protocols published as NMK occasional publications • <i>Over five scientific publications.</i> • Full <i>P minor</i> health database, and report • Banding records • Articles and photographs published in magazines and websites available to the general public • Specialised websites for <i>P minor</i> tracking data and alkaline lake ecology. 	<ul style="list-style-type: none"> • Extreme climatic events do not occur to extent that data interpretation is limited and longer term monitoring is required before recommendations can be made • New flamingo capture method functions effectively. • Earthwatch volunteers can sustain funding and workforce for long term monitoring beyond three-year grant.