CyberTracker Conservation

The Western Kgalagadi Conservation Corridor Project

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Background to the Development of CyberTracker and the role of the Kalahari trackers.

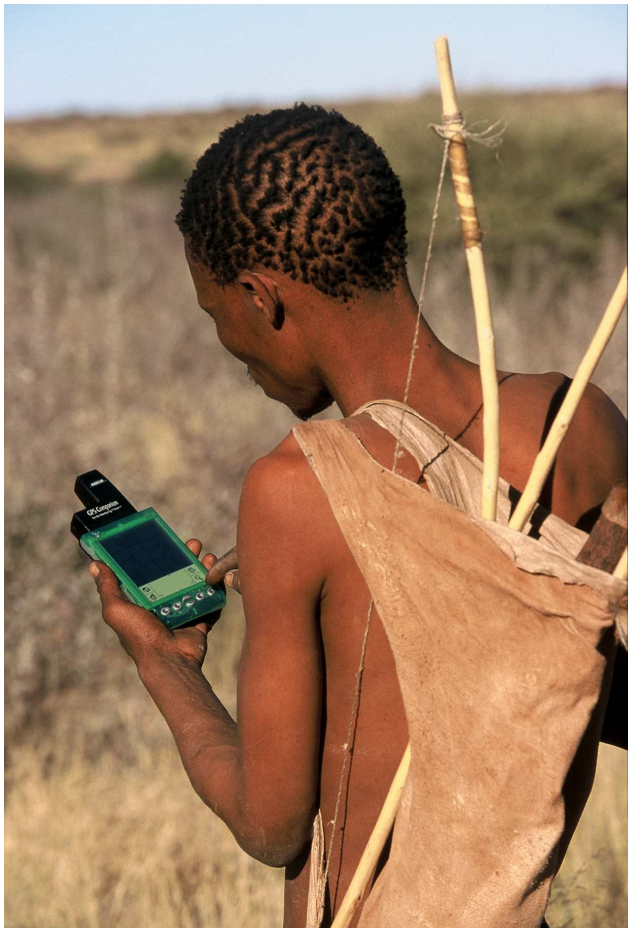
CyberTracker has its origins in an apparent paradox in human evolution: the brain evolved both in size and in neurological complexity over millions of years. A fully modern brain had evolved at a time when all humans were hunter-gatherers. Yet the same brain that has been adapted for the needs of hunter-gatherer subsistence, today deals with the subtleties of modern mathematics and physics. To resolve this paradox, it can be argued that the art of tracking may have been the origin of science, requiring the same creative hypothetico-deductive reasoning that is required for mathematics and physics. Scientific reasoning may well be an innate ability of the human mind.

If the art of tracking was the origin of science, then modern-day trackers should be able to do science. However, some of the best traditional trackers in Africa cannot read or write. To overcome this problem, the CyberTracker was developed with an icon-based user interface that enabled expert non-literate trackers to record complex geo-referenced observations on animal behaviour.

In 1991 !Nate asked me to help them. They could no longer live as hunter-gathers and needed jobs. Wildlife in the Kalahari has been decimated by fences that cut off migration routes. It was no longer viable to live as hunter-gatherers. And the art of tracking was dying out. After discussions around the fire, it was decided that I should try to find a way to create jobs for trackers. Only by developing tracking into a modern profession, will tracking itself survive into the future.

Revitalising Tracking Skills

In order to revitalize tracking skills, I initiated the Tracker Evaluation system in South Africa. But what was most significant is that of all the trackers who were evaluated over the years, Karel Benadie and James Minye, working with the CyberTracker, showed the most rapid improvement in tracking skills. Karel



explained that the CyberTracker helped him improve his tracking skills in two ways: In the past, he may have walked past a small hole, but with the CyberTracker he would stop to investigate the tracks going into the hole in order to record the observation. So the CyberTracker made him look at tracks and signs that he may otherwise have ignored. But the second reason is perhaps more inspiring – the CyberTracker motivated him to record all his observations, because he knew that one day his children will be able to see his work. In addition to the Tracker certificates, which motivated trackers to improve their skills, the CyberTracker also proved to be an effective tool to revitalize the art of tracking.

Back in the Kalahari, I worked with David Attenborough on the BBC film showing Karoha doing the Persistence Hunt in 2001. As part of the agreement, the BBC donated a CyberTracker unit, a Desktop Computer and a solar charger to the community of Kagcae. This gave Karoha the opportunity to demonstrate that he can master the CyberTracker technology – not just collect data, but download the data, view the data on maps, and recharge the batteries. While the project successfully demonstrated his ability to use the technology, funding was still needed to pay trackers to collect data on an ongoing basis.

Persistence hunting may be the most ancient form of hunting, possibly going back two million years, long before the invention of the bow-and-arrow or the domestication of dogs. After two million years, Karoha may well be the last hunter who has been doing the persistence hunt. Yet of all the hunters at Kagcae, Karoha is the most proficient in using the CyberTracker. In Karoha, one individual not only represents one of the most ancient human traditions, but also the future of tracking with computers. Karoha's story represents the most profound cultural leap – a story that gives hope for the future.

From its origins in the Kalahari, CyberTracker has now found its way into conservation projects worldwide. Most users simply use CyberTracker to record data. But the art of tracking also represents the most sophisticated and refined form of human observation. A fleeting glimpse of a small bird disappearing into a thick bush is closer to a *sign* of a bird than a clear sighting. A distant sighting of a whale in rough seas can be just as difficult to identify as an indistinct track. A dried out twig, with no flowers or green leaves, can make identification of a plant as difficult as identifying the faintest sign in the sand.

Whether looking at birds, butterflies, plants, whales, tracks or signs, human observations can be infinitely complex. The trackers of the Kalahari can inspire the development of increasingly refined observation skills. The ancient art of tracking can be revitalized and developed into a new science to monitor the impact of climate change on biodiversity - a new science that can help us solve one of the most complex challenges of the future.

The Western Kgalagadi Conservation Corridor Project

The Western Kgalagadi Conservation Corridor Project was initiated in 2008, sponsored by Conservation International and managed by Moses Selebatso.

The Kalahari is sparsely populated with wildlife, making it essential to gather data based on tracks and signs, and not only sightings of animals. The very nature of the monitoring programme requires that the individuals who gather the data should be competent trackers. Ideally, for scientific monitoring a tracker should obtain at least 95% - only three of the 13 candidates selected for the Workshop obtained more than 95%. At least half the candidates should have 95% to ensure accurate data gathering, since they work in teams of two.

Candidates came from ten villages representing five language groups and their ages ranged from 23 to 52.

Their tracking experience can be rated by four broad categories. Two have done persistence hunting (PH), which is perhaps the most ancient and demanding method of hunting. Three have done bow-and-arrow (B&A)hunting. These individuals, who are all older than 45 years, represent the old traditional generation of hunters. The older traditional hunters usually have the most refined tracking skills and traditional knowledge.

Candidates younger than 45 have hunted only with dogs and horses and some have used snares. This group represents the younger generation of hunters who grew up after dogs and horses have been introduced to communities in the central Kalahari. Some of the candidates have been working as trackers for commercial safari hunters and some as escort guides for tourists.

Name	Born	Age	Village	First Language
!Nate (Shorty) Brahman	b 1956	52	Bere	!Xo
Horekhwe (Karoha) Langane	b 1963	45	Kacgae	/Gwi
Njoxlau Kashe	b 1963	45	Bere	Naro
Motshobedi Matlakala	b 1970	38	Zutshwa	!Xo
Lezole Motshabisi	b 1972	36	Ngwatle	!Xo
Taribane Dithole	b 1973	35	Maake	!Xo
Ipoletseng Basimane	b 1973	35	Kokotsha	!Xo
Xhiko Johannes	b 1974	34	East Hanahai	Naro
Mokale Kote	b 1974	34	Ngwatle	!Xo
Batshwanalemang Tlhabanelo	b 1977	31	Ncaang	Sengologa
Kgangyame Motlhabeng	b 1974	34	Ukwi	Sengologa
Piet Manyoro	b 1982	26	Khawa	Afrikaans
Kebogile Babotse	b 1985	23	Zutshwa	Sengologa
Odirile Molemele	b 1984	24	Zutshwa	Sengologa

Name	Rating	PH	B&A	Snare	Dogs	Horses	Safari	Escort Guide
!Nate (Shorty) Brahman	4	X	X	X	X	X	X	
Horekhwe (Karoha) Langane	4	X	X	X	X	X		
Njoxlau Kashe	3		X	X	X	X		
Motshobedi Matlakala	1				X	X		
Lezole Motshabisi	2				X	X	X	
Taribane Dithole	1				X	X		
Ipoletseng Basimane	1			X	X	X		X
Xhiko Johannes	2				X	X	X	
Mokale Kote	1				X	X		
Batshwanalemang Tlhabanelo	1			(X)	X	X		
Kgangyame Motlhabeng	2				X	X	X	
Piet Manyoro	1				X			X
Kebogile Babotse	2				X	X	X	X

Tracker Evaluation Results

The focus of the WKCC workshop was mainly to train individuals in using the CyberTracker equipment and software applications. I conducted an informal tracker evaluation while testing their ability to use the CyberTracker equipment.

The results may not reflect an objective evaluation, since all the candidates were not tested on the same tracks (they were tested in small groups of up to four at a time). In addition, when I tested the four best trackers, Xhiko and !Nate challenged each other and searched out the most difficult tracks they could find in an attempt to catch each other out. The results for the four best trackers may therefore not reflect that of an objective evaluation, since the tracks selected were on average more difficult that a normal evaluation would have required. Under a normal evaluation the four best trackers would probably have scored a higher percentage. The results should therefore be regarded as provisional, although it can be used to select the best candidates for conducting scientific surveys.

In particular, !Nate should have earned his Senior Tracker certificate (100%), but made one mistake that disqualified him – he mistook a perfectly clear Wild Dog track for a Brown Hyena track. He simply did not look at the track properly and gave his answer after glancing at the track from a distance. He correctly identified Wild Dog tracks in the week before this test and subsequently, so it is not that he did not know the track. He also identified extremely difficult tracks that were much more difficult, so it is not because of lack of skill. The mistake was due to carelessness and lack of discipline. The other three trackers identified it correctly and laughed at him for making such a mistake. !Nate himself immediately recognized his mistake and laughed at himself.

What this particular mistake illustrates is that even the best trackers need to be more disciplined when gathering scientific data. In a hunting context it does not matter if they make a few careless mistakes, since tracking is self-correcting and they would soon realize if they made a mistake. But when gathering scientific data with the CyberTracker mistakes like this should not be made. It is recommended that trackers work in pairs, since this would reduce the chances of unnecessary mistakes being recorded – a second tracker will usually correct a careless mistake. While !Nate should be awarded a Senior Tracker certificate (or possibly a Master Tracker certificate), I decided to hold back on awarding him a Senior certificate until I am satisfied that he understands the importance of not making careless mistakes.

Master Tracker Evaluation

In 2010 I conducted a follow-up evaluation of !Nate, Karoha and Njoxlau, as well as /Uase Xhukwe (who was not selected for the WKCC project). The most significant result was that all four trackers excelled in the Track & Sign evaluation, not making any of the type of mistakes they made in 2008. !Nate in particular made a point of searching out the most difficult tracks and signs that he could find in order to show me what he can do.

It is clear that the disappointing results in 2008 was due to the trackers becoming rusty because they no longer hunted as often as in the past. After using the CyberTracker for scientific wildlife surveys over a two-year period, their tracking skills improved dramatically and were at the exceptional level that I observed ten to twenty years ago when they were hunting on a regular basis.

This project therefore demonstrated the value of CyberTracker in revitalizing traditional tracking skills.

!Nate, Karoha, Njoxlau and /Uase were awarded the Traditional Master Tracker certificate in 2010.

Name	Spoor ID	Level
!Nate (Shorty) Brahman	98%	III
Horekhwe (Karoha) Langane	96%	III
Xhiko Johannes	96%	III
Njoxlau Kashe	92%	III
Kgangyame Motlhabeng	88%	II
Kebogile Babotse	86%	II
Taribane Dithole	84%	II
Mokale Kote	83%	II
Motshobedi Matlakala	82%	II
Lezole Motshabisi	73%	I
Ipoletseng Basimane	58%	Fail
Batshwanalemang Tlhabanelo	57%	Fail
Piet Manyoro	48%	Fail

Tracks used to test trackers

Tracks of antelope tested were:

Wildebeest, Hartebeest, Kudu, Springbok, Duiker, Steenbok.

Tracks of mammals with padded feet were:

Lion, Leopard, Cheetah, Brown Hyaena, Wild Dog, Domestic Dog, Caracal, Jackal, Aardwolf, Honey Badger, Porcupine, Antbear, Bat-eared Fox, Cape Fox, African Wild Cat, Small Spotted Cat, Genet, Springhare, Yellow Mongoose, Striped Polecat, Slender Mongoose, Suricate, Ground Squirrel, Hare.

Tracks of birds were:

Ostrich, Secretary Bird, Kori Bustard, Korhaan, Hornbill, Crow, Dikkop.

Snake track: Puff Adder

In general, the animals that were correctly identified most often include Ostrich, Steenbok, Duiker, Springbok, Jackal, Antbear and Lion.

Animals that were identified incorrectly most often were the small mammals and birds.

Of particular concern from a scientific monitoring point of view are mistakes made with species that are important, such as Wildebeest, Cheetah and Honey Badger.

These included confusing Hartebeest with Wildebeest, made by trackers who scored 82% or less. For spoor data on Wildebeest only data from trackers who got more than 82% should be considered as reliable.

Those who scored 88% or less sometimes confused Honey Badger for Cheetah, or Cheetah for Hyaena or Leopard. For spoor data on Cheetah and Honey Badger, only data from trackers who got more than 90% should be considered reliable.

Selection of Additional Trackers

As a general rule, trackers who hunted with bow-and-arrow would most likely be among the best trackers. Of the 13 candidates, the three who in the past hunted with bow-and-arrow were among the top four trackers. In general, hunters who have only hunted with dogs and horses would not have developed tracking to the same level as bow-and-arrow hunters. A special effort should be made to include the older trackers who hunted or who still hunt with bow-and-arrow, since they would also have retained more of the traditional knowledge of the older generation. In particular, hunters like /Uase of Morgen near Kagcae should also be included in the project. !Nate and Karoha will know where to find /Uase and others who still hunt with bow-and-arrow.

Historically, dogs and horses have been introduced most recently in the area of the central Kalahari including the villages of Kagcae, Bere, West Hanahai, East Hanahai through to old Xade. Tracking skills tend to deteriorate when hunters abandon the bow-and-arrow and the persistence hunting methods to hunt with dogs and horses. The best trackers will therefore most likely be found in these villages and they will most likely be older than 45 years. Xhiko Johannes (34 years old) and Kebogile Babotse (23 years old and from Zutshwa) do, however, show that exceptional individuals may be found outside the proposed geographical and age range.

A new Methodology to Select the best Trackers in a Community

A fundamental problem in selecting the best trackers for scientific monitoring is that there are not many qualified Tracker Evaluators who can identify the best trackers and conduct an objective evaluation of tracking skills. To overcome this problem, it is proposed that a three-phase methodology can be followed to identify the best trackers and work towards an objective evaluation of tracking skills.

Phase I: An objective statistical method that allows an observer with no tracking skills to identify the best trackers in a community.

Phase II: Using the best trackers identified in a community, a Relative Tracking Expertise Assessment can be used to rank the trackers from the best through to the least skilled.

Phase III: Once trackers have been ranked from the best through to the least skilled, the top trackers can be evaluated by a qualified External Tracker Evaluator to provide an objective assessment of the level of tracking skills.

Since the first two phases can be conducted by an observer with no tracking skills, it will be relatively inexpensive. This will save time and cost since the qualified External Tracker Evaluator need not waste time on

evaluating individuals with low levels of tracking skills – he or she can focus on evaluating the best trackers in a community.

It should be noted that Phases I and II can only identify individuals who are the best relative to other individuals in a particular community – it does not provide an objective assessment of the level of tracking skills. For example, in a community where traditional tracking has not been practiced for an extended period, the "best" individual may not be a very good tracker at all.

The trackers selected for the WKCC project are now familiar with the testing procedure, but they are not qualified to assess the percentage scored. The percentage scored is based on a three-point system for easy, difficult and very difficult signs. Only qualified Evaluators can issue Tracker Certificates, since it requires an understanding of the three-point system to conduct an objective evaluation (see www.cybertracker.org).

Even if a Relative Tracking Expertise Assessment does not provide an objective evaluation of tracking skills, it will provide valuable data for future Tracker Assessments, since it will make it possible to select the best trackers for a formal evaluation. This will save time and resources, since it will not be necessary for an Accredited Evaluator to assess all trackers in all the villages.

Phase I: Procedures for identifying the Best Known Trackers in a community

An external observer (with no tracking expertise) can use the following procedure to identify the two best trackers in a community. These two trackers would be the Best Known Trackers for that particular community. The procedure is based on the assumption that the track identification of the best trackers will have the closest correlation to the true identity of the animals and that the results of the two best trackers will therefore have the closest correlation with each other. However, this method cannot determine which one is the best, since the external observer would not be able to tell which one of the two best made the most mistakes. For the most reliable results, the group of trackers tested should be as large as possible, at least more than ten individuals.

1. Each tracker should take turns to point out and circle the most difficult tracks they can find. To avoid bias each tracker should be given the opportunity to point out the same number of tracks to be tested.
2. Testing them one-by-one, the external observer writes down the answer each tracker gives. After being tested on a particular track, trackers should wait in a separate area away from those who have not yet been tested, so that they cannot communicate with each other while being tested.
3. A minimum of 35 tracks should be tested, but ideally about 50 tracks should be tested.

After testing the trackers, the observer should analyze the answers to determine which of the trackers show the closest correlation with each other. For example, if two of the trackers gave mostly the same answers, while others gave answers that differed more often from each other, then the two whose answers correlates best with each other probably also correlates best with the true answers. These two trackers would be the Best Known Trackers for that community.

Phase II: Procedures for a Relative Tracking Expertise Assessment

The Relative Tracking Expertise Assessment should be conducted by the Best Known Trackers in an area. For the WKCC project I recommend !Nate (Shorty) Brahman, Horekhwe (Karoha) Langane and Xhiko Johannes. Since these trackers have already been identified, it is not necessary for the WKCC project to conduct the Phase I evaluation – the project can conduct the Phase II evaluations to rank trackers from best to least skilled.

By conducting a Relative Tracking Expertise Assessment, they can order the trackers from the best candidate (fewest mistakes) to the candidate who made the most mistakes. The top trackers in the villages that fall within the recommended geographic range (Bere – Kagcae – West Hanahai - East Hanahai – Xade), would hopefully have a high level of tracking expertise.

1. The identified Best Known Trackers should point out and circle the most difficult tracks they can find.
2. Testing the trackers one-by-one, the external observer writes down the answer each tracker gives. The Best Known Trackers will confirm whether or not the answers are correct. After being tested on a particular track, trackers should wait in a separate area away from those who have not yet been tested, so that they cannot communicate with each other while being tested.
3. A minimum of 35 tracks should be tested, but ideally about 50 tracks should be tested.

After testing the trackers, the observer should analyze the answers to determine which of the trackers made the fewest mistakes, and order the trackers from the fewest mistakes to the largest number of mistakes. This result would provide a Relative Tracking Expertise Assessment.

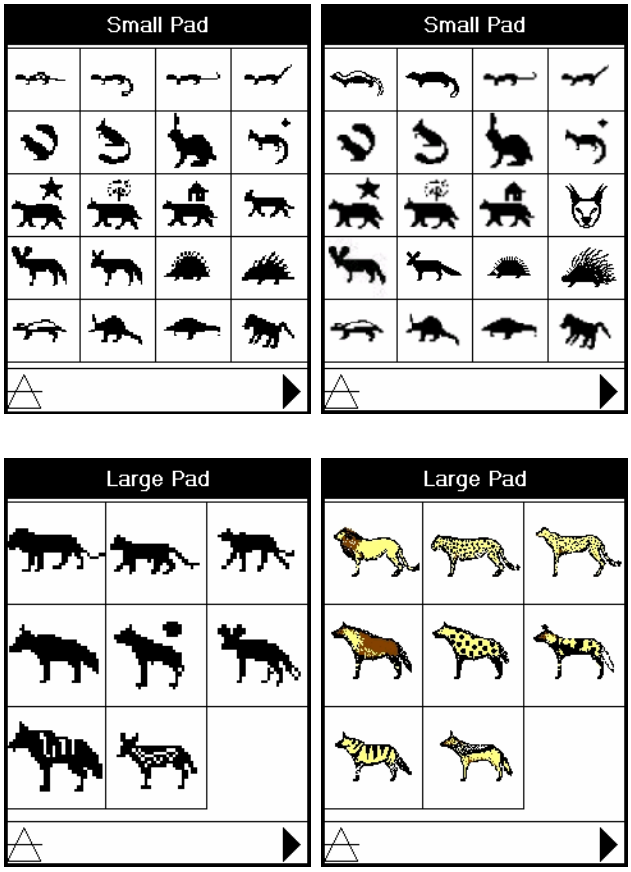
Customization of CyberTracker Software

Customisation of the software was done before field training was conducted. However, when participants made mistakes or when something was not clear, additional refinements was made to the User Interface design to make it easier to use.

Training involved both classroom training as well as field training. The most important aspect was training and evaluating their ability to master the CyberTracker User Interface to ensure that no input errors are made. Most of the participants were able to get 100% for the CyberTracker User Interface evaluation within 10 days of training.

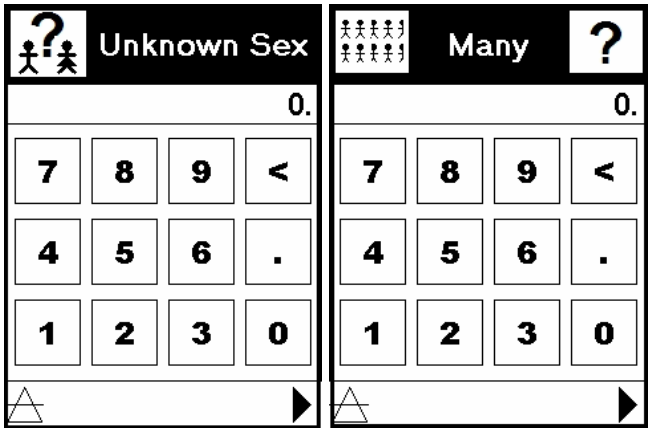
While he had no problems with recording icons that are self-evident, such as species, !Nate initially struggled with some of the species. After improving the icons to make them easier to distinguish, he had no problem recording the correct species. For some of the black-and-white icons I produced more detail. For the large predators, which were not very clear in the black-and-white icons, I created colour icons.

Only !Nate struggled with the "Total Number", "Many" (Unknown Number), "Unknown Sex" categories. These are arbitrary definitions and were therefore initially difficult to symbolize with icons.



Results of User Interface Evaluation, indicating the number of input errors made by each candidate on 7 days tested.

Name	**Result**	27-Feb	not start/ stop	28-Feb	29-Feb	29-Feb	01-Mar	01-Mar	10-Mar	19-Mar
Number of Sequence Input tests		11	9	vary	9	9	12	12	12	20
!Nate (Shorty) Brahman	100%	6	4	4	5	4	7	3	2	0
Horekhwe (Karoha) Langane	100%	1	0	0	1	0	0			
Njoxlau Kashe	100%	2	0	1	5	3	5	1	0	
Motshobedi Matlakala	100%	0	0	2	0		1	0		
Lezole Motshabisi	100%	2	0	5	2	1	2	1	0	
Taribane Dithole	100%	1	0	0	1	0	0			
Ipoletseng Basimane	100%	2	0	4	3	0	0			
Xhiko Johannes	100%	2	1	2	1	0	1	0		
Mokale Kote	100%	0	0	0	1	0	0			
Batshwanalemang Tlhabanelo	100%	2	2	1	0		0			
Kgangyame Motlhabeng	100%	3	3	0	1	0	0			
Piet Manyoro	100%	2	0	0	0		0			
Kebogile Babotse	100%	2	1	0	3	0	0			
Odirile Molemele	100%			1	1	0				



Both the "Unknown Number" as well as "Unknown Sex" used a question mark as an icon. This was changed to include a Male/Female with a question mark in the icon, after which he found it easier to distinguish. His persistence was finally rewarded when on the last day of the workshop he finally got 100%.

Each candidate was tested until he or she made no input errors and obtained 100% (see table below). However, it is recommended that all participants should do refresher training before each survey to make sure that they remember how to use the CyberTracker.

Database Structure

The CyberTracker database includes:

- Names of observers for data validation
- GPS Timer settings to measure Effort
- Survey Methods
- Main data categories

Main data categories include:

- Hoofed mammals
- Large mammals with padded feet
- Small mammals with padded feet
- Birds
- Reptiles
- Plants
- Water points
- Signs of humans
- Field notes

Hoofed mammals include: springbok, duiker, warthog, springbok, kudu, red hartebeest, wildebeest, gemsbok, eland and giraffe.

Large mammals with padded feet include: lion, leopard, cheetah, brown hyaena, spotted hyaena, wild dog, aardwolf and black-backed jackal.

Small mammals with padded feet include: striped polecat, yellow mongoose, slender mongoose, suricate, ground squirrel, springhare, scrub hare, Cape hare, small-spotter genet, large-spotted genet, small spotted cat, African wildcat, domestic cat, caracal, bat-eared fox, cape fox, hedgehog, porcupine, honey badger, antbear, pangolin and baboon.

Birds include: ostrich, kori bustard, secretary bird, vulture, eagle.

Reptiles include: snake, monitor lizard and tortoise (species can be filled in with a field note).

Plants include: water bearing plants, medicinal plants and edible plants (species can be filled in with a field note)

Observation Type include:

- Sighting
- Spoor (footprint)
- Droppings
- Hear
- Other signs

For signs, the age of the sign is given as very fresh, fresh or old.

For counts, there is the option to give an exact total or an estimate if there are too many to count (such as a large heard of springbok that may be hundreds or even more than a thousand). For exact total, the count include the number of unknown adults (sex unknown), number of male adults, number of female adults, number of juveniles (young) and number of new born (baby).

Habitat recorded with every sighting include: pan, grassland, open woodland, woodland, scrub. Habitat condition include dry, mild or green. Pan water levels recorded include dry, almost dry, half, full. For water points a distinction is made between a pan and a small water pool.

Human impact recorded include: Humans, horses, donkeys, dogs, cattle. The number of cattle is also recorded.

A tracking sequence is also included for tracking a specific individual animal.

Basic Technical Support

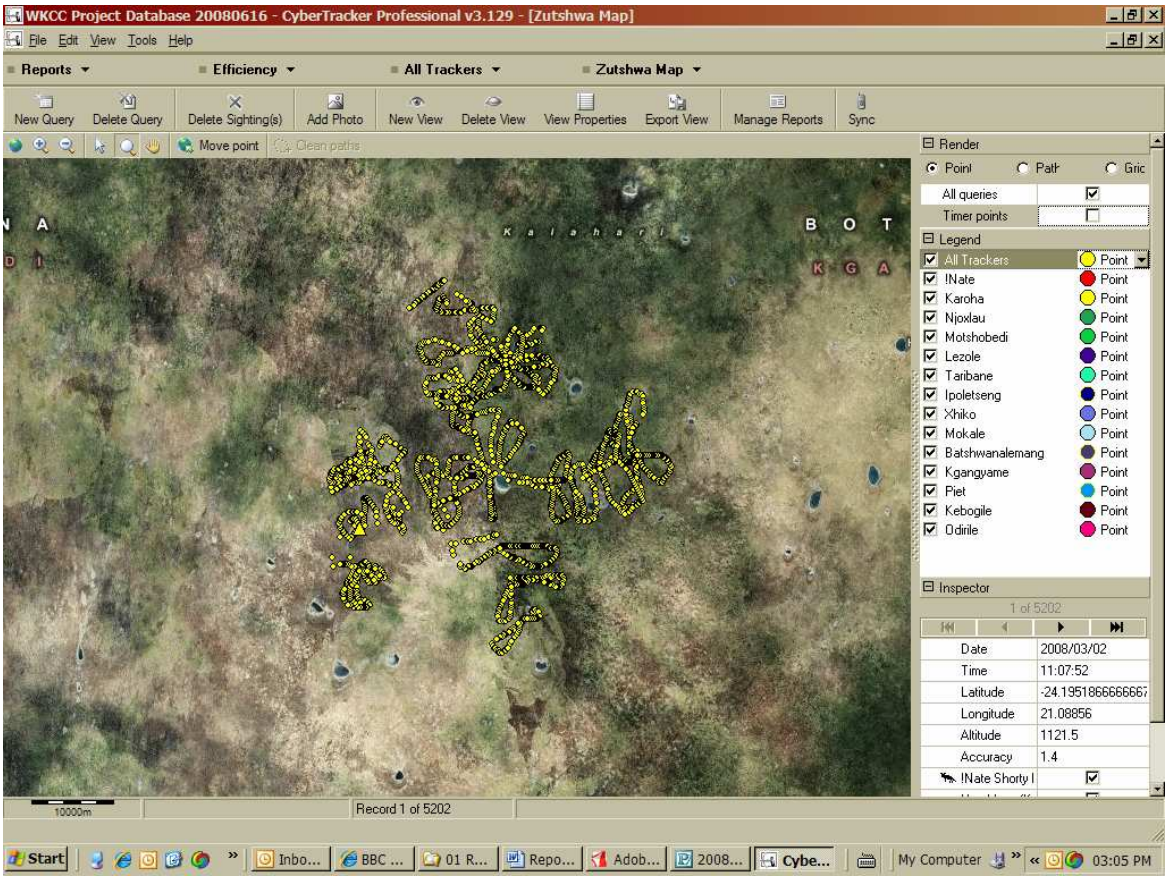
Several volunteers were also taught to start the generator, download the data onto a laptop and to recharge the batteries of the CyberTracker handheld computers. The volunteers included Karoha, Kebogile, Piet, Odirile and Ipoletseng.

Field Surveys

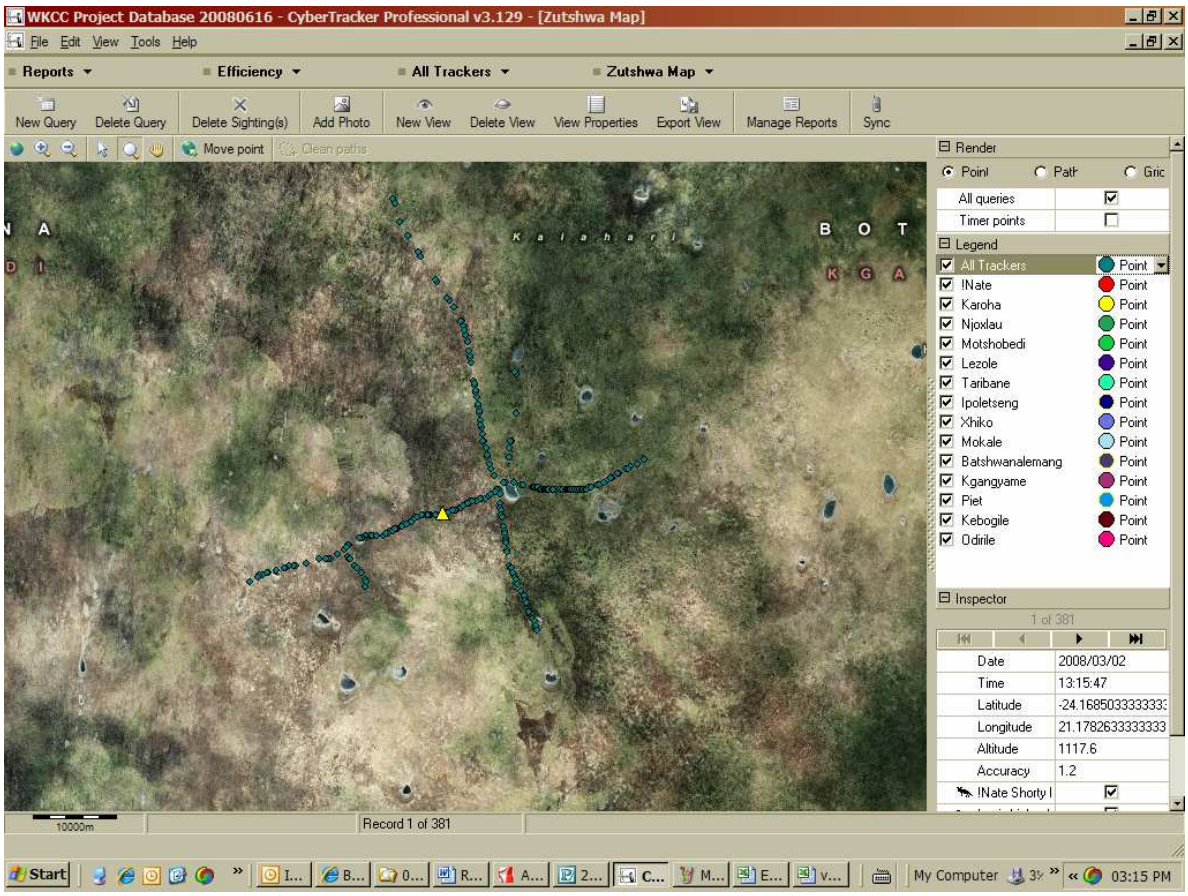
Field surveys were conducted to test whether candidates could reliably gather data and can use the CyberTracker equipment under field conditions. Field surveys included vehicle surveys and foot counts.

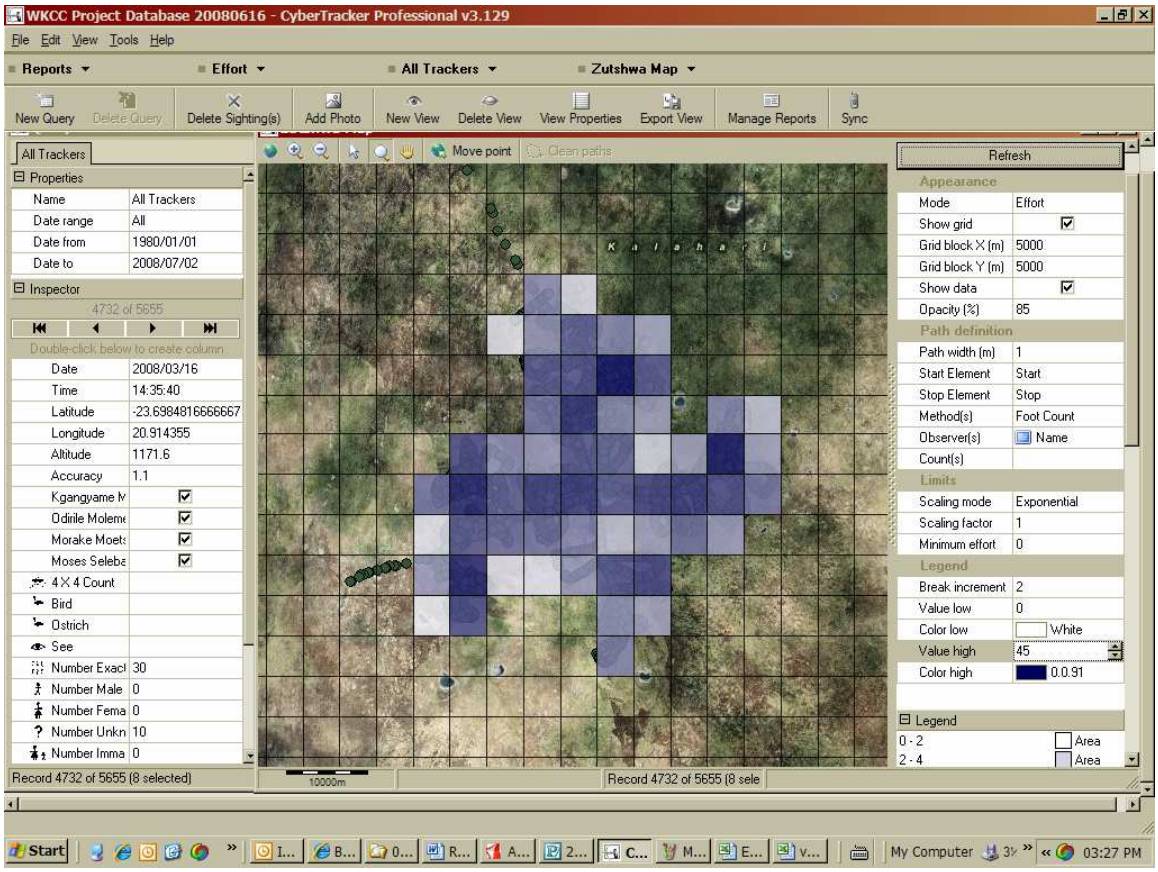
After the initial training was completed, 11 days of Foot Counts conducted over 17 days produced 5 202 observations. 776 km were covered on foot over 276 hours. Vehicle counts were done on 13 days, producing 381 observations over 370 km in 60 hours of counting.

Examples of the results are mapped on the following pages.

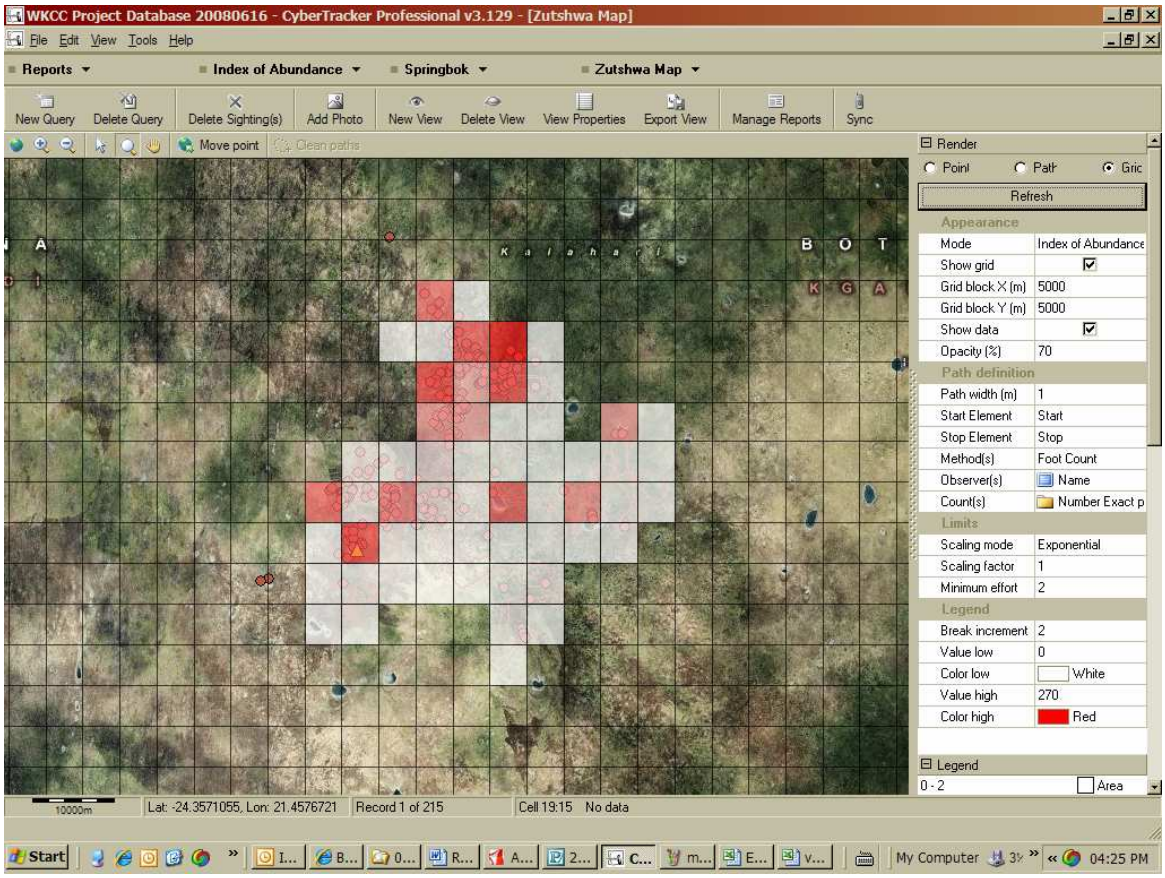


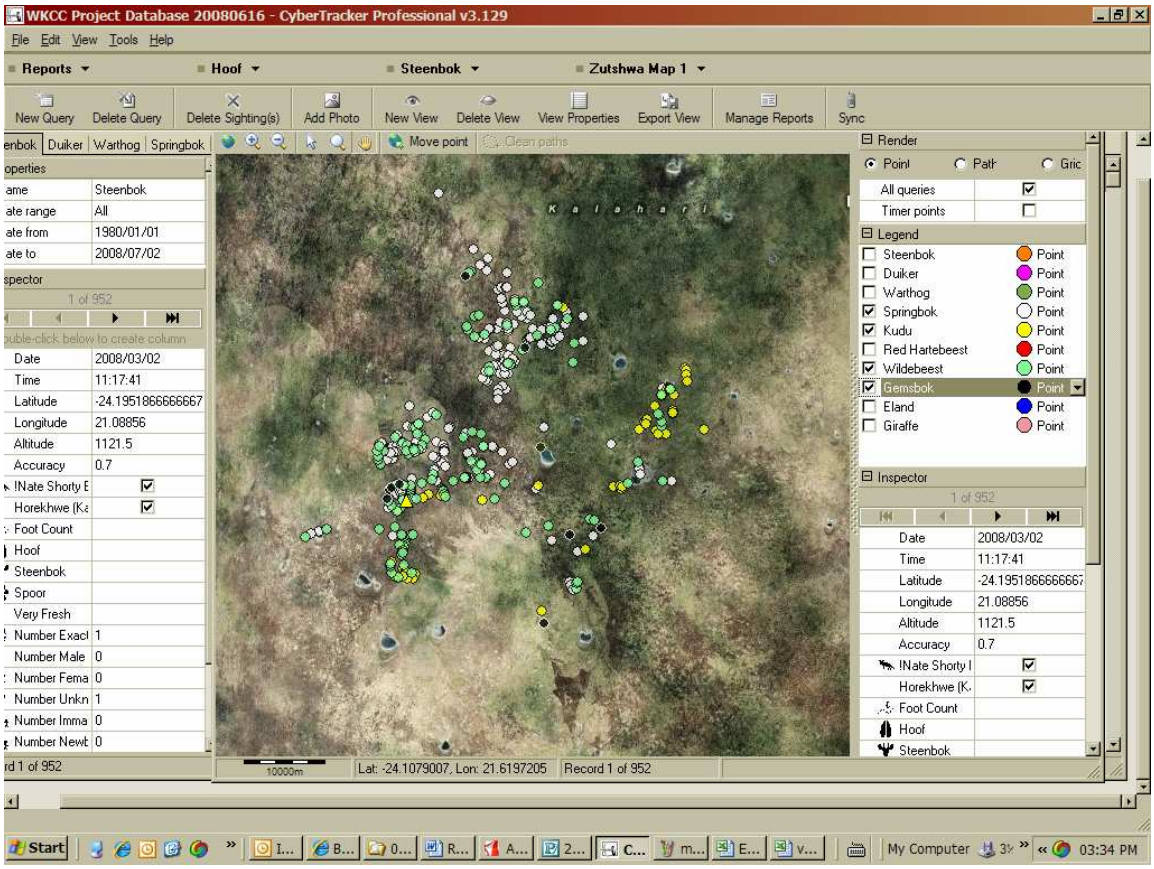
Foot Counts (above) were conducted from roads in teams of two. Vehicle Counts (below) were conducted from the vehicle as Foot Count teams were dropped off at various points.



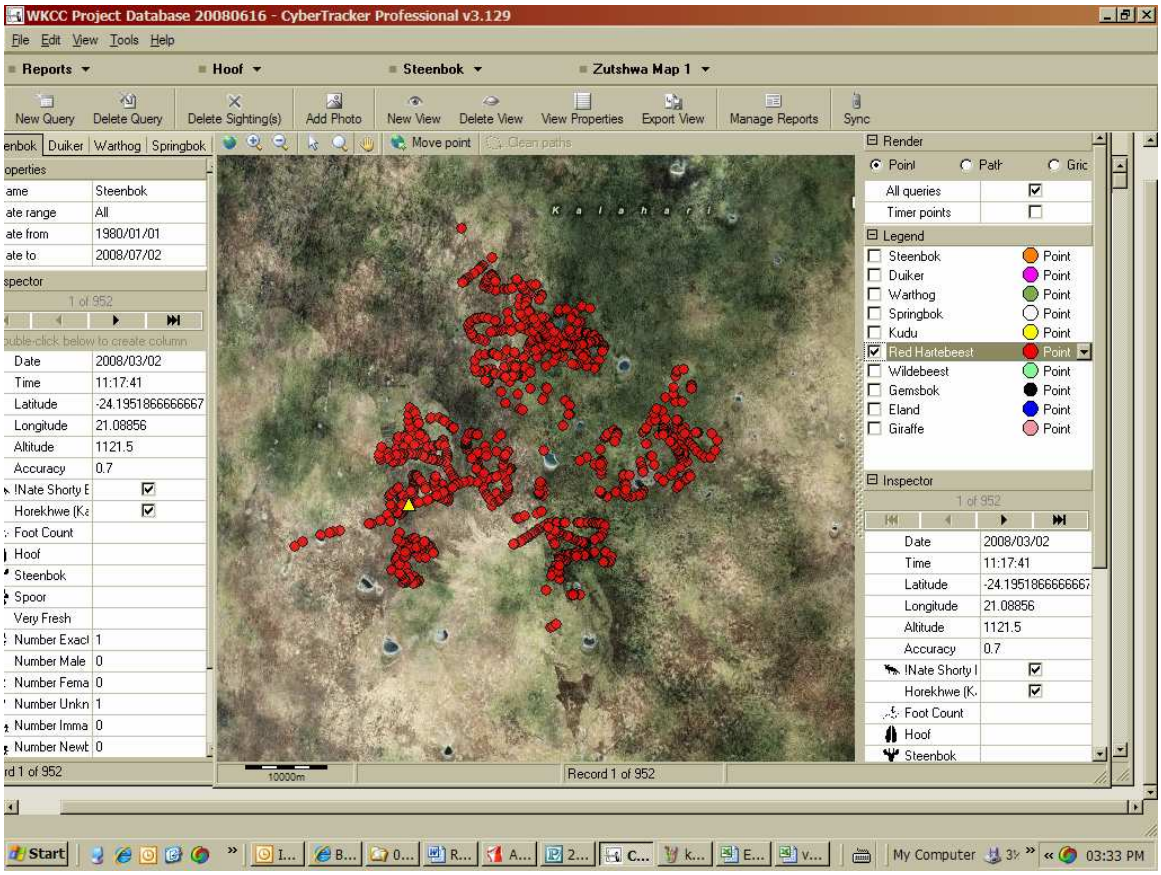


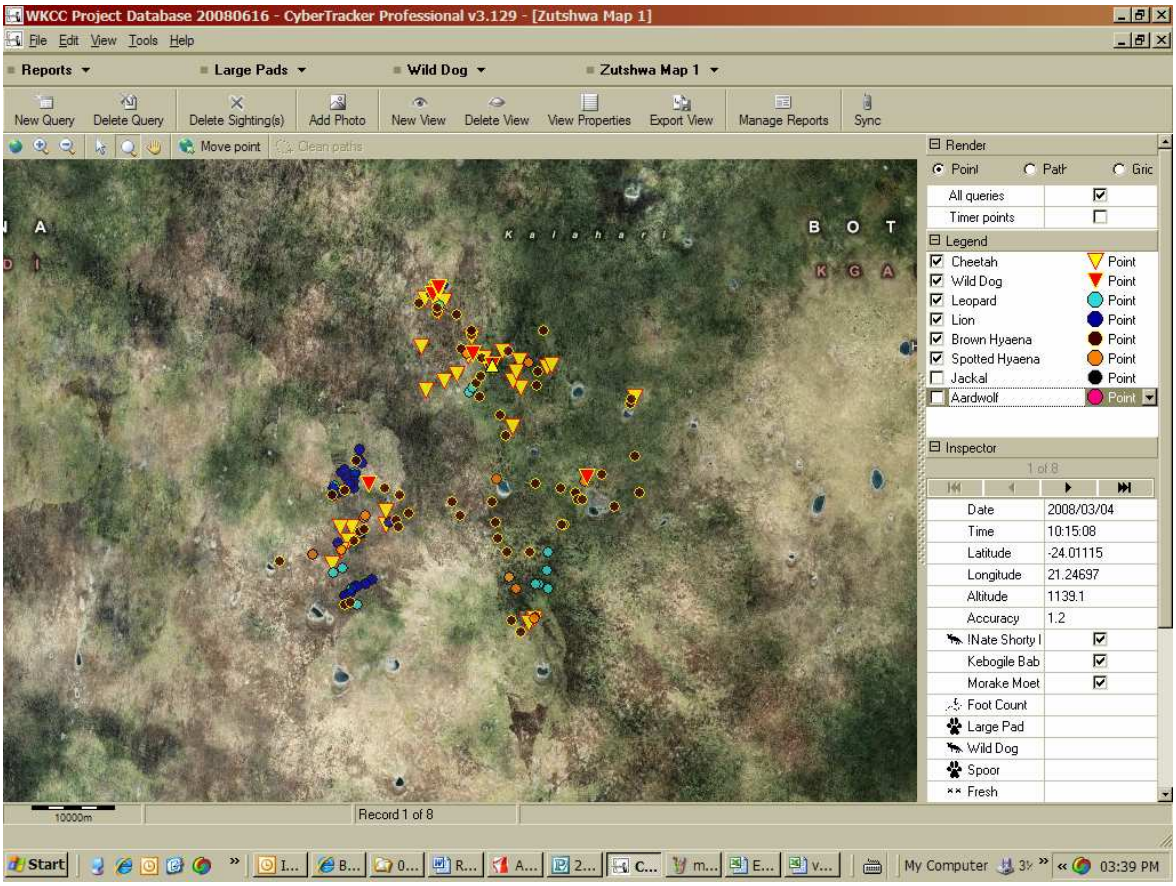
CyberTracker calculates the Effort for Foot Counts (above) or other survey methods. For each species CyberTracker also calculates an Index of Abundance (below), which makes allowance for varying Effort



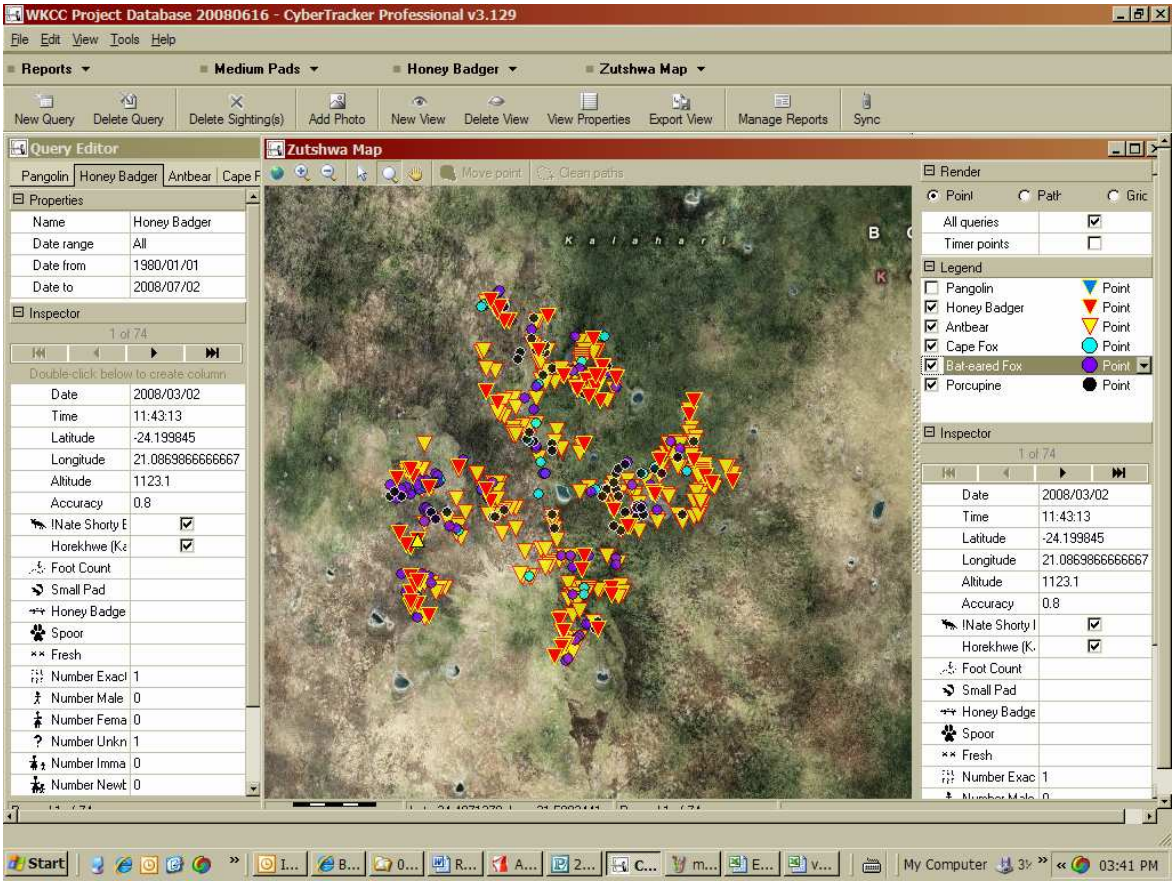


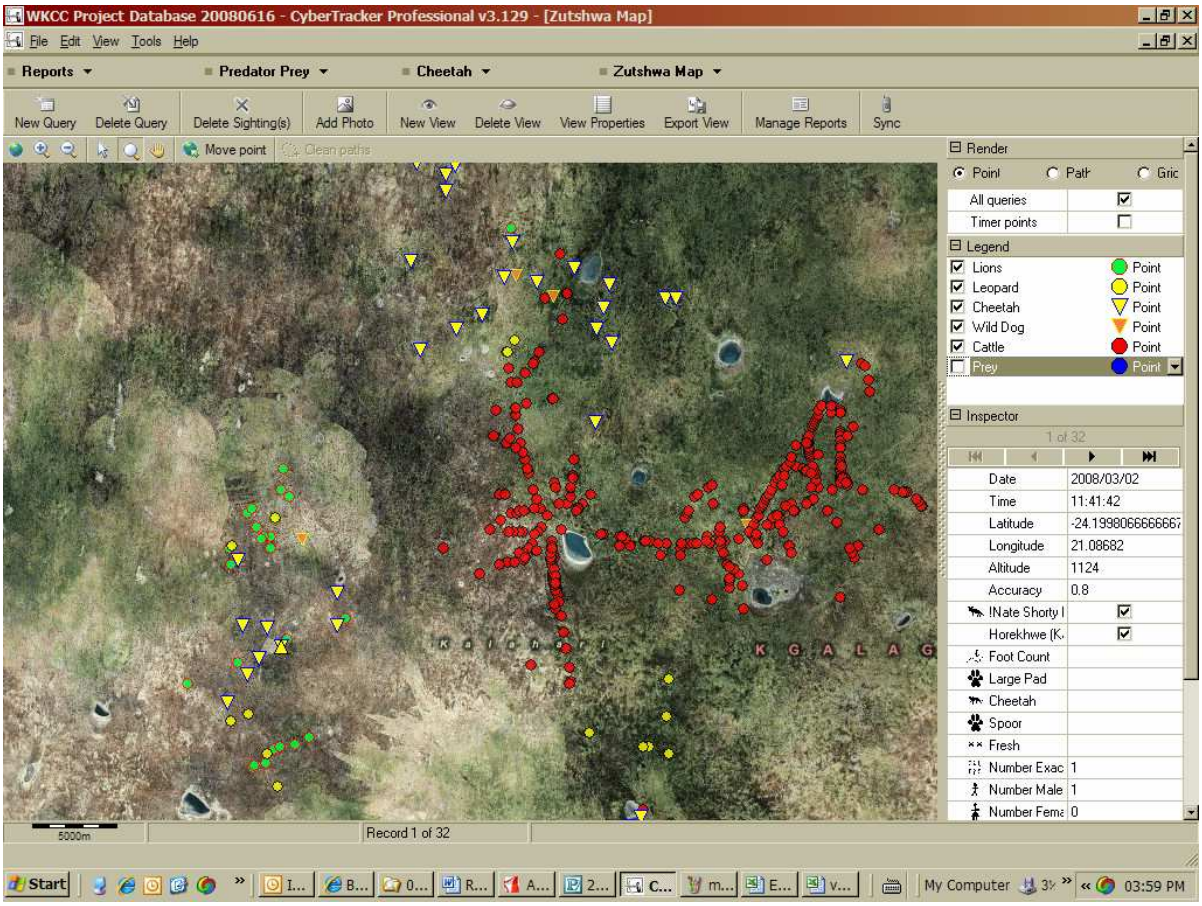
Point data of antelope species can be displayed showing several species together, such as springbok, kudu, wildebeest and gemsbok (above) or one species if the density of points is too high to show more than one species, such as the steenbok (below).



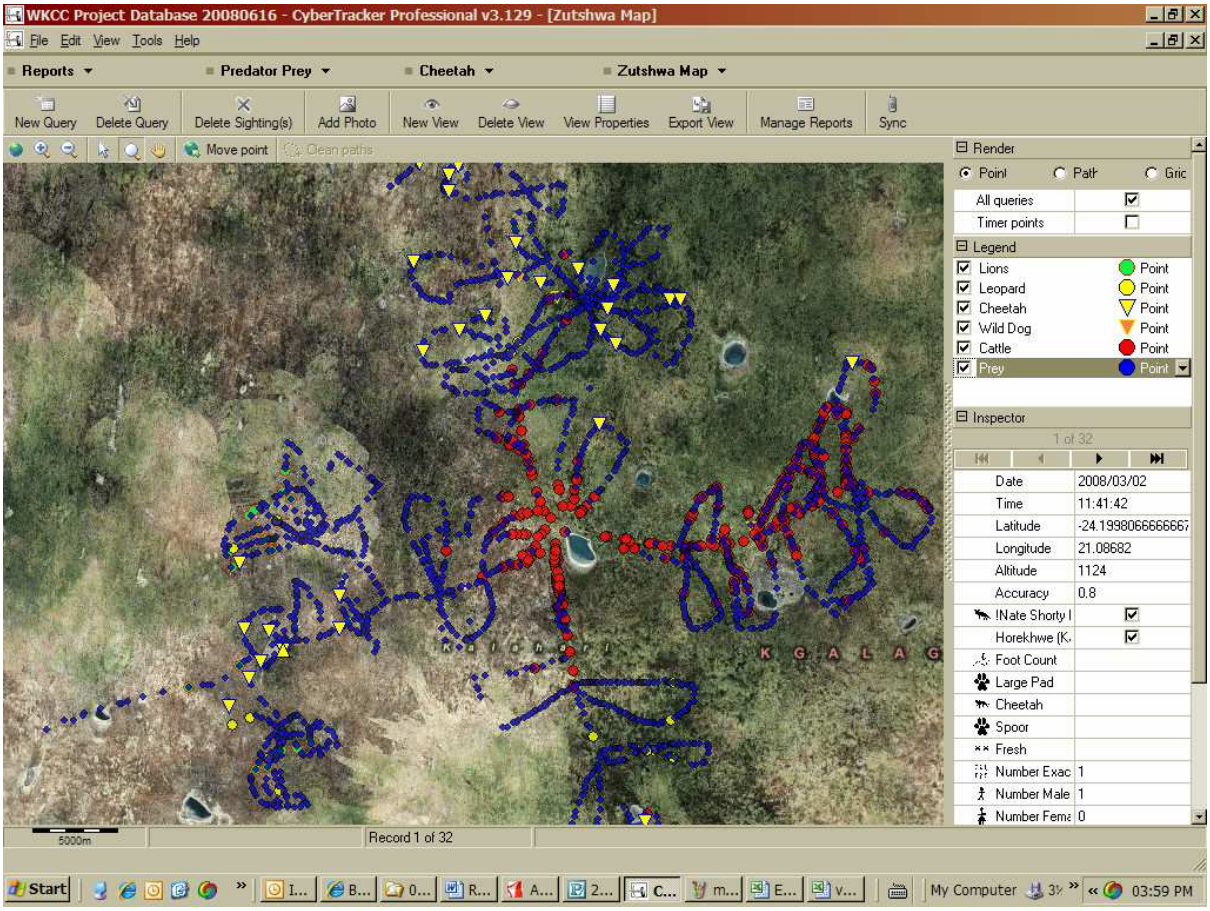


Point data showing large predators, including cheetah, wild dog, leopard, lion, brown hyaena and spotted hyaena (above) and smaller mammals such as honey badger, antbear, Cape fox, bat-eared fox and porcupine (below).





Distribution of predators in relation to cattle in red (above) and in relation to prey species in blue (below).



Perceptions of Participants

Interviews with the trackers have shown that employment is considered vital for their future. The oldest trackers, !Nate, Karoha and Njoxlau, maintain that they will always be hunters. But they also need employment. Younger trackers, like Xhiko, who have only hunted with dogs, maintain that hunting is difficult and that it is better to have employment.

!Nate: "If people hunt with donkeys, the lions kill their donkeys. It is better to work for safari hunters, because they pay well. But when I cannot work for safari hunting, I hunt on my own. If I have a job, I will work, but if I have no job I will hunt. Working with CyberTracker will be better than hunting. CyberTracker and hunting are the same, because hunting teaches CyberTracker and CyberTracker teaches tracking… you need to know all the tracks. But even if I work with CyberTracker, I cannot stop hunting, because hunting is my job, I grew up with it and I will not forget it. Some of your children must go to school and some must carry on with hunting. If you have three children, then two must go to school, but one must hunt to help the other two with meat. If a child wants to go to school you must send him to school, but if a child does not want to go to school, he must learn to hunt".

Karoha: "A job is better than hunting. Hunting now is difficult, but when I can I will hunt. When I can get a job I will take it. But when I have no job I will hunt. Even if I have a job all the time I will still go hunting – I will never stop hunting. CyberTracker and hunting is the same – one day I will work with CyberTracker, another day I will hunt. It is important that children go to school, otherwise they cannot get jobs".

Njoxlau: "I hunt with dogs, horses and donkeys. There are no lions in the Bere area. A job is better than hunting. You need money to send your children to school. This is important, because if you cannot read, you cannot get a job. It is better for children to read than to hunt – to learn something is important. Working with CyberTracker is better than hunting."

Xhiko: "Nowadays we don't want to go around the bush. Sometimes lions attack us – it is difficult to kill them, and they kill our donkeys and horses. It is better to have a job than to hunt. You must have money to send your children to school. It is better for children to go to school than to hunt. It would be better for me to get a job using the CyberTracker, than to hunt. It is very important for children to go to school. But after school you must teach them about tracks".

Recommendations

It is recommended that the WKCC project make an effort to identify at least three or four additional expert trackers from the older traditional generation of hunters. You can train someone to use the CyberTracker in ten days, but it may take five to ten years to reach the expert tracker levels (Senior or Master Tracker). The expert tracker (even if he or she cannot read or write) should be paid more than younger apprentice trackers (who may be better at using the computer). This will give the younger trackers an incentive to improve their tracking skills. A special effort should be made to transfer tracking skills from the older expert trackers to the younger apprentice trackers.

Unfortunately the best trackers seem to be most vulnerable to alcohol abuse. When conducting a survey of several weeks, the base camp should be away from a village so that trackers cannot get access to alcohol. Logistically it may require more effort to set up camp, but the social management may be easier.

Surveys should be conducted as often as possible so that participants do not get rusty, both in terms of using the CyberTracker technology as well as giving the younger participants regular practice to improve their tracking skills.

Conclusion

The WKCC project was very successful and achieved significant results. Since my first visit to the central Kalahari in 1985, when I started working with !Nate, this is perhaps the most important field trip I have done. For the first time I feel hopeful that their exceptional tracking skills will be recognized and developed for the future. The WKCC project may be the most important turning point in the history of traditional Kalahari trackers.

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