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1 Executive Summary

The CyberTracker is a data collection software that was originally developed to allow indigenous south African trackers, who cannot necessarily read or write, to record highly complex geo-referenced field observations on hand held computers (PDAs) with built-in GPS. The tool is based on the principle of using the touch screen of the PDA to select icons from a hierarchically arranged sequence of screens, customized to suit any data collection protocol, to make each observation. The data is then downloaded from the PDA into a GIS compatible data base for viewing and analysis. CyberTracker thus combines indigenous knowledge with state-of-the-art computer and satellite technology.

CyberTracker Conservation (CTC) is a non-profit organization whose mission is to improve environmental monitoring by promoting the use the CyberTracker software to increase the efficiency of gathering higher quality and larger quantities of field observations.

In August 2002 CTC was awarded an EC grant of 1.6 m € over 3 years. The objective was to provide technical support for a series of pilot field projects in southern, central and western Africa where the CyberTracker technology was to be implemented to monitor the status of natural resources. The project was granted two extensions to the period of the contract in order to complete and consolidate project activities by June 2007.

The present report provides an update on activities undertaken during the final period of the project (March 2006 to June 2007) and presents an overview of achievements and lessons learned at the end of the project.

During the final reporting period CTC continued its support to initiatives in Congo-Brazzaville (training and equipment for the Wildlife Department’s Law Enforcement Monitoring – LEM – programme; technical assistance support for LEM and Ebola monitoring in Odzala NP), Gabon (training and equipment to the Moukalaba-Doudou and Loango National Parks for wildlife monitoring, LEM, tourism development) and South Africa (Table Mountain and Kruger National Parks). Bug testing of the Version 3 was completed during this period and the software was updated to support a wider range of hardware (PDA’s) and operating systems (Palm OS and Microsoft Mobile).

The expected results of the EC grant contract included implementation of CyberTracker initiatives in at least 25 protected areas in Africa, and a total of at least 30 sites on five continents (including independent initiatives). At the end of the project it can be stated that CyberTracker activities have considerably exceeded these expectations. CyberTracker projects in Africa, initiated by the current EC-funded CyberTracker Monitoring Programme, have in fact been implemented in more than 60 sites across 15 countries. Furthermore the multiplier effect of freely downloadable software has meant that more than 30,000 potential users have now downloaded the CyberTracker software in more than 76 countries around the world, of which 21,000 have been since release of the Version 3. Our research indicates the existence of more than 700 independent projects in 75 countries in Africa,
Australia, South America, North America, Europe and Asia which is a powerful indication of the degree to which users worldwide are assuming full ownership of CyberTracker.

While the majority of CyberTracker use appears to be for wildlife and habitat/protected area surveys and monitoring, the tool is also being used in humanitarian disaster relief (Sri Lanka post-tsunami), Search and Rescue (USA- California), Post-accident environmental monitoring (Sweden), pollution and water quality monitoring (Canada), agronomy and horticulture (eg insect pest monitoring in orchards South Africa), industrial logging management planning (Cameroun), eco-tourism (Gabon), socio-economic surveys (south and central Africa) and crime prevention (South Africa).

CyberTracker has received considerable worldwide media coverage since the EC grant was awarded with at least 74 articles and/or films appearing in the media. CTC makes every effort to ensure that the EC’s critical role in supporting CyberTracker is acknowledged in these articles and the EC’s support is also acknowledged on the Home Page of the CyberTracker Web site (http://www.cybertracker.org/), which receives more than 4000 Visits per month (about 40 000 Hits per month). Furthermore most articles appearing in peer reviewed scientific journals that have used CyberTracker technology for their research cite the CyberTracker Web site as a reference.

A number of important lessons have been learned from this project. Experience has shown that it often requires only one dedicated individual, backed by a management structure that is prepared to listen to and support him/her, to get a CyberTracker programme up and running in a national park, but without such an individual, ownership cannot be ensured and it will not be successful. Available resources should therefore focus on a small number of high profile pilot projects. Other parks will then follow these successful examples.

While media coverage is important for promoting CyberTracker, this does not necessarily translate into increased user use. It is often only through practical demonstrations that the full potential of CyberTracker can be fully appreciated. Success stories like the Kruger National Park and the data on the impact of Ebola on Gorillas in the Congo are particularly helpful in this respect. On the other hand, many users have been able to get CyberTracker up and running with very little support from CTC. They have simply downloaded the free software and got it going themselves, thereby assuming full ownership of the operation.

Effective promotion of CyberTracker requires also a dynamic Web site that is continuously updated. This is time consuming and requires adequate resources (human and financial). For a non profit organization such as CTC this is difficult to achieve if its only source of funding is from external grant giving bodies.

While accepting that co-funding for this kind of project is an essential ingredient, in practice it has often proved difficult to co-coordinate mobilization of the EC funding with that of co-funders particularly when unexpected delays have held up one or other of the partners’ activities. If successful implementation of an activity requires
both partners to be operational at the same time (which is usually the case) then a
delay on one side compromises the success of the whole project since the other
partner is unable to go it alone.

Finally because of the sometimes precarious nature of donor funding it is likely that
having longer project cycle times (without necessarily increasing project budgets)
will help small non-profit organizations such as CTC to provide technical support on
a more sustainable basis.

Perspectives for the future of CyberTracker will be determined by current advances
in mobile devices and web technologies which are significantly enhancing the possi-
bilities for community projects and Citizen’s Science projects. The next version of
the CyberTracker software should therefore adopt a web based approach, making it
possible to capture and share data without having to own a desktop PC. The Cyber-
Tracker Web Version should have three major features: a Smart Phone component
(allowing data to be transmitted without recourse to a computer); a Web Accessible
Data application (to allow access data hosted on internet accessible databases);
and compatibility with Global Species Information systems (in order to create Cyber-
Tracker Electronic Field Guides for Smart Phones).
2 Background to CyberTracker Conservation and the Current Project

CyberTracker Conservation (CTC) is a non-profit organization whose vision is to promote the development of a worldwide environmental monitoring network. Climate change, pollution, habitat destruction and loss of biodiversity may have serious impacts on human welfare. To anticipate and prevent negative impacts will require ongoing long-term monitoring of all aspects of the environment.

The mission of CTC is to improve environmental monitoring by developing CyberTracker software and new methodologies to increase the efficiency of gathering higher quality and larger quantities of field observations.

The CyberTracker data collection tool was originated in South Africa in the mid 1990’s to allow expert trackers, who cannot read or write, to record complex field observations. Traditional trackers are able to make highly refined observations of tracks and signs, which can be of great value in scientific research and wildlife monitoring. Involving scientists and local communities jointly in key areas of biodiversity, CyberTracker thus combines indigenous knowledge with state-of-the-art computer and satellite technology.

The CyberTracker technology is currently used in a wide array of fields linked directly or indirectly with the environment including protected area and natural resource management, biodiversity monitoring, forestry, agriculture, social surveys, disaster relief and education.

In August 2002 CTC was awarded an EC grant of 1.6 m € over 3 years whose objective was to provide technical support for a series of pilot field projects in southern, central and western Africa where the CyberTracker technology was to be implemented to monitor the status of natural resources. Project implementation has been reported on in annual progress reports since 2003. Since project implementation was somewhat slower than anticipated (CTC were only in a position to introduce their first request for payment 7 months after signature of the contract, and there was also a 6 month delay with mobilization of Year 3 funds) a request for a 12 month extension for the period of the contract was made in September 2005 in order to a) consolidate long-term perspectives of key ongoing projects b) provide support for initiatives that had arisen as a direct result of project implementation but which are still in the early stages of implementation, and c) complete software development to meet evolving monitoring and hardware needs. Further delays meant that a second extension (Appendix 1) was necessary in order for field activities to be continued until June 2007.

Despite this somewhat stop-start progress project implementation has generally been very successful and in many cases has exceeded initial expectations. The present report provides an update on activities undertaken during the final period of the project (March 2006 to June 2007) and presents an overview of achievements and lessons learned at the end of the project.
3 Progress in Projects Benefitting from Direct Support from CyberTracker Monitoring Programme since March 2006

3.1 Republic of Gabon

3.1.1 Gamba Complex Monitoring Programme

The CyberTracker Monitoring Programme has continued to provide technical support to the Gamba complex Monitoring Unit which covers the Moukalaba-Doudou and Loango National Parks in south west Gabon. This support is implemented through a partnership with WWF who is one of Gabon’s principal conservation partners on the ground.

Over this final reporting period CTC’s support to the monitoring unit consisted of the provision of new hardware (PDA’s and accessories) to allow the unit to exploit all the advantages of the CyberTracker Version 3 and of intensive training in South Africa on the new features of Version 3 for the Gabonese monitoring unit data base manager. Lightweight sealed lead acid batteries were also provided to resolve the problem of battery autonomy during long (> 7 day) patrols. The equipment is currently being used for wildlife monitoring (marine and terrestrial ecosystems), fishing activities (commercial and sport), law enforcement monitoring, tourism planning, land use and socio-economic surveys.

Appendix 2 illustrates examples of the kind of information generated in Gamba with the aid of CyberTracker.

3.2 Republic of Congo

3.2.1 Odzala NP Monitoring Programme

Odzala National Park was the first site in the Central African forest block to develop CyberTracking techniques. This was initiated in the mid 90’s within the framework of the EC funded ECOFAC regional forest ecosystem conservation programme.

During the current reporting period the CTC Monitoring Project continued to provide support to Odzala NP through the provision of technical assistance. This technical assistance came at a critical time for the park since EC funding within the framework of the ECOFAC programme had been interrupted while waiting for ECOFAC IV to start. It was critical to provide this support since a number of important monitoring and surveillance initiatives were under way which it was essential not to interrupt. In particular, CTC’s support to Odzala enabled efforts to monitor the spread and impact of the Ebola epidemic on great ape populations in the park to be continued. It should be remembered that it was the CyberTracker technology that enable great ape die offs in northern Congo to be documented for the first time in 2001 (see Appendix 3 for further details).
In view of the importance of this issue (public health concerns, and the apparent catastrophic die-off of an endangered species) several partners collaborated, including UNESCO-CAWHFI project (Central African World Heritage Forest Initiative), WCS-Congo (Wildlife Conservation Society), WCS Wildlife Vet programme, Burren and Energy Africa oil companies. A full scale great ape and elephant systematic survey for the entire Odzala landscape was completed during this period and a preliminary summary report, which exploits CyberTracker generated data, was published in November 2006. The report confirms a significant reduction in great ape encounter rates throughout the park with the most significant reductions occurring in the northern and central sectors. (see illustrations in Appendix 2) The link with Ebola is also clear. Elephant numbers however remain good despite evidence of heavy poaching in some areas.

The use of CyberTracker for ground truthing of satellite images in Odzala is also illustrated in Appendix 4.

3.2.2 Development of a national Law Enforcement Monitoring system for the Congo Wildlife Department

In May 2007 CTC collaborated with WCS-Congo in a 10 day training course for 17 senior Wildlife Department and WCS protected area personnel. This workshop, which is part of Congo’s effort to develop a national Law Enforcement Monitoring system, was aimed at training staff in the use of CyberTracker Version 3, helping them to devise appropriate data collection sequences for LEM and assessing the appropriateness of the equipment for a nationwide LEM system. Equipment (PDA’s + accessories and LCD batteries) and trainers were provided by CTC. WCS and the Wildlife Department are currently testing the equipment on a pilot scale in selected protected areas in Congo.

3.3 South Africa

3.3.1 Kruger National Park (South Africa)

One of CyberTracker’s largest and most successful projects has been in the Kruger National Park (South Africa). After initial technical support from CTC (training and mentoring) to get the system up and running this is now an almost entirely self supporting process, fully integrated into the park’s internal management system. This project is now generating more than a million records per year. KNP is divided into 22 management sections each of which uses 5 CyberTracker units and a further 5 units are also used by the Conservation Services Department. At the end of each month each of the 22 section rangers exports their CyberTracker data and emails the small *.ctz file to Scientific Services’ GIS lab in Skukuza. The data is then collated and imported into an Access database where it is cleaned, summarized and made accessible to all users through the KNP network (Appendix 5).

CTC provided technical support to help KNP upgrade their units to the Version 3 CyberTracker software.
The current database, which CTC helped design, is an icon-based interface with English and Shangaan descriptions for the collection of the following geo-referenced data:

- Daily field ranger patrol information
- Species distribution
- Tracks of illegal human activities
- Tracks of rare animals
- Availability of surface water
- Location of carcasses
- Poaching activities
- Fence line breakages
- Distribution of invasive species
- Fire mapping
- Vegetation surveys
- Collaborative research projects
- Annual veld condition assessments
- Location of diseased or injured animals
- Impact of elephants on sensitive tree species.

Field data collected by CyberTracker provide significant benefits to both the management and scientific research activities of the KNP including:

- Planning of section patrols for area-integrity management
- Acting as an early warning system for disease outbreaks
- Identify trends in the entry and exit points of poachers
- Managing the control of invasive species
- Reporting fence breaks to the Veterinary Dept for animal health purposes.

The CyberTracker system has proven to be an indispensable tool for field data collection in the Kruger National Park, since it enables huge amounts of data to be collected over a very large area. This would have been impossible with traditional paper and pencil data capture methods. The easy-to-use icon-based interface has the potential to all but eliminate the time consuming practice of data capture, allowing more time for scientific research. This research, which is fed into the KNP’s adaptive management practices and policies, leads to a better understanding by KNP managers and scientists of the facets and fluxes of the diverse ecosystems of the national park.

Appendix 5 illustrates some of the uses of CyberTracker generated data in Kruger National Park.

3.3.2 Table Mountain National Park (South Africa) - Use of CyberTracker for crime prevention, a key facet for park management.

The Noordhoek wetlands and beach in the Table Mountain National Park, South Africa, has suffered ongoing criminal attacks on visitors over the last five years. This is a critical park management issue since crime in the park has a significant negative impact on tourism revenue. Criminal attacks included armed robbery, assault of visitors and rape. Due to the remoteness of the area, the police and park rangers were unable to apprehend suspects. Only by tracking suspects and using the CyberTracker to plot their movements, was it possible to plan successful operations to catch the criminals. The CyberTracker monitoring programme has proven very successful in reducing and preventing attacks on visitors. After several arrests in 2004, there have been no reported attacks on visitors and a number of attempted attacks were prevented during the period of 2005 to 2007 (Appendix 6 illustrates the kind of criminal tracking data collected). CTC has continued to provide ongoing training to parks personnel since past experience has shown that spates of criminal attacks can start up again following a quiet period after the arrest of suspects.

CTC is also providing on the job training to field rangers in the use of the CyberTracker and as part of the ongoing monitoring programme of animals and endangered plants in the area. Species not known to occur in the area have been discovered, including the Cape Fox and Yellow Mongoose. Movements of otters are also closely monitored.
The first build of CyberTracker Version 3 was released in April 2005. This version involved a complete redesign of CyberTracker. Appendix 7 illustrates some of the new software features. CyberTracker 3 was released in a simplified Standard version and a more advanced Professional version. Work on bug testing, corrections and refinements have continued throughout this final reporting period. The new CyberTracker Version 3 provides important improvements, including:

- The software makes it much easier to design a database and customise a CyberTracker Screen Sequence using the Sequence Designer, giving access to much larger numbers of users who cannot afford to pay for technical support
- Modular Screen Designer allows users to create their own CyberTracker Screen Designs
- Screen Profiles make it possible to use the same CyberTracker Screen Sequence on different PDA’s with different screen sizes and screen resolutions.
- Saving screen designs as Screen Templates make it easy for users to create their own CyberTracker Screen Sequences
- Use text, icons, thumbnail photos or full-screen photos in screen designs
- Users can create an Electronic Field Guide
- CyberTracker Species Identification Filter feature make it possible to identify unknown species
- Navigate in field with GPS Moving Map feature
- Simple Queries of data using the Table Filter feature makes it much easier to view data
- Advanced Queries of data using formal logic makes it possible for advanced users to analyse data in more sophisticated ways
- View data in Tables, Maps and Photo Views
- The Add Photo feature allows users to link digital photos to GPS points on Map. By selecting a point on the map the photos taken at that point can be viewed.
- Compatibility with additional handheld computers and smart phones (see below)
- Export data to MS Excel, eXtended Markup Language (XML), ESRI Shape Files, Web Pages (HTML), or Comma Separated Values.
- Export Line Shape Files
- Efficiency Graphs
- Frequency Graphs
- Effort of Patrol
- Index of Abundance
- Laser Range Finder for Distance Sampling
- Creating multiple categories for data in CyberTracker database makes it possible to analyse data using various categories
- The CyberTracker Database can be changed over the life of a project without losing existing data
5 Integration of New Hardware

The increase in the number of users has resulted in a number of requests for us to support a range of new hardware models. CyberTracker Version 2 only supported low resolution black and white Palm PDA’s. CyberTracker Version 3 now supports two separate PDA operating systems: the PalmOS and Microsoft Windows Mobile for PocketPC.

CyberTracker version 3 also support a range of Screen Profiles, from 160x160 Black & White screen display through to high resolution colour displays. CyberTracker is designed so that a variety of hardware units can be used to collect data, without it effecting data collection in any way. Users, such as large national parks, can therefore continue to use old hardware units while phasing in new units as the old units need to be replaced.

Due to technical variations, a number of hardware models required extensive bug testing and software modifications. CyberTracker not only support various models from old through to the newest, but also a range of different models currently on the market.

Hardware units that are supported include: old Black and White Palms, Handspring Visor with Magellan GPS, Colour Palms, PocketPC 2002, PocketPC 2003, Windows Mobile 5, Dell Axim PocketPC, Garmin iQue 3600, Garmin iQue M5, Trimble GeoXM, TDS Recon, HP iPAQ PocketPC, HP iPAQ hw6500 Smartphone with GPS, Fujitsu Siemens Pocket Loox with GPS, Fotuna Bluetooth GPS, HP Bluetooth GPS Navigation System, Garmin 10 Bluetooth GPS Receiver, Leadtek GPS 9537 Bluetooth GPS Receiver, Airis PocketPC with GPS.

The CyberTracker software has been designed in a modular way so that it will be easy to add support for new hardware units in future. PDA and GPS units are developing very fast, so it is important that CyberTracker should be able to support new models as they come onto the market.
6 General Overview of Achievements, Lessons Learnt and Perspectives

6.1 General Overview of Achievements

The expected results of the EC grant contract included implementation of CyberTracker initiatives in at least 25 protected areas in Africa, and a total of at least 30 sites on five continents (including independent initiatives). At the end of the project it can be stated that CyberTracker activities have considerably exceeded these expectations. CyberTracker projects in Africa, initiated by the current EC-funded CyberTracker Monitoring Programme, have indeed been implemented in more than 60 sites across 15 countries.

In addition to projects implemented by CTC within the framework of the current EC grant, the CyberTracker software, developed through this project, is also distributed free on the CyberTracker website. This has helped to create a network multiplier effect, resulting in numerous independently implemented CyberTracker projects throughout the world.

Over the last seven years more than 30 000 potential users have downloaded the CyberTracker software in more than 76 countries around the world. Since CyberTracker Version 3 was released in mid-April 2005, more than 21 000 potential users have downloaded CyberTracker. Our research indicates the existence of more than 700 independent projects in 75 countries in Africa, Australia, South America, North America, Europe and Asia.

The EC-funded CyberTracker projects have been implemented either through or in partnership with externally – often EU - funded projects or organizations in support of national structures (eg ECOFAC, ECOPAS, CURESS, WWF, WCS, African Parks Foundation, CAWHFI), directly by national structures whose personnel have received the required training (eg South African parks services, Congo-Brazzaville Wildlife and Protected Areas Authority), and by research and environmental organizations (CIRAD, CMS/ASS, Gembloux University, University of Cape Town, Harvard University, University of Massachusetts Boston). A more detailed list is given in Appendix 8.

While the majority of CyberTracker use appears to be for wildlife and habitat/protected area surveys and monitoring, the tool is also being used in humanitarian disaster relief (Sri Lanka post-tsunami), Search and Rescue (USA- California), Post-accident environmental monitoring (Sweden), pollution and water quality monitoring (Canada), agronomy and horticulture (eg insect pest monitoring in orchards South Africa), industrial logging management planning (2 concessions in Cameroun), ecotourism (Gabon), socio-economic surveys (south and central Africa) and crime prevention (South Africa). Appendix 9 provides a selection of projects for which we have information.

A number of technical and information documents relating to CyberTracker use are available on the CyberTracker website at: www.cybertracker.org
6.2 Project Visibility

Since the signing of the EC contract in August 2002, CyberTracker has had worldwide media coverage. We are aware of at least 74 press articles and/or films that have appeared in the press but there are certainly many more that we have not seen (Appendix 10). While it is impossible to control what journalists publish with respect to CyberTracker, particularly as so much information can be gleaned off the internet without directly contacting CTC, every effort has been made to ensure that the EC’s critical role in supporting CyberTracker is acknowledged. The EC’s support of CyberTracker is acknowledged on the Home Page of the CyberTracker Web site (http://www.cybertracker.org/), which receives more than 3000 Unique Visitors per month (about 40 000 Hits per month). Furthermore most articles appearing in peer reviewed scientific journals that have used CyberTracker technology for their research cite the CyberTracker Web site as a reference.

Finally all collaboration agreements signed between CTC and an implementing partner carries an article requiring that the partner specifically acknowledges the EC support to CyberTracker in any reports or articles produced.

6.3 Lessons Learnt

6.3.1 Focus on a small number of high profile projects

The most successful projects involved national parks where at least one individual, backed by his management structure, showed initiative in developing and managing CyberTracker activities. This proved to be crucial to the success of implementing the CyberTracker Monitoring Programme in new national parks. In parks where there were no individuals who could take responsibility for managing the data and supporting field staff, projects were not successful at all.

On the other hand, many projects were able to get CyberTracker up and running with very little support from CTC. They simply downloaded the software and got it going themselves, thereby assuming full ownership of the operation.

Where there were no interest or support from management in the first place, it was impossible to implement CyberTracker. However, after the success demonstrated in the Kruger National Park, a number of other national parks (who were previously not interested) have shown interest in developing a CyberTracker programme. This illustrated the value of high profile success stories in promoting the use of CyberTracker.

The main lesson learnt is that it requires only one dedicated individual, backed by a management structure that is prepared to listen to and support him/her, to get a CyberTracker programme up and running in a national park, but without such an individual, ownership cannot be ensured and it will not be successful. Available resources should therefore focus on a small number of high profile pilot projects. Other parks will then follow these successful examples. This means that the project time frame should have been longer in order to allow a more progressive implementation of activities, giving time for successful activities to get established and create a multiplier effect for sustainable successes elsewhere.
6.3.2 Marketing and Awareness needs to be more focused in order to successfully promote CyberTracker

CyberTracker has been very successful in getting media coverage worldwide but this has not necessarily translated into increased CyberTracker use since even people who know about CyberTracker do not always understand what it can do. Media coverage alone is therefore not sufficient to show people how they can benefit from using CyberTracker.

CyberTracker has done ground-breaking and innovative development, but it is in some ways so different from what people are used to, that it is sometimes difficult for people to conceive of what it really can do. Experience has shown that only when people experience a practical demonstration, do they fully understand the potential benefits of CyberTracker for their work. Creating greater awareness will therefore require word-of-mouth promotion. One of the best ways to promote CyberTracker is through success stories like the Kruger National Park and the data on the impact of Ebola on Gorillas in the Congo. Only when people see tangible results do they understand the potential benefits.

Effective promotion of CyberTracker requires also a dynamic Web site that is continuously updated. This is time consuming and requires adequate resources (human and financial). For a non profit organization such as CTC this is difficult to achieve if its only source of funding is from external grant giving bodies. In the future CTC will explore ways in which the necessary financial resources for upkeep of the Web site can be generated through the technical support that CTC gives to CyberTracker users. Also the CyberTracker Web site and Help files, are currently only available in English. This has undoubtedly meant that a significant proportion of potential CyberTracker users have been missed.

6.3.3 Research and Development is critical for successful promotion of CyberTracker

While the focus should be on implementing a small number of pilot projects, more resources should be used for research and development in order to make it easier to implement CyberTracker. This will make it possible for larger numbers of projects to get CyberTracker up and running with no technical support.

More work can be done to refine the software user interface design as well as the user help guides (including translation to other languages). Pilot projects should also be used for field research to test ways to make it easier for users to implement CyberTracker. This would be the most cost-effective way to increase the number of projects using CyberTracker.
5.3.4 Funding, Co-funding and Project cycles

While the principle of co-funding for this kind of project is undoubtedly a sound one (in that it encourages buy-in from interested stakeholders) in practice it has often proved difficult to co-coordinate mobilization of the EC funding with that of co-funders particularly when unexpected delays have held up one or other of the partners’ activities. If successful implementation of an activity requires both partners to be operational at the same time (which is usually the case) then a delay on one side compromises the success of the whole project since the other partner is unable to go it alone. This is particularly the case in Central Africa where social and political instability, and the resulting severe institutional weaknesses, mean that it is almost impossible to stick to predefined schedules. The knock on effects of funding partnerships that have got out of synchronization can be potentially very serious since it is often not possible to simply suspend activities until a later date. On-going commitments, such as staff employment contracts, cannot simply be put on hold. Flexibility in project design, including provisions for extension of the project period, is therefore critically important. This has fortunately been accepted by the EC, be it sometimes with substantial delays.

Finally because of the sometimes precarious nature of donor funding it is likely that having longer project cycle times (without necessarily increasing project budgets) will help small non-profit organizations such as CTC to provide technical support on a more sustainable basis.
6.4 Perspectives: a CyberTracker Web Version

Advances in mobile devices and web technologies are significantly enhancing the possibilities for community projects. Therefore the next version of the software will adopt a web based approach, making it possible to capture and share data without owning a desktop PC – just a Smart Phone. The CyberTracker Web Version will have three major features:

**Smart Phone component**

Leveraging the existing work of CyberTracker Version 3, we will create support for Smart Phones such that data can be sent directly from the phone to a web site, on an automatic or user selected schedule. In addition Smartphone software will be updated from the internet.

**Web Accessible Data**

A web application will be used to access data hosted on internet accessible databases eliminating the need to physically deliver data. Web access will reduce the time to share data and will promote community projects over large spatial scales.

**Global Species Information**

There are several initiatives to create universal species information sources. The CyberTracker Web version will be compatible with these initiatives. Available species information can then be used to create CyberTracker Electronic Field Guides for Smart Phones.

CyberTracker Web thus fundamentally promotes collaborative distributed data capture and sharing. It will facilitate this by supporting the interchange of data via international standards adopted by or under development by organizations such as the Global Biodiversity Information Facility (GBIF), the Taxonomic Databases Working Group (TDWG), and the IUCN. These are vital attributes for any data capture system that must work at the global scale.
Appendix 1: Extension of contract period

An amendment to contract B7-6200/02/0407/TF was requested on 14th September 2005. However the introduction of this request appears to have coincided with reorganization at the EC which resulted in delays and some confusion for both parties. On the 15th November an amendment was signed by the EC services ("Amendment n°2 to contract CAS/2002/0407/000001") but never officially delivered to CTC. Furthermore it defined project start date as 21st February 2002 (rather than 21st August 2002) and defined project duration as 96 months (ie until Feb 2010). Following enquires by CTC a revised amendment (Amendment N° 1 to contract ENV/2002/060-520), extending the contract period to 21st August 2006, was drawn up and signed by both parties on 14th March 2006. However as this was now only a few months before the official ending date of the contract a second extension was requested on the 28th June 2006 requesting a prolongation for a further 10 months. Amendment N° 2 prolonging the project period to 21st June 2007 was signed by both parties on the 18th August 2006.
Appendix 2: Summary of map products derived using CyberTracker technology within the framework of the WWF-Gamba protected area complex (Moukalaba-Doudou and Loango NPs) project in Gabon

Maps 1 and 2 show how results from basic use of GPS Cybertracker technology within the PDA’s. Village territory zoning have been mapped by local forestry school students, trained to use these PDA’s by the CTC-trained WWF database manager. These maps are integrated in management plans for the National Parks in the area.

The following 5 maps show more elaborate use of the technology. These maps were produced for a tourism company (www.taresika.com) in order to help them to map their tourism concession area, and to evaluate wildlife presence and abundance in their concession.

Map 1: Proposed zoning of Peny village territory in Moukalaba-Doudou National

Map 2: Inventory of traditional land use activities
Maps 3 and 4 show basic information concerning the tourism concession area. Map 5 shows the lay-out of transects for wildlife monitoring effort within the concession.

Maps 6 and 7 show some visual results regarding one selected species, the forest elephant. Map 6 indicates numbers of elephant dung piles per km², and map 7 shows an interpolation of these data for parts of the area. Data from both maps can be automatically generated by CyberTracker Version 5 software.

CyberTracker technology has been of key importance for the realization of two important ecological monitoring exercises undertaken by Park management, WWF and partners. The establishment of ecological baseline data for Loango National Park, as well as a complete inventory of great apes in Moukabala-Doudou National Park. The joint ape survey project between WWF Gamba and the Max-Planck Institute for Evolutionary Anthropology, Leipzig, Germany had two major objectives. First, to test newly developed approaches for surveying great apes using CyberTracker technology. Secondly, to collect information, in a standardized programmed sequences in field computers, relevant for on-site ape conservation management. The preliminary results suggest an average gorilla density in Moukalaba-Doudou of 1.13 individuals/ km². Projected to the entire park (4155km², excluding the Nyanga marshes) this gives a total estimate of around 4,700 individuals.

The maps at right and below are examples of maps generated from results of the ecological monitoring exercise in Loango National, where again, CyberTracker technology was at the centre for data collection, transfer and analysis.

Map 8 shows the transect lay-out within Loango National Park, as programmed in field computers.
Maps 9 to 12 show respectively encounter rates of elephants and great apes, both on "recce transects" (path of least resistance) and line transects.

**Map 9 and 10:** Elephant dung encounter rates on recce and line transects.

**Map 11 and 12:** Great ape nest encounter rates on recce and line transects.
Appendix 3: Use of CyberTracker to monitor impact of Ebola on great ape populations

Data collected using CyberTracker showed the extent of lowland gorilla mortality due to Ebola in the Lossi Sanctuary and the Odzala National Park, Republic of Congo.

At the time of the Ebola outbreak in 2001 no conventional statistical data was available, since the outbreak was not anticipated. The only data available was CyberTracker patrol data that showed the presence of lowland gorilla before the outbreak of Ebola, and absence of gorilla over a large area after the outbreak.

Veterinarians of the International Medical Research Center of Franceville (CIRMF) have been able to collect samples and confirm the presence of the virus in chimpanzees and gorillas. Carcasses of other species have also been found in the same area. Red dots indicate the presence of carcasses infected with Ebola.

Index of Abundance for lowland gorilla clearly show the catastrophic drop in numbers. Index of Abundance also suggested a drop in chimpanzee, duiker and bush pig numbers. For the first time infected carcasses of duiker confirmed that Ebola not only kill great apes and humans.
The following 3 illustrations also show how historical CyberTracker data in Ozdzla NP was used by the 2005 Odzala Great Ape and Elephant Survey to substantiate the link between Ebola and the significant reduction in great ape encounter rates that occurred during the Ebola crises between 2002 to 2006.
Great ape carcass encounter rates in Odzala NP (Green 2003, Blue 2004, Red 2005)
GIS interpolation of gorilla nest densities in Odzala NP 2006 (post Ebola crises).
Appendix 4: Use of CyberTracker for Ground Truthing of Satellite Images

CyberTracker field observations gathered in Central African rain forests have been used for satellite image geo-referencing, interpretation and for map validation at a level of detail never achieved before. Mapping dense humid forest, fragmented forest and non-forest make it possible to identify deforestation hot spots. Reliable analysis of satellite radar images is limited by a lack of appropriate field observations. To solve this problem CyberTracker was used in the Odzala National Park to collect a series of parameters about different types of forests. Field data was used to correct the interpretation of satellite images (see above).

Data was collected for TREES (Tropical Ecosystem Environment observations by Satellite), in collaboration with ECOFAC, also funded by the European Commission.
Appendix 5: Kruger National Park

CyberTracker data on Patrol Distribution for one month in the Kruger National Park
CyberTracker data on Patrol Distribution for one year in the Kruger National Park
CyberTracker data on Poaching Activities and illegal Trans-migrant Tracks in the Kruger National Park
Appendix 6: Table Mountain National Park

The Noordhoek wetlands and beach in the Table Mountain National Park, South Africa, suffered ongoing criminal attacks on visitors over the last five years. Criminal attacks included armed robbery, assault of visitors and rape. Due to the remoteness of the area, the police and park rangers were unable to apprehend suspects. Only by tracking suspects and using the CyberTracker to plot their movements, was it possible to plan successful operations to catch the criminals. The CyberTracker monitoring programme has proven very successful in reducing and preventing attacks on visitors. After several arrests in 2004, there have been no reported attacks on visitors. A number of attempted attacks have been prevented during the period of 2005 to 2007.

In the past a spate of criminal attacks started up again following a quiet period after the arrest of suspects. To prevent this from happening in the future, ongoing training has been provided to ensure the integrity and safety of the area.

A number of field rangers are being trained in the use of the CyberTracker and as part of the ongoing monitoring programme also records observations on animals and endangered plants in the area. Species not known to occur in the area have been discovered, including the Cape Fox and Yellow Mongoose. Movements of otters are also closely monitored.
An essential part of the strategy is to get to know the area, to gather information on criminals by studying their tracks, their movements and where they hide.

Knowing the movements of criminals make it possible to plan strategic observation posts to monitor their movements.

Tracking and plotting the movements of criminals on a map makes it possible to plan operations to catch them and collect enough information to convict them.
Individual criminals are monitored by their tracks. Tracks also make it possible to establish associations between criminals by comparing groups of individuals who walk together on different days.

Criminals who got away from the crime scene have been arrested later and connected to the crime scene with footprint evidence. Footprint evidence can be as effective as fingerprints.
Appendix 7: CyberTracker Software Features

CyberTracker Screen Designs

The CyberTracker icon interface was originally designed for trackers who cannot read or write. However, scientists and conservationists benefit from the icon interface enabling significantly faster data collection than text interfaces or written methods.

CyberTracker is the most efficient way to gather large quantities of geo-referenced data for field observations, even by non-literate users, at a speed and level of detail not possible before.

Screen designs can combine text and icons for the optimum efficiency. Number and text fields can also be entered by means of conventional key pads or keyboards. Icons can be designed and customized for the user’s specific needs and imported into CyberTracker.
The CyberTracker Screen Designer makes it possible for users to design their own Electronic Field Guides with Species Identification Filters.

The Species Identification Filter consists of a sequence of screens each with a checklist of characteristic features of a species. For each subsequent screen, the Filter gives an indication of the number of possible species. When the possible species have been reduced to a small number, the user can skip to the Result Screen to visually compare the species.

The Electronic Field Guide makes it possible to imbed definitions, descriptions and images into the data capture Screen Sequence, providing an immediate reference for easy validation of field observations.
Designing a Screen Sequence

Designing a Database with a Screen Sequence requires no programming skills. Creating data Elements for each Screen automatically creates a structured database.

A selection of Screen Templates make it easy to link screens together into a Screen Sequence for the Handheld Computer interface.

To create a Filter for species identification, each species is defined by a check list of characteristics.

Screen Designs can also be customized by adding and modifying Screen Components for Static Controls, Data Controls and various Actions.
Moving Map for Navigation

The CyberTracker Moving Map features makes it possible to navigate using the PDA/GPS to track the path of the user in real time. A green triangle shows the user’s position while a yellow line shows the path followed.

CyberTracker provides a conversion feature to convert any map to the ECW file format. For example, a TIFF image that is already geo-referenced will automatically be converted to a geo-referenced ECW file. Maps can also be geo-referenced in CyberTracker.

The Moving Map on the PDA/GPS also makes it possible to use the stylus to pinpoint the position of an observation on the map if a GPS fix cannot be obtained (under thick canopy or in a deep gully), or if an animal is some distance away from the observer.
Data can be viewed in Tables and Maps. Photo views allow the user to attach photos to data points.

It is easy to filter data in the CyberTracker Table View. Queries can be saved in Reports, which are updated when new data is collected.

Once data has been filtered it can be Exported to Microsoft Excel, Comma Separated Values, XML or HTML formats. The Map View can also be exported as ESRI Shape Files.
Effort of Patrol

The automatic GPS Timer Points records the path followed by the observer and makes it possible to measure the Effort of Patrol.

Patrol paths shown on a map makes it possible to ensure the area integrity of a park. Efficiency Graphs show the number of observations, the distance covered and the time spent on patrol each day.

A Grid View of the map calculates the Cell Count as well as a spatial visualization of the Effort of Patrol.
Index of Abundance

The Cell Count and Effort of Patrol is used to automatically calculate an Index of Abundance. The Grid View for the Index of Abundance provides an indication of the spatial distribution of animals.

CyberTracker makes it possible to define a Minimum Effort Required for the Index of Abundance to represent a reasonable representation of the true abundance of animals. Cells that do not have the Minimum Effort Required (shown with arrows above), will not be shown in the Grid View.

A graph plotting the Index of Abundance against the Effort of Patrol is used to estimate the Minimum Effort Required. A negative correlation indicates that some cells should be removed from the Grid View. The linear correlation should be zero, unless an increase in Effort has a direct impact on the Index of Abundance.

The graph showing the calf mortality of the endangered Bontebok in the De Hoop nature reserve in South Africa shows that an Index of Abundance is sufficient to detect a catastrophic decline in a population.
Appendix 8: List of Projects implemented in Africa that have received direct technical support from CTC through the EC grant

**Republic of Congo:**
- Direction de la Faune et des Aires Protégées for nationwide monitoring of protected areas
- Parc National d'Odzala (ECOFAC / DFAP)
- Parc National Noubalé Ndoki (WCS / DEFAP)
- Zones Peripheriques au Parc Nationale Ndoki
- Reserve Communautaire Du Lac Tele
- Parc National De ConKouati-Douli
- Réserve de la Léfini (John Aspinall Foundation / DFAP)

**Gabon:**
- Complexe de Gamba (WWF)
- Parc National de la Lopé (ECOFAC, London Zoological Society)
- Parc National de Minkébé (WWF)
- Parc National d'Îvindo (WCS)
- Rougier forestry concession
- IFK forestry concession (with Gembloux University)

**Cameroon:**
- Exploitation Forestière Palisco (with Gembloux University)
- Réserve du Dja (ECOFAC / DFAP)
- Lobèke (WWF / DFAP)

**RCA:**
- Zones Cynégétiques Villageoises (community-managed safari hunting zones) in northern CAR. (ECOFAC, MinEF, Sociétés de Chasse sportive)
- Parc National Manovo-Gounda-St Floris (ECOFAC/MinEF)
- Parc National Bamingui Bangoran (ECOFAC/MinEF)
- Réserve de Sangba (ECOFAC/MinEF)
- Parc National de Mbaéré-Bodingué (ECOFAC/MinEF)

**Equatorial Guinea:**
- Parc National de Monte Alen (ECOFAC / INDEFOR)

**Benin / Burkina Faso / Niger:**
- Parc Transfrontalier du W (EC funded ECOPAS regional project)

**Tchad:**
- Parc National de Zakouma (CURESS, Cirad)
  - Contribution to reconnaissance surveys of fauna in the Sahel-Saharan zone (CIRAD, CMS/ASS)

**South Africa National Parks:**
- Kruger National Park
- Makuleke Community Project in Kruger National Park
- Karoo National Park
- Kgalagadi Transfrontier National Park
- Table Mountain National Park
- Namaqua National Park
- Marekele National Park
- Addo Elephant National Park
- Mountain Zebra National Park
- Wilderness National Park
- Tsitsikamma National Park
- Kimberley National Parks Research Group
Western Cape Conservation Board, South Africa:
De Hoop Nature Reserve
Cederberg Nature Reserve
Jonkershoek Nature Reserve
Hottentotsholland Nature Reserve
Kogelberg Nature Reserve
Limietberg Nature Reserve
Walkerbay Nature Reserve
Outeniqua Nature Reserve
Goukamma Nature Reserve

Northern Cape Province, South Africa:
Doornkloof Nature Reserve
Rolfontein Nature Reserve
Oorlogsloof Nature Reserve
Goegap Nature Reserve

Free State Province, South Africa
Koppies Nature Reserve
Willem Pretorius Nature Reserve
Tussen die Riviere Nature Reserve
Sandveld Nature Reserve

Mpumalanga Province, South Africa
Songimvelo nature reserve
Origstaddam nature reserve
Loskopdam nature reserve

Private Nature Reserves, South Africa
Phinda Resource Reserve
Thornybush Nature Reserve

Botswana
Botswana Wildlife Department

Zimbabwe
CIRAD, community based projects in the Zambezi Valley.

Mozambique
Gorongosa National Park

Tanzania
A new sanctuary south of the Serengeti managed by VIP Safari Club.
Appendix 9: A selection of Independently Implemented Projects

Projects resulting from free downloads of the software but not receiving direct technical support from the EC-funded CyberTracker project.

More than 700 independent projects have registered in 76 countries. Countries where CyberTracker projects have been implemented include: South Africa, Namibia, Botswana, Zimbabwe, Mozambique, Angola, Kenya, Tanzania, Uganda, Rwanda, Madagascar, Niger, Bourkina Faso, Bénin, Tchad, Rep. Central Africa, Rep. Congo, Gabon, Cameroon, Senegal, Equatorial Guinea, Nigeria, Côte d'Ivoire, Australia, New Zealand, China, India, Tajikistan, Malaysia, Sri Lanka, French Guiana, Vietnam, Argentina, Bolivia, Brazil, Columbia, Costa Rica, Belize, Mexico, USA, Canada, Alaska (USA), Mongolia, Spain, Portugal, Italy, Netherlands, Germany, Belgium, Luxembourg, France, Austria, United Kingdom, Switzerland, Sweden, Israel, Russia, Japan, Antarctic, Poland, Papua New Guinea, Greenland, New Mexico, Ukraine, Ethiopia, Thailand, Romania, Taiwan, Zambia, Chile, Ireland, Peru, Canary Islands, Malawi, Brazil, Czech Republic and Pakistan.

A selection of some of the most interesting Independent Projects include:

- Greenland: Environmental monitoring programme in the high arctics. National Environment Research Institute (http://www.dmu.dk/International/) and is used to get at baseline on biotics factors to see whether any potential climate changes might affect them. See more @ http://www.dmu.dk/International/Arctic/Climate+change/ and http://www.zackenberg.dk/
- Ukraine: Field mapping of karst and cave features, Ukrainian Institute of Speleology and Karstology
- Antarctic: Marine Biology - Whale Survey
- Uganda: Effects of ecotourism on Bwindi mountain gorillas.
- South Africa: University of Stellenbosch, Department of Forest Science.
- South Africa: Stellenbosch University. Monitoring pest population levels in deciduous fruit orchards and vineyards
- Costa Rica: Tracking of jaguars on the Osa rain forest.
- USA: Butterfly censuses in State of Florida
- Snow Leopard Conservancy in Sonoma CA to help customize Cybertracker for research on snow leopards in Nepal, India, and Pakistan.
- India: Hunting practices by indigenous tribes in Northeast India
- Ethiopia: African Parks Foundation project in Omo National Park. Aerial surveys, large mammal, socio-economic and ground work.
- Israel: Integrated Pest Management on regional scale in field and horticultural crops
- USA: Boston MA, Bioblitzes in conjunction with E.O. Wilson LIFE project.
- USA: Citizen Science project through the Boston Museum of Science.
- Senegal: Chimpanzee behaviour.
- Canada: Intertidal shoreline surveys by volunteer groups. Data from these surveys is posted in the Community Mapping Network (http://www.shim.bc.ca).
- Flemish bat-group: Updating of the current distribution maps, monitoring of the bat population.
- New Caledonia: Survey of marine turtle in the Bourail area, New Caledonia, south Pacific.
- Romanian White Stork population monitoring.
- Gibraltar: Bird monitoring.
- Taiwan: Department of Life Sciences and the Institute of Biodiversity in National Cheng-Kung University. Several projects e.g. "Monitoring of the parasitic plant Cuscuta", "The survey of C4 plants" and "The weeds database of Taiwan".
- Spain: EPPEX (Equipo de Investigación Primeros Pobladores de Extremadura), is an archaeological project on middle and lower Pleistocene in Iberian Peninsula.
- Bolivia: Forest project.
- The Austrian Armed Forces Disaster Relief Unit. Emergency response missions to assess the situation and report to the On-Site Operations Coordination Center and to the UN Office for Humanitarian Affairs.
- Alaska: Study of sperm whale depredation of longline fisheries.
- Canada: Winnipeg, River Water Quality Monitoring.
- Switzerland: Butterfly census.
- Peru: Bird follow-up in Cajamarca.
- USA: Dolphin research in Southern California.
- Australia: Collecting field data for line transect surveys of Kangaroos in New South Wales.
- Australia: Anangu Pitjantjatjara Yankunytjatjara Lands in Central Australia. Information about threatened species such as Malleefowl and Black-flanked rock wallabies. Cybertrackers are good in the field as a quick way of collecting GPS based data as many Anangu (the Aboriginal people of the Pitjantjatjara Yankunytjatjara Lands) have poor literacy.
- Costa Rica: Population size and structure, as well as microhabitat parameters in a study on the single remnant population of the critically endangered variable harlequin frog (Atelopus varius).
- Cameroon: use of CyberTracker in 2 industrial logging concessions (DECOLVENAERE - 150,000 ha and SEFAC – 400,000 ha) for forest inventories as part of the sustainable forest management planning process.
- Cameroon: The impact of logging on gorillas' and chimpanzees' spatial distribution in an active concession of South-eastern Cameroon.
- Spain: Aiguestortes i Estany de Sant Maurici National Park, in Spanish Pireness. The project is about mammals distribution in protected area and the relation with habitat characteristics.
- Vietnam: Rural development project collecting farmers asset data.
- Brazil: Medical surveys.
- New Zealand: Disaster Relief.
- Czech Republic: Valuate the coverage of demands of engangered species with focus on their possible reintroduction.
- The Washington Conservation Corps will be utilizing the Cybertracker system to collect monitoring information on approximately 30 ecological restoration project sites throughout the state of Washington.
- Kenya: Lions of Tsavo.
- USA: Santa Rosa, CA. Search and Rescue.
- Russia: Ecology problem in central Russia
- China: Snow Leopard monitoring
A selection of Independent Projects that illustrate the geographic range include:

**AFRICA:**
- Angola: Quicama National Park
- Cameroon: WWF Cameroon Programme, Yaounde
- Côte d'Ivoire: Parc National de Taï
- Equatorial Guinea: Zoological Society of London and Imperial College London: PhD project collecting biological, sociological and economic data on all elements of a bushmeat supply chain.
- Gabon: Programme Kudu, Research and monitoring of sea turtles.
- Gabon: Loango NP, WCS/Operation Loango. Project combined between conservation, scientific research and eco-tourism for the National Park of Loango.
- Kenya: PhD research on the ecology of the mountain bongo antelope.
- Madagascar: Ranger based monitoring in Madagascar's National Parks.
- Namibia: Oshimeno. Game counting.
- Rwanda: Nyungwe Forest Reserve
- Uganda: Effects of ecotourism on Bwindi mountain gorillas in Uganda
- South Africa: Stellenbosch: Insect pollinators in transformed landscapes in the Cape Floristic Region (CFR).
- South Africa: Marloth Nature Reserve, Swellendam.
- South Africa: De Wildt Wild Cheetah Project
- Tanzania: Kigoma, Gombe Stream Research Centre.

**ASIA / MIDDLE EAST:**
- Israel: Ramat Aviv, Tel Aviv University. Bird behavior studies.
- Israel: Society of Preservation of Nature in Israel
- India: Snow Leopard in Ladakh.
- China: Snow Leopard monitoring
- Vietnam: Hoang Lien National Park

**AUSTRALIA / NEW ZEALAND:**
- Australia: Fox monitoring for Parks Victoria
- Australia: Research Unit, Cultural Heritage Division, Hurstville
- Australia: Alice Springs: North Territory Government’s Biodiversity Conservation Division, teaming up with Aboriginal trackers to study the elusive sand-dwelling marsupial mole of Australia.
- Western Australia: Rangelands Sustainability Monitoring Project.
- North Western Victoria: Monitor breeding numbers of malleefowl.
- New Zealand: Department of Conservation.

**CENTRAL AMERICA:**
- Costa Rica: Tracking of jaguars on the Osa rain forest in Costa Rica
- Mexico (and USA): Borderlands Jaguar Detection Project.
**South America:**

- Argentina: Sustainable development and conservation of the patagonian steppe.
- Argentina: Population ecology and conservation of guanacos (Lama guanicoe) in Patagonia.
- Bolivia: Logistic Project, La Paz.
- Belize: Belize Biodiversity Information System.
- Brazil: Small farm in Atlantic Forest, Sao Paulo State.
- Columbia: Ecology of montane forests in Columbia - Central Andean region.

**North America:**

- USA: New Jersey. Bald Eagle Territory Use.
- USA: Island of Martha's Vineyard, MA: Habitat and den site characteristics of striped skunks (Mephitis mephitis).
- USA: Yellowstone National Park.
- USA: Murray, Kentucky: Effects of habitat fragmentation and stream channelization on mammalian activity along river corridors.
- USA: Southern Connecticut: Education program to introduce elementary aged school children (grades 1 - 5) to nature around their own school. The goal is to inspire them to step away from their computer games and television sets and instead head out-of-doors to enjoy the real world.
- USA: Montague, Massachusetts: Montague Plains Community Mapping Project.
- USA: Austin, Texas: Impact of exotic invasive plant species on bird habitat in Central Texas.
- USA: Northern Maine: Lynx Tracking Project.
- USA: Portland, Oregon: Cooper Mountain Survey.
- USA: Ann Arbor, MI: BioKIDS: Kids' Inquiry of Diverse Species.
- USA: Amesbury/Newburyport, Ma: Wildlife Inventory Project.
- USDA - Track the spread of specific vectors that affect a number of crops in California.
- USA: Banks High School in Banks, Oregon.
- USA: San Francisco, California: Field data pertaining to trail locations, plant communities.
- USA: Striped Skunk behavioral ecology in coastal waterbird nesting habitat.
- USA: Hopkinton, NH: GIS and Natural Resource Management Class.
- USA: Presidio, San Francisco: Crissy Field Community Environmental Center.
- USA: University of North Carolina: Research on Elephant Tracking in Cameroon.
- USA: Houghton Lake, Michigan: Coyote-dog hybrid presence in Roscommon CO.
- USA: Santa Barbara: Thesis work for Masters in Environmental Science.
- USA: Western painted turtle survey in Western Oregon.
- USA: Lakota Community, Sitting Bull College in Fort Yates, North Dakota.
- USA: Minnesota: Masters thesis research, Wildlife Research Institute of Ely. The effects of supplemental feeding on the activity patterns of black bears.
- USA: Sensing Cape Cod project at the Cape Cod National Seashore.
- USA: Lewisville, Texas: LLELA Mammal Activity Study.
- USA: Utah Biology Department, University of Utah, Salt Lake City. Resource use in ant communities in Texas and Arizona.
- Canada: PostDoc work at Parks Canada and the University of Manitoba. Research on two species at risk: the Swift Fox and Woodland Caribou.
- Canada: Vancouver: outdoor education program to allow students to learn behaviour ecology.
- Canada: University of Alberta, Wildlife Productivity & Management.
- Canada: Montreal, Quebec: Monitoring of native plant populations in agricultural landscapes.

**Europe:**

- Austria: University of Vienna, Austria. Master degree on the neotropical poison frog *Allobates femoralis*, in French Guiana.
- Belgium: Nature and Forest Departmentt of the Univeristy of Gembloux.
- Belgium: Agronomical studies.
- France: Hunting and bushmeat trade survey at Mount Nimba Biosphere Reserve (Republic of Guinea).
- France: Lyon. Training the managers of the World Heritage Protected Areas in 9 West African Countries, including Senegal, Guinea and in Niger Republic.
- Italy: University of Rome.
- Luxembourg: Groupe Spéléologique Luxembourgeois.
- Poland: GPS surveying for LULC mapping and verification, Wroclaw University, Institute of Plant Biology.
- Netherlands: Register nests of birds in grassland.
- Portugal: Dept Zoologia, Univ de Coimbra, Portugal.
- Spain: El Rocío Huelva: Recuperación de Patrimonio en Doñana.
- Spain: Ordesa and Monte Perdido National Park.
- Spain: Seabird migration study in the Strait of Gibraltar.
- Switzerland: Butterfly census.
- Sweden: Karlstad: Mapping specimens from enviroment (water, dust) during accidents (fires and chemicals).
- University of Leads, England.
- Bushmeat research programme.
- Bird Reserves in UK.
- Ireland: Ecology and habitat data in nature reserves in the Dublin.
Appendix 10: Television and Print Media Coverage

Since the signing of the EC contract in August 2002, CyberTracker has had worldwide media coverage:

**CNN, World wide** Wildlife sanctuary gets high-tech shot in arm, December 2004.


**The Economist, UK** Hunter-programmes: A new device puts an old skill to work. 10 June 2004.

**BBC, UK** The Life of Mammals features the Persistence Hunt.

**Frankfurter Allgemeine, Deutschland**

**WIRED Magazine, USA**

**Wired News, USA**

**GEO, Deutschland**

**Conservation In Practice, USA**

**Phoenix TV, Germany**

**K&L Up to Speed, Belgium**
Trailblazer - Wireless communicatie help geografie, 3 October 2003.

**Red Herring, USA.**

**Red Herring, USA.**
Working the fields. By Alex Soojung-Kim Pang. March 23, 2005

**Discovery Channel, Germany**
Fahrtensucker online

**The Philadelphia Inquirer, USA**
Scientists brings high-tech tracking device to remote rain forest. By Andrew Maykuth, 18 January 2005.
The Christian Science Monitor, Boston, USA
Fast Tracking. By Laurent Belsie, online article, 3 April 2003.

ZDF, Germany

3Sat, Germany

Misereor, Germany

BOILER, Italy
Innovazione - Sulle tracce dei gorilla con il satellite. By Megan Lindow.
Innovation - On the traces of the gorilla with the satellite. By Megan Lindow.

Techsoup, San Francisco, USA

Future Now, California, USA

Financial Mail, South Africa
Conservation on Track. By Sasha Planting, 3 December 2004.

New Zealand Surveyor, New Zealand

Kruger Park Times, South Africa.

Ford Foundation, South Africa

Saudi Aramco World, Saudi Arabia

Southern Cross Review

Another World is Here

Popular Mechanics, South African Edition

SAFM, South Africa
Radio interview on "Future Watch", Thursday 2 October 2003 at 2pm.
**Weekend Argus, South Africa**

**Africa Geographic, South Africa**

**Country Life, South Africa**

**Pervasive Computing, USA**

**Canoe Network, Canada**
Conservation over poverty - Uprooted South Africans win land back, develop ecotourism

**Indiantelevision.com, TUBE TALK**

**SABC Africa, South Africa**
Live interview, on Monday 26 July 2004.

**News24.com, South Africa**
Cyber Louis on the right track. By Hilary Prendini-Toffoli, 8 October 2003.

**Mirabilis, Canada**
Bushmen using PDA’s. 13 July 2003.

**NICMOC BLOG**
Trailblazer. Bush Space: Looking up and down at the same time. Wired Mag, June 2003 by San Foral Kwinter.

**Sunday Times, South Africa**

**CollegeBound Network, USA**
Take a Scholastic Wilderness Adventure. By Alexia Allen, September 2002.

A more extensive list is given on the CyberTracker website at:
www.cybertracker.org/Media.html