Section 6: Training

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This chapter covers training. Topics covered are: selection of trainees, overview of the curriculum, training on the scientific approach, basic computer operation, analysis and reporting, training in field methods, training of planning, logistics and personnel management, training in interview skills, and training in first aid for humans and in wildlife health issues.

8.1 Selection of trainees.

In some cases, the people to be trained will already be protected area authority staff or the employees of conservation organisations. However in many cases new staff need to be selected, recruited, and trained. The selection procedure usually involves announcements in national newspapers and radio, and announcements in local University or wildlife and forestry schools. Local or international NGOs should be targeted as they often know good, enthusiastic people hoping to be recruited into conservation work.

Interested people who respond to announcements, whose CV fits with the requirements of the post, and whose referees (if any) respond positively can then be interviewed. If people know the local names of trees and wildlife and show enthusiasm, it is a good sign. People who have hunted in their youth are often good observers. For team leaders, the ideal person is a University graduate who has grown up in a village and hunted or collected in the forest, as then they have not only some theoretical background, but also practical natural history skills. However this is not a hard-and-fast rule, as some urban graduates have proved excellent observers and natural historians.

The skills required by a team leader are very wide. They have to have a capacity for organisation and logistics, as they are responsible for each mission and the practical requirements of each (food and medical supplies planning and purchasing, camping and scientific equipment, itinerary and calendar). They will also be the primary data recorder and navigator, will enter the data, archive it, and perform at least basic analyses and reporting. They should be able to take good decisions and be respected by their peers, as they will be responsible for the lives of a group of people in the forest, often many days walk from the nearest road. Arrogance and selfishness will not be respected by others and can endanger the mission and the people on it. This is important as teams are often out in the forest for several weeks at a time, where interpersonal tension can become exaggerated; the ability of a team leader to resolve conflicts and to be seen as a good and fair judge of a situation is invaluable.

Normally teams also have other members: the assistant team leader does not need to have an academic background, but should be a good field observer and should also be an organised person. Other team members are the compass-bearers, cutter, and porters. All team members should receive navigation training for safety reasons, and instruction on transect cutting should be given to all people involved in the “forward” team (this includes the cutter and compass bearer: see chapter 5; “Survey team”).

8.2 The training team

Ideally the trainers should be senior staff, having done many hundreds of kilometres of transects and recces in their time, plus the analysis and reporting required. They should be well-organised, able to plan and implement the training course well. The trainers should have an excellent grasp of the working language of the training course (English, French, Spanish, Malay, or whatever is the most commonly used language of the country). In some cases the group of trainees may be from two or more main language groups, and in this case trainers should be bilingual or at least one trainer should be proficient in each language (for example this is the case in Cameroon which has both English- and French-speaking provinces)..

As a general rule, the more trainers the better. Of course the ideal is one trainer to every trainee, but this is rarely attainable. However this can be partly achieved by pairing complete beginners with more experienced trainees, so that there are trainer-trainees for some parts of the work.

In the forest, it is rarely useful to have more than five trainees in a group. If there are more in a given training session, split them up so that each group of five has at least one senior trainer and, if possible, an assistant trainer. This is particularly important when tasks such as transect cutting, navigation, measuring perpendicular distances to nests, etc. are being taught; if people are standing around waiting their turn for something they will rapidly become bored or distracted and you they will miss important points.

8.3 Curriculum.

A full training course for team leaders for wildlife surveys should be at least 10-12 weeks long. This allows for three short missions with the associated preparation, implementation, data analysis and reporting for each. The curriculum should include theoretical sessions at the beginning, where the scientific approach to hypothesis testing, basic statistics, animal counting, data collection and archiving, data analysis, and reporting is covered. If trainees have little computer experience, they should be given a two-week course, covering basic computer operation, and spreadsheet and word processing (usually Excel and Word). Trainees need to understand the need for rigour and how the data they are collecting will be analysed. Ideally trainees should be the people who will not only collect the data in the field, but also plan the missions, enter the data into a computer, and carry out preliminary or even full analyses and reporting of the results that they collect. When people have a stake in the data that they collect (usually by being recognised as an author of a report) and they understand the implications of the data for the eventual decisions that will be made as a result of the data, they are much more likely to be rigorous in the collection of the data in the first place.

A two-week intensive navigation course should be given before the first multi-day field trip, covering map, compass, and GPS use, which again is also put into practice during the field trips. A taught course in logistics should also be given, which is then put into practice in the field during the field trips, which should include planning of all aspects of a field mission. About a week should cover first aid for humans, and wildlife health issues. The latter is important both for noting signs of sick animals in the field, or signs of illness (diarrhoea, blood in dung) and to prevent disease transmission in either direction between themselves and the forest animals. This is obviously most important with great apes, as they are the most likely to be affected by human disease (and to be infected with disease that can be dangerous for humans) but it also applies, for example, to other species of primates, wild pigs and other ungulates. If dung is to be collected for examination of genetic material or parasite/ disease occurrence in wild populations of apes or other animals, careful training should be given on the safe methods of collecting and storing faecal material.

"Classroom sessions" should be interspersed with "practical sessions" even when teaching simple analysis, as people learn much better with a hands-on approach. The old Chinese proverb, below, is very apt when teaching wildlife survey methods and approaches, and it has proved true time after time in the field.

I hear, and I forget;
I see, and I remember;
I do it myself, and I understand".

Fieldwork should start out as day trips at the beginning of the course, but at least two and if possible three camping trips should be undertaken during the course, as this enables people to understand, and to gain experience in planning and implementing the logistics of planning food, baggage, itineraries, and transport. Trainers should ensure each trainee takes a turn at all aspects of planning and implementing a field trip. Finally every trainee should be shown how to take care of materials (storage, transport, cleaning, and maintenance) before and after each mission, as this plays an important part in the comfort and safety of the whole team, the successful collection and storage of data, and in the overall success of each mission.

Ideally a training course for ape survey and monitoring should be at a site where there is a reasonably high density of apes. This may sound facile, but experience is extremely important. Many field staff come to ape survey either as trained biologists or as ex-hunters, or both, but in either case their skills do not normally include spotting nest sites- hunters usually concentrate on signs on the ground or on movements in the trees, and biologists may come straight from University with little field experience. If trainees only see twenty or so nest sites during their whole training course, they will not have seen a wide enough variety of nest type construction, or of ages of nests, and they will not individually have measured perpendicular distances/ estimated age/ height etc. of each nest group. If the site allows for a hundred nest sites to be seen by trainees during their course, they will gain much more experience and will also develop the ability to spot nests from the ground.

An example of a standard training course is shown in Annexe 6.i.

8.4 The scientific approach and an introduction to data analysis

The first part of this section will be classroom-based. It is good to start with a PowerPoint presentation but have a very interactive way of teaching- many of the trainees will have already worked as staff, students or as interns in protected areas, others may have studied wildlife management / conservation/ forestry at University. Encourage dialogue (guided by the trainer) as these sessions go on. People who have come from forestry school have often already seen how timber inventories are carried out, and may have done some calculation of density and /or absolute stock of timber trees themselves. Wildlife graduates, if they have never worked as interns or students in a protected area, may have only been exposed to the theory of inventory and to a rather dry, rote-learning approach to basic statistics. Here we will use the "*I do it myself, and I understand"* approach in order to achieve the best results.

Again, as for much of this chapter, we encourage the use of the White & Edwards (2000) book; and for this section chapters 1-4 should be used by the trainee and by the trainer as an excellent learning and teaching tool.

We suggest that the first part of the whole course should include the following:

- A short speech from the main trainer, introducing the director of the training site (see next point) outlining the subject of the training course, and, in a few words, explaining the desired outcome (a cohort of people trained in the theory and practice of ape survey and monitoring methods). The trainers should also stress that the course is not competitive, but a technical training for important wildlife conservation work, so people should be encouraged to help each other during the whole course, as different people will have different and often complementary skills and past experience.

- A welcome from the director / Conservateur/ head warden of the site at which the training course is to be held, with, if possible, a presentation from him or her on the importance of the site for wildlife (with the accent on apes in this case), whether there is any existing data on ape density and on human impact, how often estimates are made of the wildlife populations within and around the site, and how these are done. The presentation should also include the threats to wildlife at the site- hunting? Clearing for agriculture? Illegal (or legal) logging and mining? Wildlife disease?

- A self- presentation by each of the trainees, explaining what they have done in the past. Specifically, each person should say what educational level they have reached AND, very importantly, what field experience they have already had. This helps the trainers to understand who will need more help in theory and in field craft during the course, and also helps the trainees.

- Distribution of the following items: a personal copy of the White & Edwards book (which is available free and which can also be downloaded from the internet: if the originals are no longer available then the trainers can print out the requisite number of copies and have them locally bound)

8.4.1 Importance of baseline surveys and monitoring programs for great ape conservation and protected area management.

Trainers should lead a discussion on this topic to start off with. Ask trainees “What type of information is important to conserve apes?” Encourage them to discuss both absolute abundance (how many animals?) relative abundance (number of signs seen per kilometre walked) and the spatial component of both (How many animals are in Park A as opposed to park B? Are there fewer animals in the east of the area than in the west?). Then introduce them to the temporal component, which is where surveys start to turn into monitoring- are there more or less animals in site A in 2007 than there were in 1997?

When different people have talked about their experiences in different sites, encourage them to think about *why* different patterns of abundance and distribution occur. In the case of great apes, there are of course natural factors such as vegetation type, but what we should be concerned about are the human factors. These will be (i) hunting pressure (ii) loss of habitat and (iii) disease. Explain that because of this, any ape (or wildlife) survey must include recording all human sign and also vegetation type, as well as all ape sign. This means that human pressure can be measured as well as animal density or relative abundance. Human pressure can be quantified by the number of human signs seen per kilometre walked, or by the area of vegetation modified from "natural" forest to agriculture within a given time period; or the number of settlements or hunting camps recorded along existing roads, or even by the number of kilometres of roads built within a protected area or around its periphery.

8.4.2 Introduction to sampling theory

Explain that although the information required involves having a good idea either of absolute number/ density/ relative abundance/ distribution of apes and human activities, it is impossible to count *all* individuals and it is impossible to go to every square metre of ground in a forest to search for sign. This will lead to a discussion of how to estimate these parameters by *sampling*. Again, use the White & Edwards (2000) book as a teaching guide here- sampling is well explained in Chapter 3.

8.4.2.1 Accuracy and precision

There are two main things to stress in this section. One is *bias;* one is *precision.* The concept of *bias* is one of the most important things that trainees need to understand. A biased result is one that is smaller than, or larger than, the real statistic for the population as a whole. In other words, it is *inaccurate*. If people realise that they may bias their results by sampling only in the parts which are easy to get to (near a road, or where the terrain is flat) then the results will not be *representative* of the area as a whole. Explain what a representative sample means using examples- if one wanted to know the average height of people in a town, would one stand outside the primary school and measure the first hundred people that came out of the gates? If not, why not? If one wanted to know what types of animals are found in a National Park, would one only count the ones seen from a boat or a car? If not, again, why not? Explain that to be representative, one should think in advance about the different geographical areas, types of vegetation, variations in topography, distances from human influence, or other broad variations within the area to be sampled, and also the effect that sampling at times of year may have on the results. The sampling design should be representative of the area as a whole, so that the results collected in the sample can be used to draw conclusions for the area.

Also important is the ability to describe how *precise* estimates are. *Precision* defines the quantitative limits within which we are sure that our estimate, calculated using only a sample of the real population, reflects reality, because our estimate is based only on a small proportion of the whole population being measured. In real terms precision is often expressed as the variance, standard deviation, standard error, confidence limits or coefficient of variation of an estimate (these statistics are all closely related). Higher precision means that you are more able to compare your data with other datasets from previous surveys or from other sites.

Graphically precision can be shown as error bars. For example below is a graph of the density of ape nest groups found on transects within four National Parks in Gabon (Fig. 6.4.1). The height of the histograms represents the mean density. The error bars are the 95% confidence limits above and below the mean. Note that the error bars for Ivindo are much wider than those for Birougou. Note also that the error bars are almost the same above and below the mean as the figure for the mean itself for Ivindo, whereas for Birougou it is less than a third. This means that the precision of the estimate for Birougou is much more precise than that for Ivindo. There can be several reasons for this. Either there were not enough samples in Ivindo, or there is more intrinsic variation between the different samples in Ivindo than in Birougou, or a combination of both.

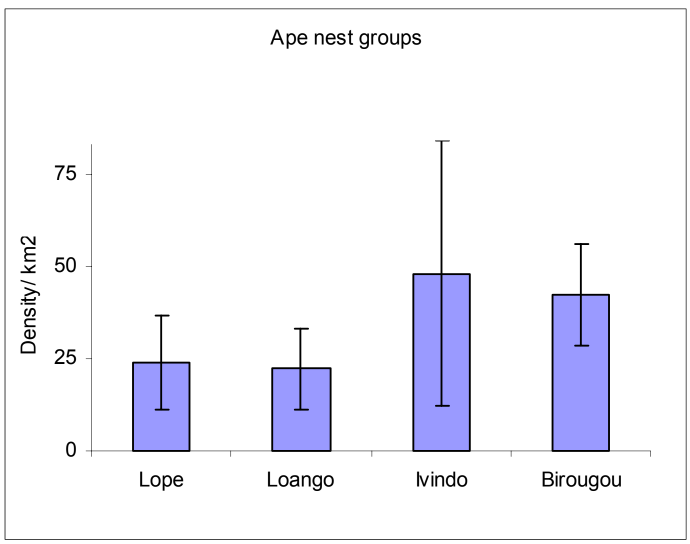


Fig. 6.4.1. Mean estimated density of ape nest groups in four sites in Gabon, with the upper and lower 95% confidence limits around the mean.

The ideal is to estimate both *accurately* and *precisely.*

An estimate can be accurate without being precise: the phrase below is perfectly accurate- the true number of elephants in Cameroon lies somewhere between the two figures but the phrase gives no information as to what the real figure might be.

"There are between 5 and 10,000,000 elephants in Cameroon"

An estimate can be precise without being accurate: here the precision is a million times more precise than in the example above but it is completely inaccurate!

"There are between 5 and 10 elephants in Cameroon"

An estimate can be both imprecise *and* inaccurate! The true number is estimated as only a few thousand (African Elephant database, 2006) so the example below is both much too high and very imprecise (there is a twenty-fold difference between the upper and lower confidence limits).

"There are between 500,000 and 10,000,000 elephants in Cameroon"

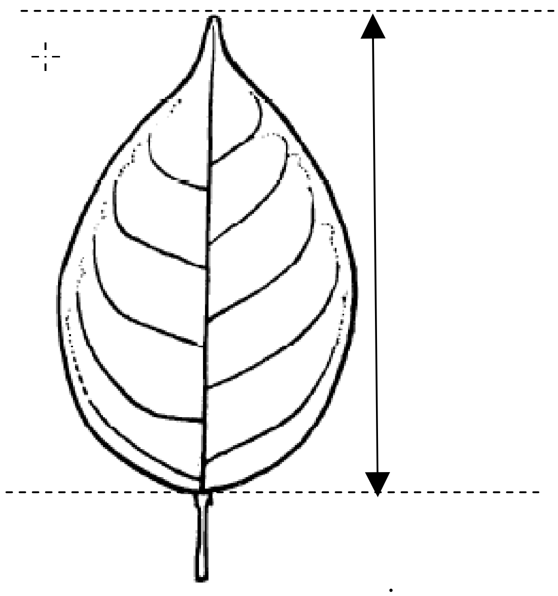
Because one way of improving precision is to increase sample size, trainees can be given an exercise where they collect data, and then use larger and larger subsets of this data to see how (i) precision improves with increasing sample size; (ii) the cumulative mean of increasing sample size flattens off.

8.4.2.2 Field exercise I. Introduction to descriptive statistics and precision.

Take the trainees to a nearby area of forest, and show them one of the commonest understorey plants. Explain that each person should collect five leaves of this species, and that the length of the leaves will be the parameter that they will use for understanding statistics.

First, discuss bias (and how it can lead to an *inaccurate* estimate of the true mean length of the leaves. The sample should be representative of the species. So people should think about how they might bias their results, even unconsciously, by selecting certain types of leaves (the cleanest, the youngest, those on the top or edges of the bushes. Ask them how they can avoid bias- selecting leaves with their eyes shut is one solution, and ensuring that all areas of the bush are sampled, not just that which is easy to reach. Ensuring that different parts of the area are sampled is another- not just next to the path, but near and far from a stream, in light gaps and under shade, etc.

Then everybody should return to the classroom to start the measuring and calculation process. Explain how to measure the leaf- from the tip of the leaf to the end (Fig. 6.4.2)



Measure from the tip of the leaf to the junction of the leaf and the petiole, to the nearest millimetre.

Fig. 6.4.2. Sketch of how each leaf should be measured in Field Exercise I.

Secondly trainees should explore precision. They should each measure their own five leaves to the nearest millimetre (give people clear plastic rulers for this exercise). Then they should calculate the mean, and the upper and lower 95% confidence intervals for the five leaves. People should write up their results on the board, and then calculate basic statistics –mean, standard deviation, standard error, 95% confidence limits) using a pocket calculator (this helps them understand how these statistics are arrived at). Use the White & Edwards book for help (or any basic statistics book).

For example, here are the results for the first three people:

	Leaf length in cm	
1	11.0	Anne
2	28.5	Anne
3	39.0	Anne
4	30.0	Anne
5	19.5	Anne
6	14	Jean
7	13	Jean
8	14	Jean
9	20	Jean
10	36	Jean
11	16	Georges
12	27	Georges
13	23	Georges
14	35	Georges
15	24	Georges

The mean for each person was: Anne: 25.6; Jean: 19.4; Georges: 25.0.

The 95% confidence intervals were: Anne: 13.3; Jean: 12.0; Georges: 8.6.

Now ask them to calculate the same statistics for all fifteen leaves. The mean for all 15 leaves in our example was 23.33, and the confidence interval was 4.96- much smaller than for only five leaves.

The trainees should carry on adding more and more leaves to the subset until they see that there is little change in the mean or in the precision. This way they can see that after a certain sample size, additional data does not change precision very much.

They should also draw, by hand, a graph of the cumulative mean of the sample (calculations again to be done by hand). In this example (Fig. 6.4.3) there is much less variation after about 20 leaves have been measured (the zig-zag line flattens off).

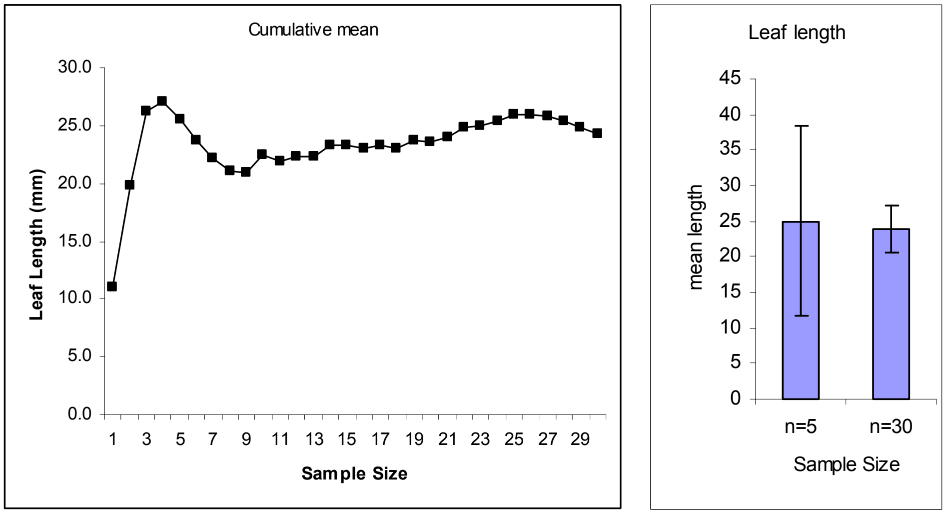


Fig. 6.4.3. Left: the cumulative mean; right: the mean and the 95% confidence limits for a sample size of 5 and a sample size of 30 leaves from the same area.

8.4.2.3 Ability to detect change

The precision of the estimate is very important for the ability to detect change. Very simply put, if the confidence limits on two successive estimates overlap, then it will probably be difficult to say with certainty if there has been a real change in the population being counted.

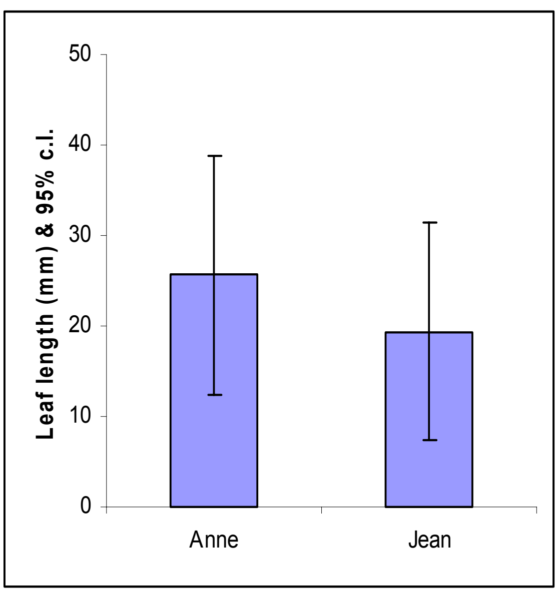


Fig. 6.4.4. Mean and 95% confidence limits of the mean length of leaves for a sample size of 5 for Anne and 5 for Jean.

Use the data collected on the leaves to demonstrate. For example, in Fig. 6.4.4 the means of the two samples have such wide confidence limits (N=5 in each case) that it will be difficult to say if there is any real difference in the lengths of the leaves collected, even though the leaves collected by Jean are apparently shorter than those collected by Anne. By contrast, if the confidence limits were narrower, (e.g. Fig. 6.4.5), where N=30 and one sample was from plants growing under the canopy and one population from the same species growing at the savannah-forest boundary ("shade" and "light" in the example) there is a higher probability that there is a real difference between the populations from which the two samples were drawn.

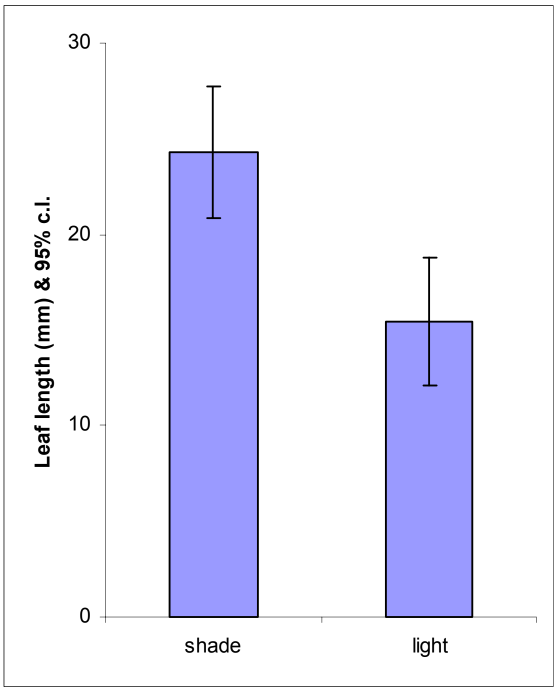


Fig. 6.4.5. Mean and 95% confidence limits of the mean length of leaves for a sample size of 30 for "shade" and 30 for "light".

The trainees should be introduced to statistical tests and probability, as the way we detect change is, of course, based on testing the data we collect to see if apparent differences in abundance of wildlife (or human presence) between monitoring cycles could simply be a result of random variation. This is usually a fairly difficult concept to grasp. Trainees in Africa, at least, have usually been taught basic statistics in forestry or wildlife school, but (i) it is usually taught rather theoretically: it is rare for them to be asked to collect real data themselves and use it as the basis for investigating these concepts and (ii) they have often never needed it in their professional lives and have therefore forgotten it. The White and Edwards manual, again, is an excellent way of teaching these concepts.

8.4.2.4 Why has change occurred?

Finally, if real (statistically significant) differences in abundance occur between monitoring cycles, or between different sectors of an area that has been surveyed, trainees should think about why these changes have occurred. In general, there are three main drivers for population change in great apes. Habitat modification may reduce the amount of space (and food) available- the strength of the effect will vary by species, as, for example, gorillas can use secondary vegetation for food, whereas chimpanzees require more fruit. Hunting directly impacts the animals by removing individuals from the population. Disease (e.g. Ebola in Central Africa) also directly impacts individuals and social groups. Proxies for hunting are twofold. The first is the encounter rate of human sign, and the second is the degree of remoteness of the ape populations from human activity. Usually this is measured as the distance to the nearest road, village, hunting path, or hunting camp. Introduce trainees to the concept of hypothesis testing: there are good examples in the White and Edwards book concerning chimpanzee populations in logged and unlogged forests, for example. They should think of reasons why chimp densities might be lower in logged forests (lead the trainees through the thought process) and how they could test their ideas. Introduce them to the idea of a control situation and an experimental situation (many people will have already met these concepts in wildlife school but may never have addressed them in a wildlife conservation context such as this one). Ask them to first construct hypotheses, and then to make predictions about what they would expect if their hypotheses were correct.

Finally talk about covariates. The reason why we collect several types of data for each observation (slope, vegetation type, season, etc) is because these factors may also affect animal abundance and distribution. We may predict that human pressure is the most powerful, but we can examine this prediction more carefully if we take the other possible explicatory variables into consideration.

Class Exercise: the scientific approach.

Show the trainees the following graph (Fig. 6.4.6). It represents the mean fruit score for a species of African forest tree much appreciated by apes (*Santiria trimera)*. Trees growing in the shade (green bars) had a higher fruit score than those growing along a logging road (yellow bars). The difference was significant (From F. Maisels, unpublished data)

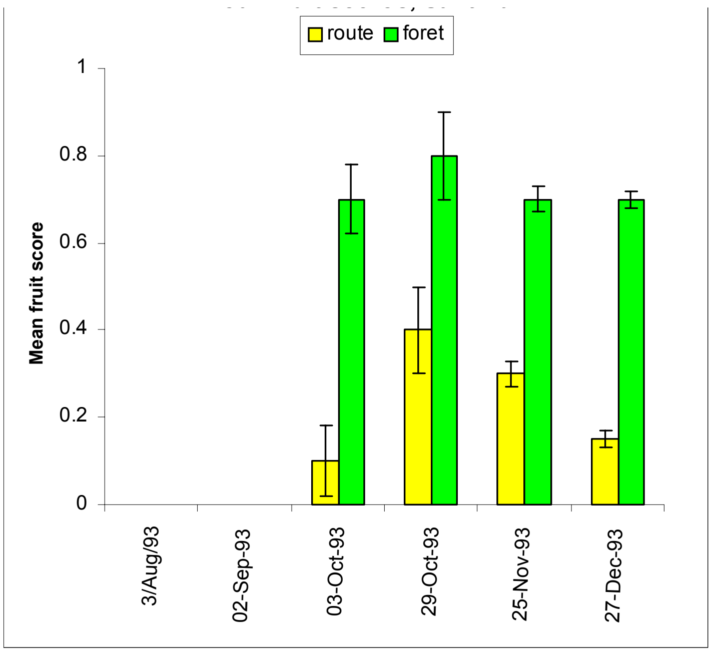


Fig. 6.4.6. Graph for Class Exercise: mean fruit scores for a sample of 10 *Santiria trimera* trees growing beside a road, and 10 growing in the forest, away from the road.

The trainees should think of reasons why this should be so. They should come up with environmental (or other) differences between the road and the forest interior (e.g. light and temperature levels, humidity levels, soil compaction, damage to trees by passing bulldozers, abundance of shade-loving pollinators, etc). They should then formulate hypotheses based on these differences, and also come up with predictions based on these hypotheses. This works well if each person in the training session comes up with a hypothesis, and it is written down so everyone can see and discuss it, and then the same person who has postulated each hypothesis comes up with a prediction. A test should then be proposed by each person. The difference between a hypothesis and a prediction is often confused and this exercise can take a whole morning. An example would be: if the low fruiting levels are caused by damage to trees, we would predict that trees in the forest (off the road) damaged by elephant activity would also have lower fruit scores than those not damaged by elephant activity. People should explore ways of looking at one variable at a time (in other words to think of control situations).

8.4.3 Basic computer course

A two –week computer course is advisable for people who have never used computers before. Even for people with some knowledge, it is useful to go over a basic course. The subjects covered should include organisation of information into folders and subfolders, and security: use of an antivirus, care in what is being downloaded, and use of a surge protector- this last is most important in the tropics as lightning storms, lizards in the wiring, and unpredictable current surges are common. Use of Excel and Word are obligatory, as all data will be first stored in spreadsheet format (normally Excel or Access) and reports are normally written in Word or a clone thereof. We will not go into detail here as most beginner computer courses are similar, and in most countries a consultant can be hired at reasonable rates to give such a course. Practice in appropriate data analysis and manipulation will come after people have made their first field trips and have collected some data.

For Excel, train people to use at least the following:

Data entry in prearranged columns;
Creation of new spreadsheets;
Copy, Cut, Move, Formulas;
Creation of an index column;
Use of “Sort” to arrange data by order of, say, date, or species;
Use of “Filter” to check data;
Use of “Pivot table”
Use of “Subtotals”
Creation of simple histograms;
Using “bins” to arrange data into classes.

For Word, train people to create text, automatic headings and tables of contents; insert tables, and insert graphics into their text. They should be shown a standard report and look at layouts.

8.5 Developing field skills

The most obvious part of surveying is that the observers should be able to detect and correctly identify the objects of interest. Nothing can replace experience. If trainees have never worked in the field before, their ability to spot sign will improve the longer they are in the forest, so the maximum number of field days should be aimed for during the training course, even during days when ape (or other animal) sign is not specifically being targeted.

Even if trainees have previously been hunters or forest users, many will never have had to detect ape nests. So a search image for nests should be pushed from the start.

8.5.1 Navigating in the forest

The first part of field training is a navigation course. The chapter on navigation from White & Edwards (2000) is very useful for this.

Trainees should first be shown the basics of map and compass. Many will never have seen a compass before: often wildlife or forestry colleges cannot actually afford to buy them and their courses are completely theoretical and classroom-based. Only after people have shown themselves to be capable of navigating using map and compass should the second module, GPS training, be given. Remind trainees that if they forget the map and compass, a GPS will not be very useful and if it breaks down they will probably be lost, perhaps many days from the nearest road. They should be able to prove that they can carry out exercises such as navigating their way around a triangle of, say, 2 km a side *without* GPS, in thick forest, and end up at the starting point. During navigation and all other field training sessions, the instructor should keep a GPS unit with the tracklog running, in order to later show the trainees exactly where they went and where any mistakes were made.

We strongly advise the use of a set of laminated topographic maps at 1:100 000 scale, showing contour lines and watercourses (Fig. 6.5.1). The maps should be gridded and the coordinates shown along the edges: if using degrees and minutes, a grid of 1 minute is useful; if using UTM, a grid of 1 km is useful, especially in rugged sites. These maps can be prepared for each survey (covering the whole area to be surveyed, such as a protected area) in advance, and laminated using fairly strong plastic.

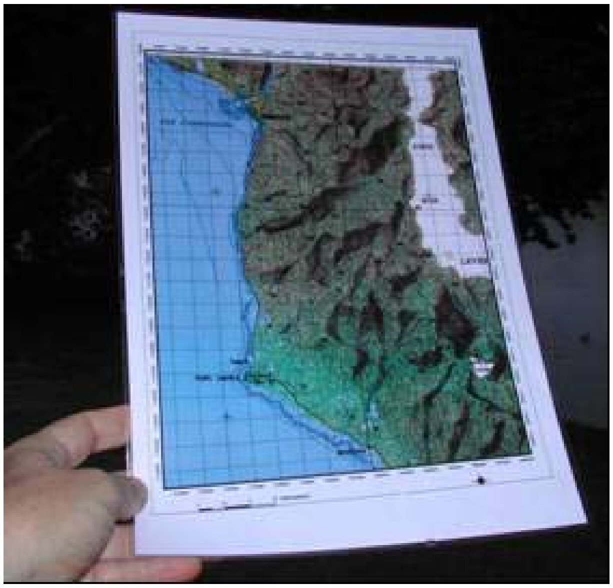


Fig. 6.5.1. Plastified map for field work.

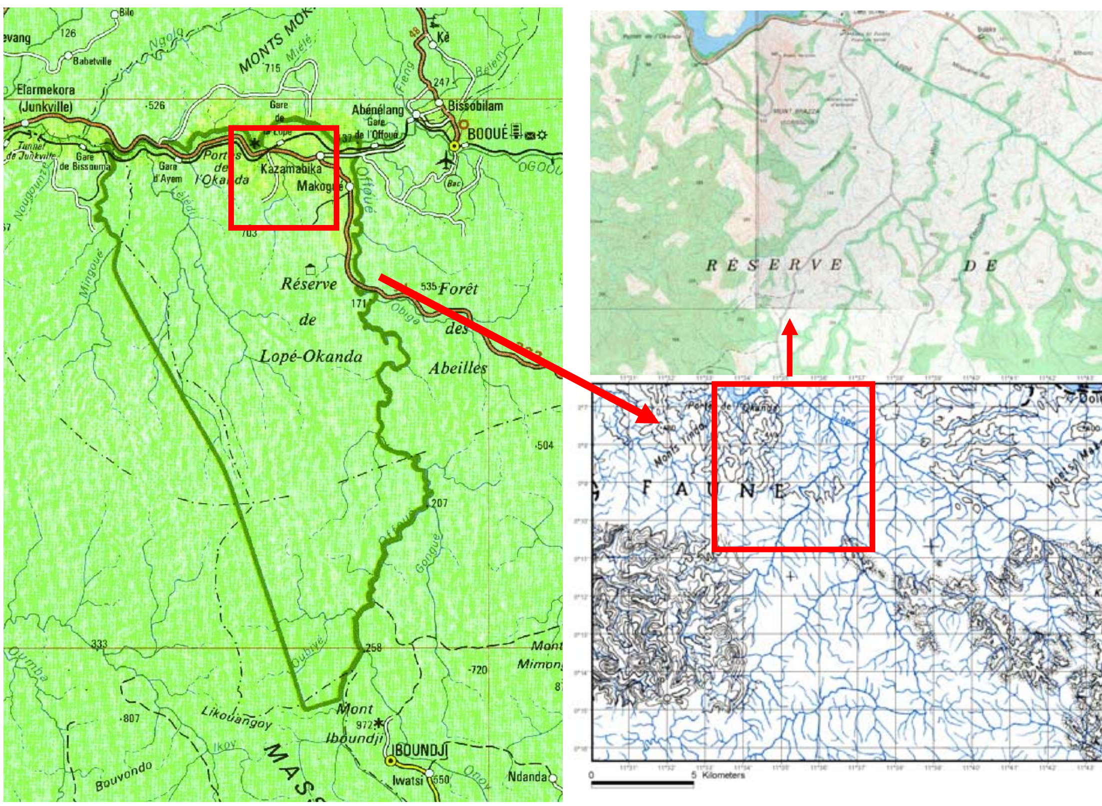
8.5.1.1 Maps

Explain that a map is like a bird's eye of the world, or that it is like the view you get from a high mountain. Some people may never have used a map before, so go slowly and carefully and ensure everyone understands each step.

Explain that there are three main uses of a map. You can understand an area using a map. Secondly you use it to find your way across the area of interest. Finally you will use it to show to others where you went and what you recorded, and exactly how and where other people should go to get to what you found. This could be transects, a poacher's camp, a marshy clearing important for gorillas, or illegal mining inside a National Park.

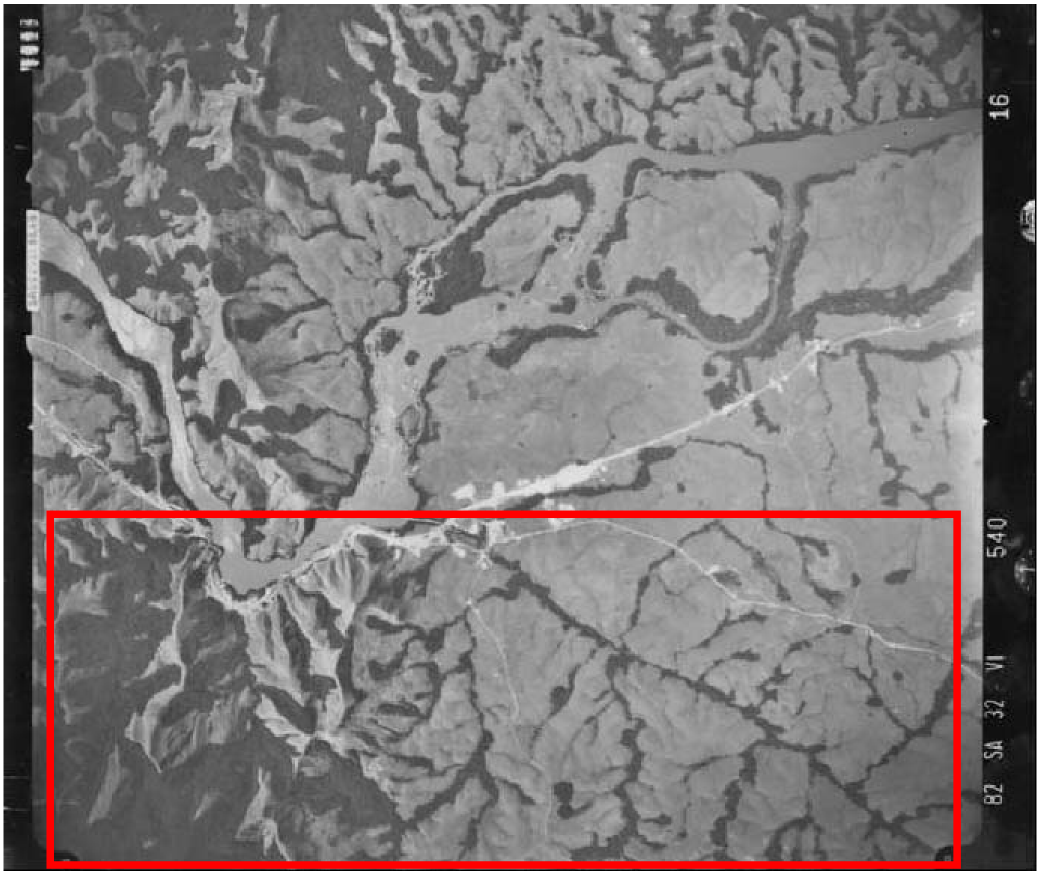
Show different types of map to trainees. The 1:1000 000 maps of countries, the 1:200 000 maps often available commercially (these are often one decimal degree square and cover entire countries); some countries also have 1: 100 000, 1: 50 000 or even 1:20 000 maps available, at least for some parts of the country. Show also thematic maps (logging concessions, vegetation maps) and maps made by projects from field data, such as tracklogs of a field mission overlain on a topographic map.

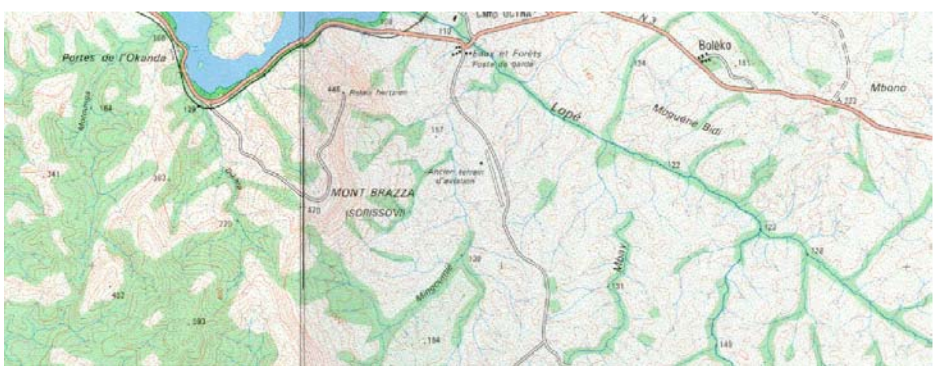
Show satellite images, radar images, and aerial photos to trainees and explain how the topographic maps are made. Most of the 1:200 000 maps of Central Africa, for example, were made from aerial photos taken in the 1960s. Since then, villages have moved, the road network has greatly changed, at some sites the vegetation has changed (deforestation) and the magnetic declination has changed, and all of these should be taken into account when using the maps today.



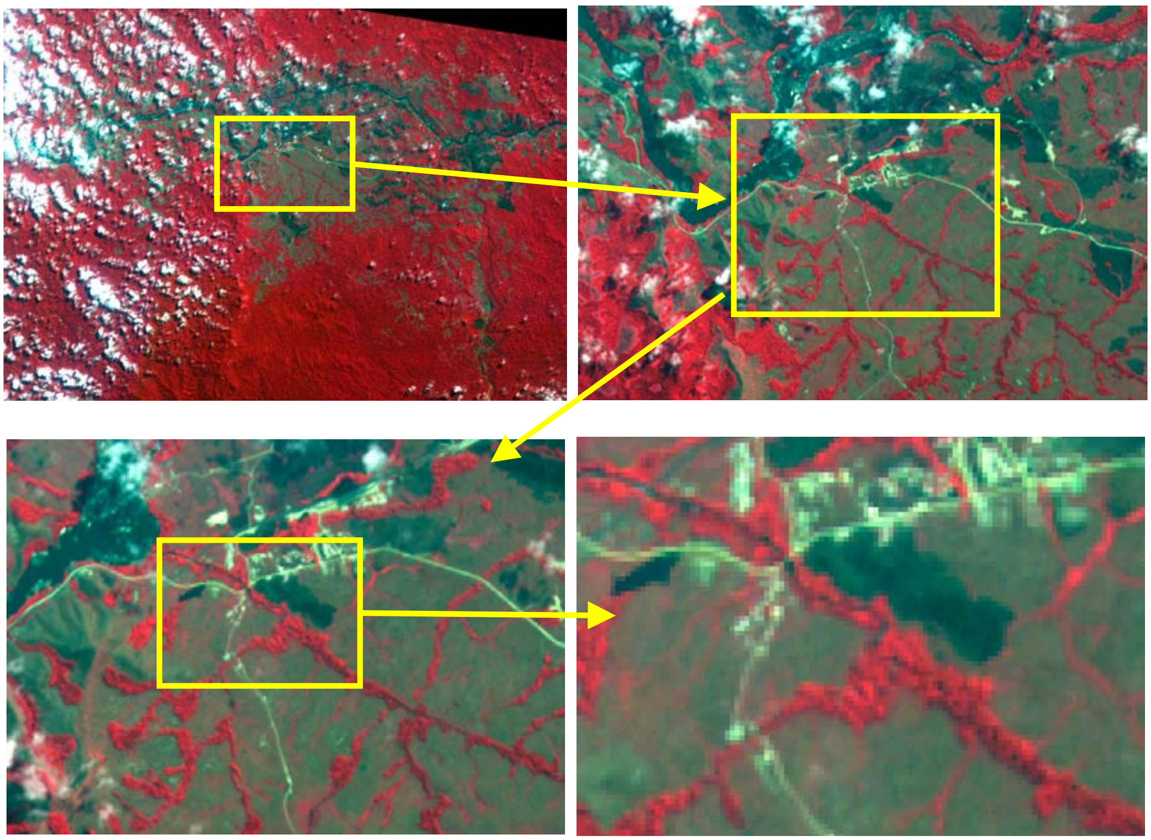
Left: a map of the Lopé area, central Gabon, from the 1: 1000 000 scale country map. The small red square shows the area on the map to the bottom right, which is from the 1:200 000 scale map. The larger red square on the 1:200 000 map shows the area in the last map to the top right, which is from the 1:50 000 scale map of the area that shows roads, villages and even individual buildings and details of gallery forests and savannah patches. Note how the amount of detail increases with each change in scale from country-wide, to region, to local village scale.

Most topographic maps are made from aerial photos. Below the image from 1982 and the corresponding part of the 1: 50 000map that was made from it is shown.



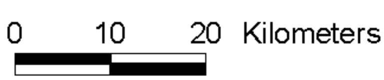


Show how remote sensing can give a good idea of more recent vegetation, and how zooming into images works up to a certain point but then becomes pixellated. Examples from the area in the maps above are shown below in a SPOT satellite image: as the scale increases (the yellow squares show the area shown in the subsequent image) more detail is seen at first, but at a certain point (bottom right) the pixels are visible and zooming in further does not improve matters.



Trainees should be introduced to the concepts of:

- scale (both numeric, such as 1:100 000) and graphic (see sketch below);



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Ensure that people can calculate distances between any two points from a map using the appropriate scale. Give a series of exercises using different scales of map. Give people slightly reduced photocopied maps (which often happens in the field!) and get them to work out the new scale. This is essential when the field trips are planned (number of kilometres to be walked each day between campsites). Also get people to work out distances along rivers or roads, using a string (the lanyard of a compass is a useful measuring tool for sinuous features). Explain that this is important for calculating both time and fuel requirements: a boat trip of 100 km may need 100 litres of fuel, and the same trip in a straight line may only be 40 or 60 kilometres on foot.

- Latitude and longitude, and how it differs from UTM;

Get people to work out the coordinates in both degrees/ minutes and in UTM of a series of points from different maps. They need to be able to understand how calculate the coordinates using the edges of the map. Like distance measuring, this will be repeated when they plan field missions.

- Legend showing the symbols on maps. Colour coded to show water features (blue), topographic features (brown and black), vegetation (green) and human physical and legal features (red, black, yellow). Coded by thickness and form of line (roads, railways and rivers; administrative/ political / protected area boundaries), or the form and/or size of the symbols (human settlement size and type, particular buildings).

- Orientation (most commercial maps have the north at the top, but trainees should check every time).

- Magnetic declination. Use an existing 1:200 000 map which has the declination along the edge in the year the map was published, and ask trainees to calculate what the declination should be in the current year.

- Date of map production, and the source of the data. This is important not only for the magnetic declination but also for the existence, or not, of roads or other human infrastructures on the map and in the field.

The concept of contour lines is important for planning fieldwork and for finding campsites easily. Show trainees how these lines are constructed, using a rock on the ground that they can draw lines around and also look down on from above. The closer the lines are together, the steeper the slope. Show how to identify valleys and ridges, and the relationship of rivers to contour lines. A sketch is shown below (Fig. 6.5.2), and an exercise can be found in Box 1.

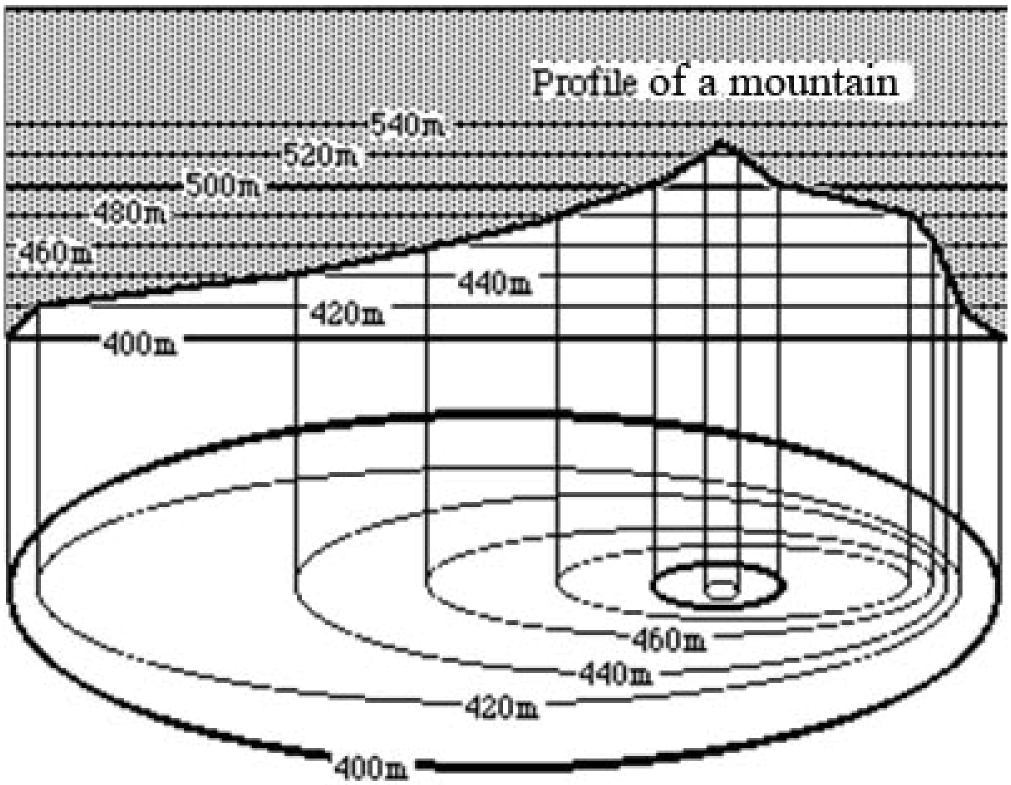
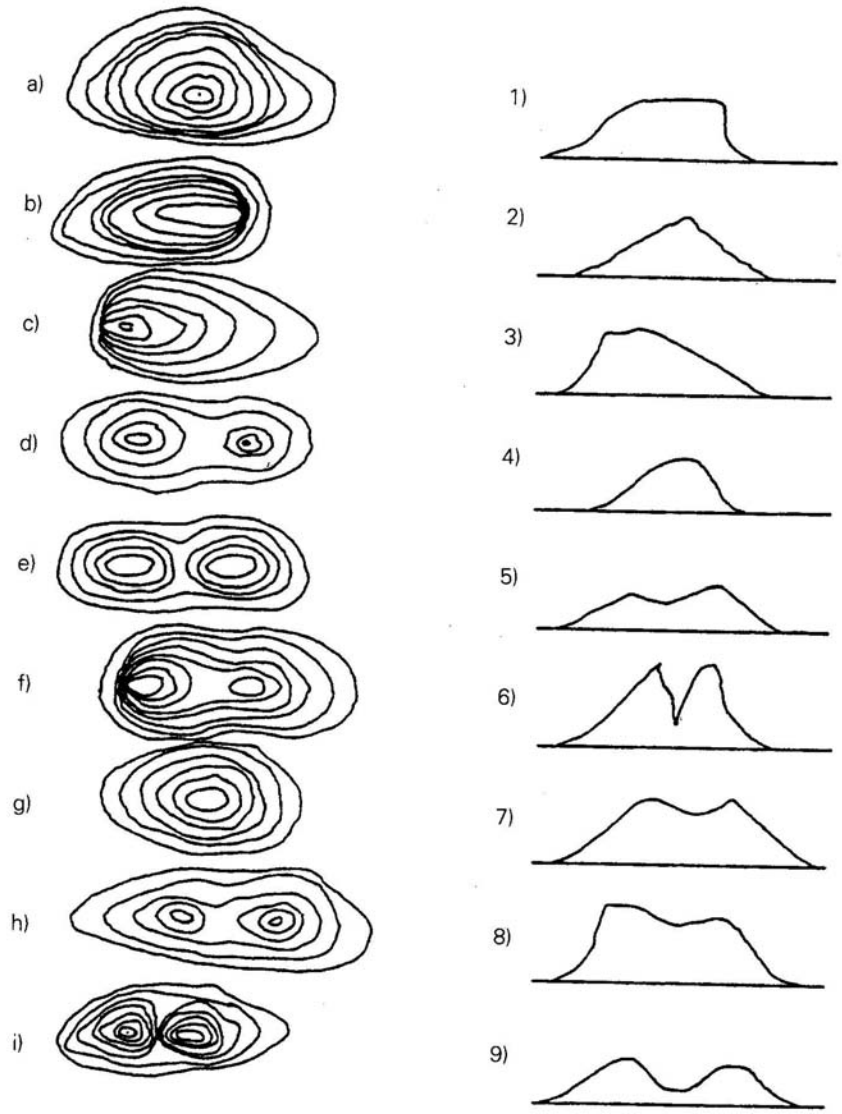


Fig. 6.5.2. Relationship between the profile of a mountain (top) and the corresponding contour lines as they would appear on a map (bottom).

Box 6.1. Understanding contour lines.

Get trainees to match up each set of contour lines with the appropriate hill. For example, contours (a) go with hill no. 2.



8.5.1.2 Compass

8.5.1.2.1 What is a compass?

Show the trainees different types of compass (Fig. 6.5.3). The basic, flat transparent plastic plate type is the cheapest and is commonly issued to all members of a team. It is good for navigation and map reading but not for transect cutting. The folding mirror sighting compasses are slightly more expensive and can be used for both navigation and for transects. The best type for transects are the solid metal blocks which one looks straight through- they are almost unbreakable and are the most accurate when placed on a supporting pole. All compasses are supplied with a cord and this should be attached to the person carrying it at all times (either around the neck, or tied to a belt loop). If an elephant charges and you drop your compass, you are at an enormous disadvantage from then on and, if you get separated from your companions, you may be lost for good.

Flat plate compass **Folding mirror compass** **Metal sighting compass**

Fig. 6.5.3. Three types of compasses.

Compasses have three main uses.

1. Finding out at what bearing an object (such as a hilltop or even a group of monkeys) is from the observer.
2. Keeping on a bearing (such as a transect or a recce).
3. Calculating a bearing between two points from a map.

8.5.1.2.2 How is a compass used?

Start off with the simple flat plastic plate type. These can be bought as a teaching set from Forestry Suppliers, specifically for training courses.

Explain the four cardinal points of the compass (north, south east and west) and the mid points between them (north-east, south-east, etc) (Fig. 6.5.4). Most compasses that people will be using in the field have 360°. However explain that some, generally used by the military, have 400 “grades”. We will deal only with the 360° type here.

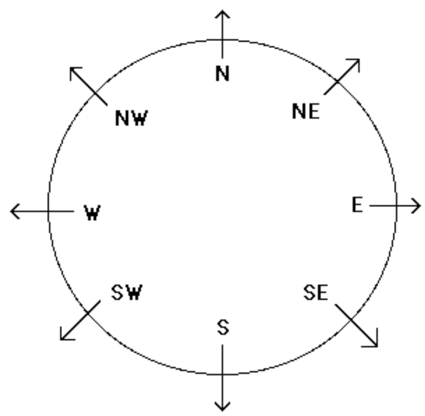


Fig. 6.5.4. The four cardinal points of a compass and the mid-points.

Ask someone to put a machete, pair of secateurs, or any other common iron or steel object near the compass. Show everyone what happens to the needle- it is affected by the iron and gives a false reading. This will remind everyone to ensure that the compass is kept away from such objects whilst navigating!

Explain that the 360 ° are divided into four quarters, divided by the 90, 180, 270 and 360 (or 0) degree markers (Fig. 6.5.5.). The trainees should understand that all directions between 0 and 90 degrees are between north and east; all directions between 90 and 180 are between east and south, and so on. This avoids important errors in the field if people have calculated a direction which is actually 180 degrees off the real desired direction. If the trainee knows the direction is going to be roughly east, but calculates a direction off a map or off the compass itself of 270°, he or she should immediately realise that an error of this type has been made. This usually occurs when the compass has been placed back to front.

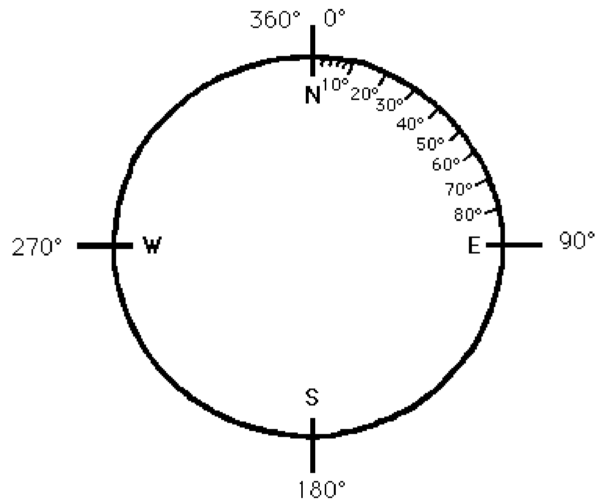


Fig. 6.5.5. The four cardinal points of a compass expressed in degrees and an example of the first 90 degrees.

Most flat plate compasses have divisions only every two degrees. Make sure everyone understands this. Find alternative models to show differences.

Show people that on the flat plastic plate type of compass (Fig. 6.5.6.) there is usually a printed arrow that points in the direction of travel.

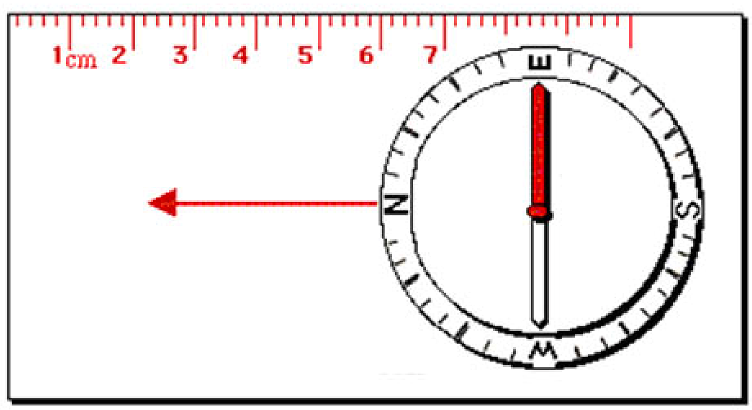
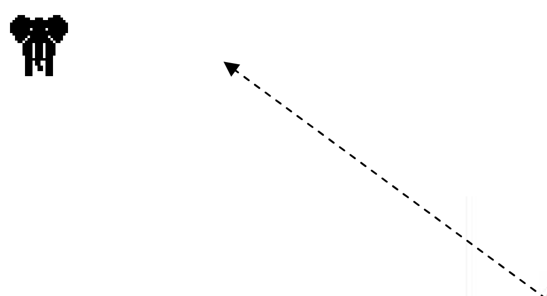


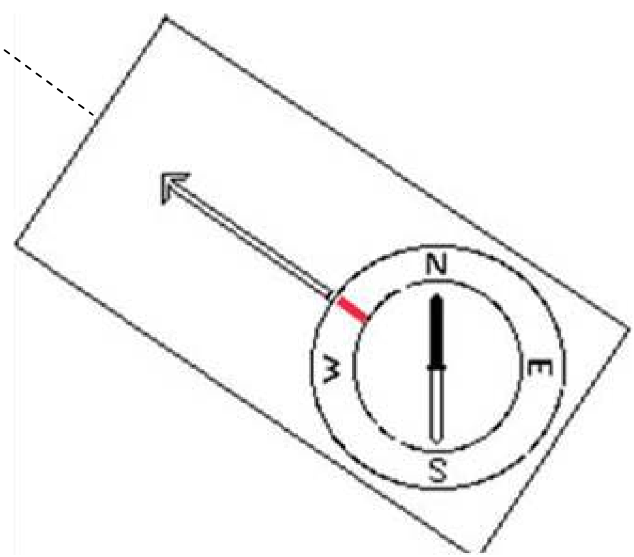
Fig. 6.5.6. A flat plastic plate compass showing direction of travel arrow (pointing left in this case)

Explain what the "back bearing" is (the opposite bearing to that originally taken, which will get you back to the start point, which is calculated by adding or subtracting 180 °).

8.5.1.2.3 Take bearings to objects.

Use the flat plate type to start. Show people how the needle turns freely if the compass is held correctly, but how it can stick if it is held at an angle. Some compasses are set to a particular zone (such as the northern hemisphere) and require to be held slightly off the horizontal in order to rotate freely. The person holding the compass should hold it in both hands in front of the centre of their body (at about the level of the bottom of the sternum) and face the object in question. They should turn their whole body so that they are standing exactly facing the object. Then they should rotate the dial of the compass so that the north end of the needle exactly superimposes the north of the compass dial (Fig. 6.5.7.). The advantage of holding the compass at sternum level means that they can look straight down at it and be as accurate as possible.





Here a typical flat plastic plate compass is aligned towards an object (the elephant!). The bearing should be read off the red line (probably about 300 ^{o}). Note that the compass dial has been turned so that it is aligned with the red end of the compass arrow (which points north).

Fig. 6.5.7. Aligning a flat plastic plate compass towards the object of interest and aligning the compass dial correctly.

Get all the trainees to take a bearing to different objects all around them, and to also make a rough estimate as to whether each object is to the north, north-east, south, south-west, etc. This helps to implant the connection between the number of degrees read off the dial and the points of the compass.

8.5.1.2.4 Keeping on a bearing

Once people have become relatively accurate at taking a bearing to a distant object, show them how to approach the object along the bearing. If you are in a forest, the distant object will not be visible during much of the trajectory. Show people that before starting out, they should look along the line of their bearing and select a landmark. This could be a tree, rock, building, etc, and they should walk to the landmark. They should then use the original bearing and select another landmark on the same line. This step should be repeated until they get to the distant object. The scale of these first exercises should only be in the order of 500m or so. If they miss the distant object, get them to measure roughly by how much they have missed it, and to which side. Many people have a tendency to deviate to one side or the other, and sloping ground will make people either slowly descend, or overcompensate and ascend, off the bearing.

After this step, get people to cut their first transect. Explain the method, and then two trainers should show how it is done. Put a sighting compass on a flat-topped pole. Emphasise the need for (i) minimum cutting and (ii) immediate reaction on the part of the cutter if the compass bearer sees him or her start to deviate. See Chapter 13 in the White & Edwards (2000) book, and Chapter 5 (Transects) of this book. The trainer should ensure that the trainee does not touch the compass, but simply looks through it with one eye, and looks at the back of the cutter with the other eye. This always proves difficult at first, as the trainee has to learn to keep both eyes open to superimpose the compass on the middle of the back of the cutter, and the trainee must pay close attention to each trainee until he or she learns how to do this. Often it is a sudden understanding as the two (compass and cutter) snap into focus for the trainee, and after that it is usually easy to maintain the correct focus. The trainer should regularly check the bearing by asking the compass bearer to step aside; the trainer can then check the reading on the compass. It is good practice to have one trainer with the compass bearer and another bearer with the cutter, so both minimum cutting and reaction to the compass bearer's instructions are understood and quickly reacted to. The trainee cutter should be encouraged to look back along the line from time to time with his or her compass and to read the back bearing. Is it 180 degrees from the transect direction? It should be!

8.5.1.3 Field exercise II: walking a triangle

Divide the trainees into pairs. Each pair should then navigate a triangle, in forest (preferably with thick undergrowth so that they cannot see far ahead) Ask each pair to walk in a straight line for 300m due north (zero or 360 degrees). They can use a hip chain or a tape measure. Then they should turn right, and take a bearing of 120 degrees, and walk another 300m. After the second 300m they should turn right again (heading along a bearing of 240 degrees). After 300m they should be back where they started. If they are not, why not? Get them to work out where they went wrong.

After returning to the classroom, ask the trainees to draw their trajectory on a piece of paper. Ensure the north is to the top of the paper. They can use their compass as a guide for the angles of the lines (see sketch of the compass below). If they did it right, they should have drawn an equilateral triangle like that to the left (Fig. 6.5.8).

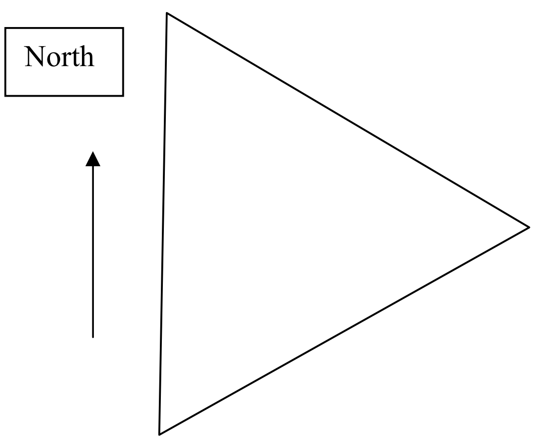


Fig. 6.5.8.a Sketch of the trajectory walked by trainees in Field Exercise II.

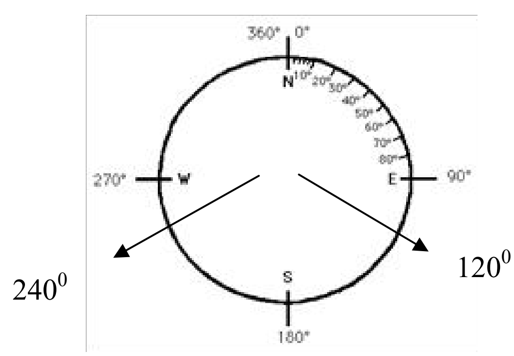


Fig. 6.5.8.b. Placement of the three angles on the compass dial walked by trainees (360, 120 and 240 degrees) in Field Exercise II.

This is the time to introduce them to the combination of map and compass. Explain how the drawing they have just made is essentially a sketch map of their exercise.

8.5.1.4 Map and Compass combined

Ask people to lay their compass on top of a topographic map of their area. They should align the map so that the north of the map faces magnetic north (by moving the map around until the north needle of the compass is aligned with the north of the map: Fig. 6.5.9). They should see that the three directions that they took (the bearings of 0, 120 and 240) are due north, south-east, and south-west. The next map shows how the plastic-base compass allows the map itself to be seen through the compass, making it easy to line up the north of the map with the north on the compass. If the map has parallel lines on, you can line it up with the compass easily.

Now people can calculate the direction between any two points on the map. For example, the site of Boleko is roughly east of the Eaux et Forets base. However people need to know better than "roughly". The next step is to either draw on the map itself, or simply align the long side of the compass with the exact direction you need to take (they may use a long ruler if they need to), making sure the "direction arrow" is pointing in the direction of travel. The red line on the map (6.5.10) shows the direction; the trainees should find the bearing from the red dot in the savannah to the yellow dot on the road. The dial of the compass should be turned so that the "N" (zero or 360 degrees) written on the dial is exactly to the north of the map. Most plastic compasses have parallel lines within the circle of the dial to facilitate this. The bearing should then be read off the dial as before (in this case the red line where the bearing should be taken is highlighted and the direction is 335 degrees.).

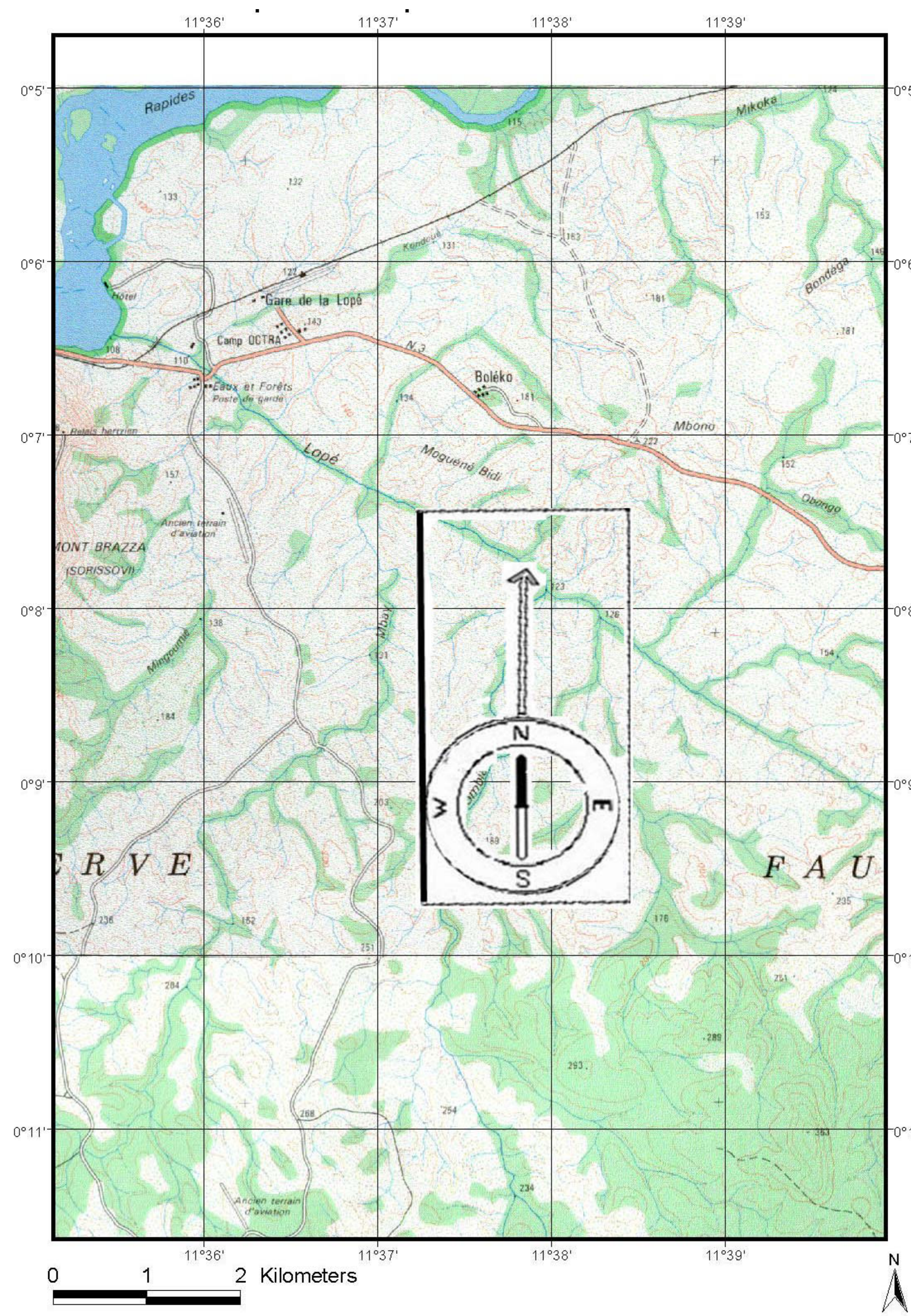


Fig. 6.5.9. Aligning a map to magnetic north using a compass.

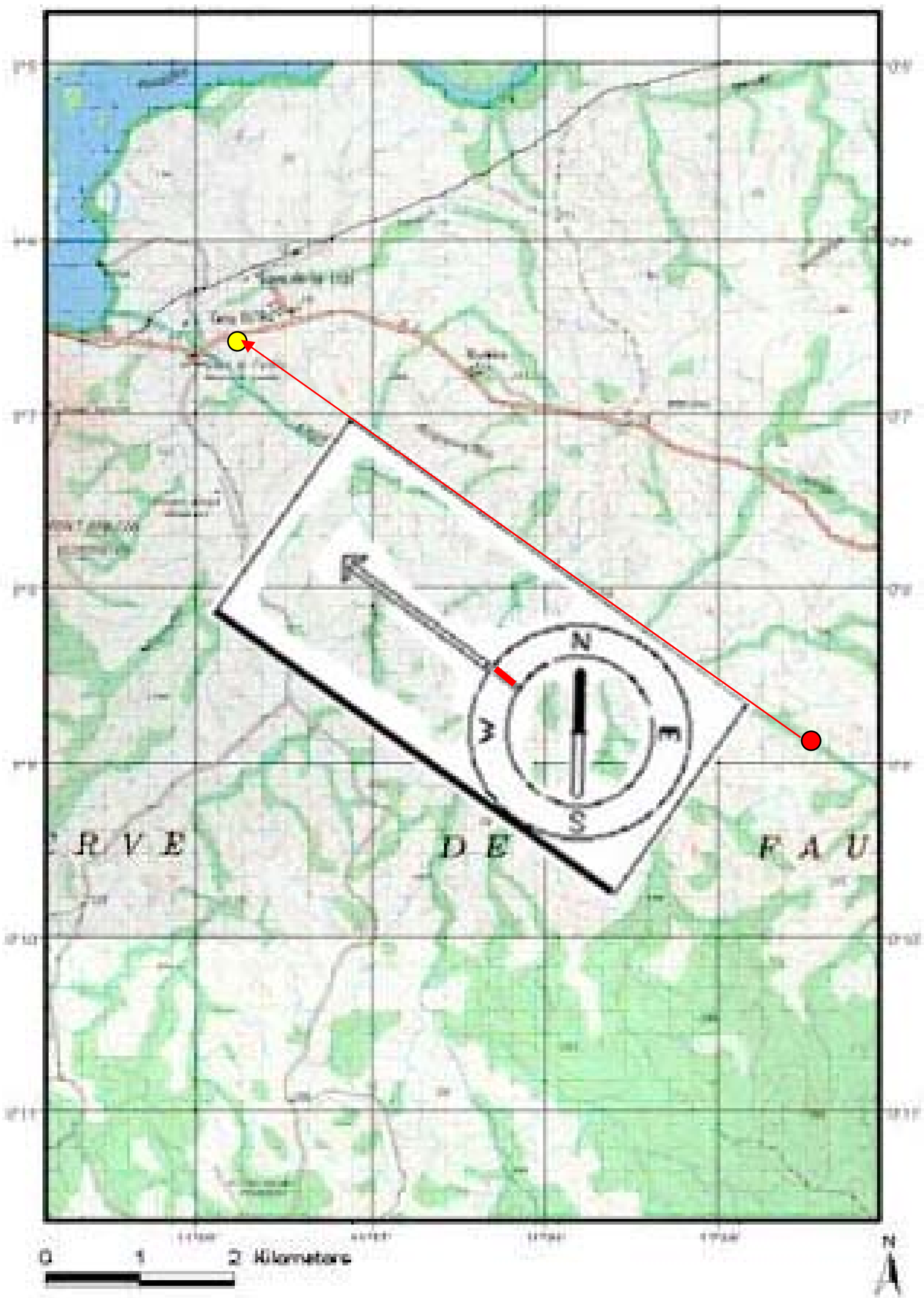


Fig. 6.5.10. Taking a bearing off a map using a flat plastic compass.

Trainees should become highly proficient. During fieldwork this has to be done many times each day- to simply navigate between points, to navigate around unexpectedly deep swamps, to find flat campsites by permanent watercourses- the list is endless. During navigation training, every day of fieldwork is worth its weight in gold.

8.5.1.5 Magnetic Declination

People will already have seen this during the first, "Map" section. Now it is time to put it into practice. For example, at a particular site, one may have to subtract 2 degrees from the magnetic compass bearing to get the true bearing. The bearings that were calculated in the exercises above did not take magnetic declination into account. To actually get between the two points, trainees will have to carry out an exercise where they have to work out the true direction of the distant objects that they have already taken bearings to (hilltops, distant trees, etc), and conversely, the bearing they will have to follow on their compasses to successfully reach the points they have calculated off the map.

Get people to think about what will happen if the declination is ignored. Show them how the error gets greater and greater as the distance increases. A rule of thumb is: around the equator, if declination is ignored it typically results in errors of 50-100m over a kilometre.

8.5.1.6 Field exercise III: simple orienteering

Using a map of your area such as the one above, select a series of ten points numbered 1-10 within about a 2 km radius of the training centre. Go to these points beforehand and put a jam jar with unique objects for each point: for example, squares of red plastic at point 1, thumbtacks at point 2, and beer bottle caps at point 3! Mark the points on the map. They should be recognisable in the field- a road junction, an old village site, a river confluence, a patch of savannah, etc etc. Ask the trainees to group into pairs again. Each pair should then carry out the following exercise:

(i) Calculate the coordinates of each point (Lat/ long or UTM, whichever is used at the site) and write what they think it is.

(ii) Calculate the bearing and distance from point 1 to point 2, from point 2 to point 3, and so on.

(iii) Write these down in a "route" as follows:

Point	Latitude	Longitude	Bearing	Distance to next point	Time arrived at point	Object found in jar?
1: road junction	xxxx	xxxxx	34	450 m		
2: centre of small savannah patch	xxxxx	xxxxx	95	600 m etc		
3 …etc	etc	etc	etc			

Send them out into the field. Each team should bring back the objects they find; write down what time they got to each points, and what they found in the jar! Afterwards people who did not find some points can discuss why not, and see where they went wrong.

8.5.1.7 Field exercise IV: mapping a site

Select a series of places within about a kilometre diameter. The training centre at Lopé has been used for such an exercise (see photo below: Fig. 6.5.11).

Fig. 6.5.11. The training centre at Lopé, Gabon.

Ask trainees to work in groups of four. Each group should have a compass, a tape measure, and a notebook. They should measure the size (length and breadth) and orientation of each building, the distances between the two corners of each pair of buildings that are closest, and the compass bearing between these two corners. In addition, the length and direction of each segment of road should be calculated. The distance to the forest edge (or nearby stream or other natural feature) should also be measured. Any relief should be noted.

Then, using squared paper, each trainee should make a sketch map of their group's measurements. It can be compared to a real blueprint, aerial photo, or map of the site.

An example is below (Fig. 6.5.12):

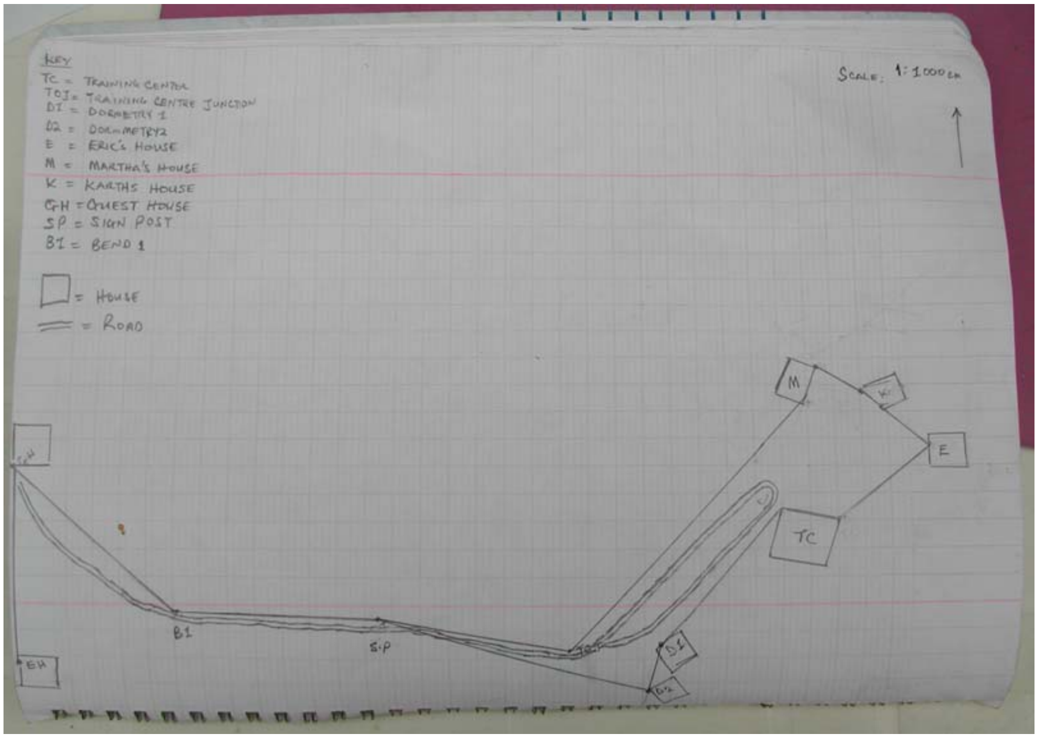


Fig. 6.5.12. Trainee's sketch map of the training centre at Lopé, Gabon.

8.5.1.8 GPS (inc. waypoints, tracklogs)

Only once people are proficient in the use of map and compass should they proceed to GPS. In truth, the GPS is an extremely valuable tool and has speeded up the procedure of survey and navigation enormously since the introduction of affordable, robust field units in the 1990s. However, we will repeat again here that they DO break down and /or people DO run out of batteries for them if they plan badly, in which case the team has to navigate without it, even if it is just to leave the forest.

The initial training session should include an overview of the different "page" options (see Section 5 of this book). Trainees should be shown how to change the units on the GPS between degrees minutes and seconds, degrees and minutes, decimal degrees, and UTM. They should be shown that they can change the time, the spacing of the tracklog, enter and delete waypoints, and download and upload tracklogs and waypoints (this chapter, section 6.5.3).

8.5.1.9 Field exercise V: GPS – entering and finding coordinates

The best way to learn GPS in the field is probably to repeat some of the same exercises as above, but using the GPS. Trainees should be asked to find coordinates on a circuit on a map given to them by the training team, and to enter these coordinates into the GPS units. Trainers should check these coordinates. At sites straddling the equator (where some points may be north and some south of the equator) trainers should pay particular attention to whether each latitude has been correctly entered ("N" or "S"). Trainees should be asked to navigate to their coordinates using the "Go To" function on the GPS. The same objects-in-jam-jars trick can be used as for Field Exercise III, which helps both the trainee to know he or she has arrived at the right spot, and helps the trainer to know who has managed to complete the course successfully and who needs further help. The tracklog should be set to a 40-second interval, which records exactly what each team did and helps the trainers to understand why a group may have made an error. The trainees should download the tracklog themselves into a computer or handheld unit, which can display the route they took.

For both plotting the route around the points and for the site mapping (exercises II and III, above) trainees should use the "Distance and sun" (in the main menu) to find the distance and direction between each pair of points. These should be compared with the distances they got using the traditional methods. Are there errors? If so, discuss why and their sources.

Trainees should become familiar with the fact that the GPS sometimes loses the signal, and get into the habit of checking that the position shown is actually the position they are at, and not the last position that the unit picked up several kilometres back. People should also get into the habit of marking a waypoint in the GPS every hour, and also marking major river crossings, *and of writing these down in their notebooks* as they can be extremely useful if/when the unit breaks down or when it has not had a signal for a long time and it is getting dark. This way, at least a reasonable campsite can be located using map and compass, starting from the last GPS location.

Because generally transects are defined by start and stop points which are geographic coordinates, people should be trained to arrive within about 10m of predefined coordinates.

They should be shown that as one approaches a point the direction goes haywire, and once this happens, and they are within about 10m, they can stop.

People should be shown good management of the navigation field kit: this is covered more fully in section 6.6. (Team management & logistics). Basically, in remote sites the lives of the team depend more on the navigation kit than on any other set of equipment. Each member of the party should have a map and compass, at least two of the sets of maps should be laminated, and preferably two GPS units and spare batteries should be carried by two different people.

8.5.2 Collecting data on line transects

A PowerPoint can be shown before the field sessions to demonstrate the important things to remember. Explain that transects are to measure densities and not only encounter rate, and that rigour is essential. Explain the basic mistakes that people tend to make (assigning perpendicular distance to zero is the commonest and the hardest to deal with *post-hoc*).

As outlined above, the first thing to do is to make sure each person knows how to find the beginning of the transect using the GPS (the Go To function): see above, section 6.5.1.9.) Then the trainees should be divided into groups, each of which will cut their first transect. Each trainee should be issued a flat plastic compass, a pair of secateurs, and a reasonably robust field notebook and pencil.

Each group should have the following equipment:

- a sighting compass;
- a laminated map of the area;
- a person-sized, flat-topped straight stick on which to place the sighting compass;
- a GPS and spare batteries;
- a topofil (hip chain) machine;
- at least one spare bobbin of thread for the hip chain;
- a notebook and pencil, with several pages of the notebook already prepared as a checksheet (see Chapter 5, section 5.3.8);
- a tape measure (50m is best, although 30m will work);

- a pair of binoculars.

Each group of trainees should consist of a cutter, a compass-bearer, and two observers. A third person may accompany the observers as assistant (to help to take measurements) but it is not really necessary on practise transects. At least one trainer should be with each group.

The trainers should demonstrate how to open the line is done (see above, section 6.5.1.2.4). They should take care to demonstrate that only secateurs should be used unless absolutely necessary; and that really very little opening is usually required to allow the observers (in single file) to pass easily.

During the training course the trainers will need to demonstrate all of the possible ways to deal with different situations in the field, including when to decide to stop a transect because of danger or impossible terrain (a cliff, a very deep swamp….). Show the trainees what to do when they cross a steep-sided valley, or a heavy tangle of lianas (the topofil will need to be passed through the lianas probably off the belt of the observer), or a river!

The first practise transects should be in an open understorey forest, if possible. The groups of trainees should be running parallel transects within about 100 metres of each other, which allows the trainers to easily move between groups if necessary. Open understorey forest is easier for beginners and they can also judge if their own lines are straight! During the following days and during field trips they will meet other types of forest which present more challenges.

After about 100m of transect has been cut, the observers should walk along the transect carrying out the following tasks:

- attaching the topofil at the start of the transect and setting the counter to zero;
- noting vegetation, slope, weather, and waypoint at the start of the transect, and making sure the other details are written in the notebook at the beginning of the checksheet;
- ensuring the tracklog of the GPS is set to 40 seconds and that it is "on" (it should be on "Fill" and not "Wrap");
- Looking carefully on the ground and in trees for animal and human sign, and, if sign is detected, taking appropriate notes and measurements. One observer should look for signs on the ground and the other to signs in the trees (mostly nests).

The trainers should emphasise that the signs closest to the transect should not be missed, but that trainees should try and spot signs at all distances from the transect. Particular attention should be paid to *above* the transect as ape nests are easily missed if immediately overhead. Trainees should be shown how sometimes overhead objects are spotted once they have gone past them, so they should get into the habit of looking *back* along the transect frequently.

Perpendicular distances to the centre of dungpiles and nests and all the appropriate details should be recorded. Chapter 5, section 5.2.1 (Procedures) should be carefully followed. The trainers should demonstrate the first couple of times. As ape sign is normally pretty rare, *all* dung (even rodents) should be used for training purposes. For each dungpile, record species, age, and class if it is elephant dung.

During the first field day, the teams should run their parallel transects until about 15:30h, when the light levels become too low for reliable visibility. The teams should collect up their topofil so that it does not clutter up the forest floor, collect their compass-supporting sticks and all equipment, and return to the base.

Once back at base, all the teams should look at their data. The most common data (which will probably be blue duiker dung) should be put on a frequency histogram. The example below (Fig. 6.5.13) shows an example of what the data should look like. Note that there is a "shoulder" to the distribution.

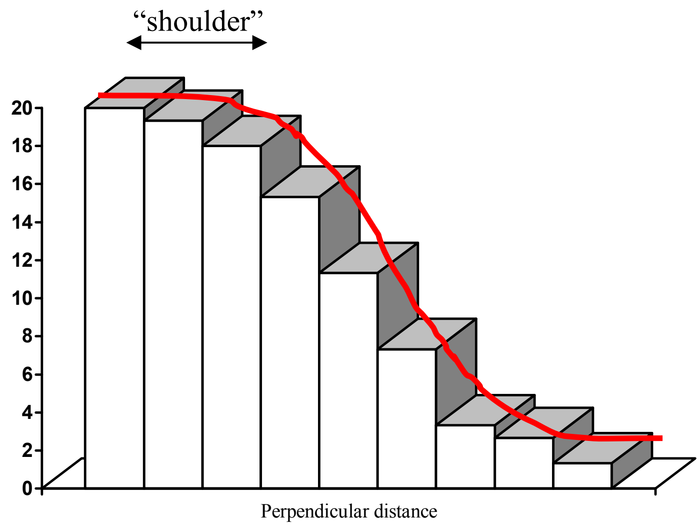


Fig. 6.5.13. Typical frequency distribution for perpendicular distances if data has been collected correctly.

Common Errors

The form of the histogram is a guide to the trainees' field technique. If people mark down "zero" as the perpendicular distance if an object is on the transect, the resulting histogram will look like that shown below ("Spiked" data; Fig. 6.5.14). It is clear that this curve does not have a "shoulder" and density will be very difficult to calculate. To avoid this type of histogram, measure all perpendicular distances from the centre of the object to the transect, where the transect is physically marked by a thread of topofil. There will be almost no "zero" measurements at all on a correctly taken set of distance measurements along a transect.

If the trainees have been rounding off their data to the nearest 5 or 10 centimetres, the resulting histogram will show "heaped" data at intervals (see the histogram: Fig. 6.5.15) and again it will be difficult to fit a curve with a good "shoulder" to the data. Again, to avoid this kind of result, people should record each perpendicular distance accurately, without rounding.

“Spiked” data.

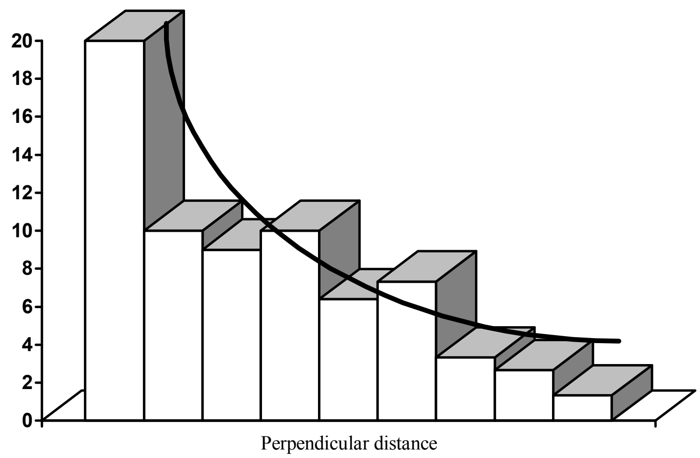


Fig. 6.5.14. Typical frequency distribution for perpendicular distances if objects near the transect have been assigned a distance of “zero” instead of carefully measured

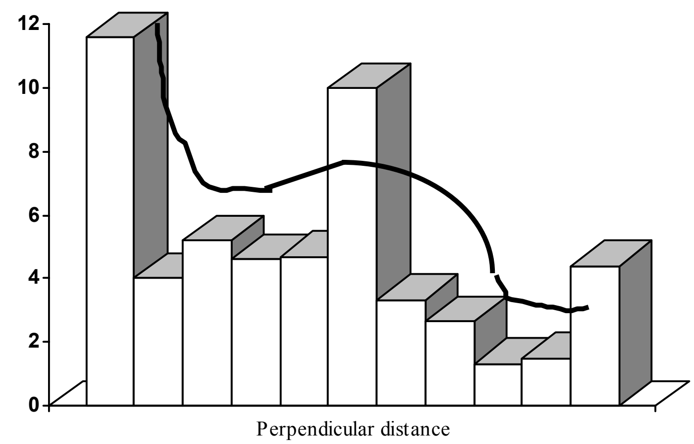


Fig. 6.5.15. Typical frequency distribution for perpendicular distances if data has been “rounded off to the nearest 5 or 10 centimetres (or metres).

If trainees’ histograms are spiked or heaped, then they know- and the trainer knows- where errors have been made and where they need to improve.

As the training course goes on, trainees should continue to make histograms of their data, and hopefully they will see improvements.

There should, as was mentioned in the "Curriculum" section of this chapter be at least two longer, multi-day camping trips for each group of trainees. During these trips the teams should cut at least one 1-kilometre transect a day, plus walk recces, collecting data. The trainers should pay attention to the speed of travel (1km an hour is probably best for transects), how measurements are being taken, and how records are being kept. At the end of these trips the data should be collated and organised into excel on a computer, and the first stages of analysis carried out (making histograms per type of sign per species as above, calculating encounter rates, and mapping out the route taken by each team).

8.5.2.1 Field exercise VI: at sites where there are few real animal signs

At some sites or in some countries, there are too few duiker or rodent dung to act as good training objects and the trainers will have to improvise. We have found that good substitutes are charcoal (smallish pieces and arranged in dung-sized piles); brown wooden hair beads, little squares of cardboard…. The objects have to be biodegradable and brownish.

A 400m transect is laid out in the forest by the trainees. They should mark the beginning and endpoints both physically, with flagging tape, and with GPS waypoints. When the trainees have finished and have left the transect, the trainers now go along the transect, putting out the "false dung" on each side of the transect (Fig. 6.5.16.). There should be 10 piles per band on each side of the transect (so 20 piles within each band). Each band is 1m wide. Put them out to 6 metres from the transect, so there are120 piles.

The trainers know that there are 25,000 objects per sq km:

120	No of false dungpiles in study area
4800	Area of study zone (12 x 400m)
0.025	Density of false dungpiles per sq metre
25000	Density of false dungpiles per sq kilometre

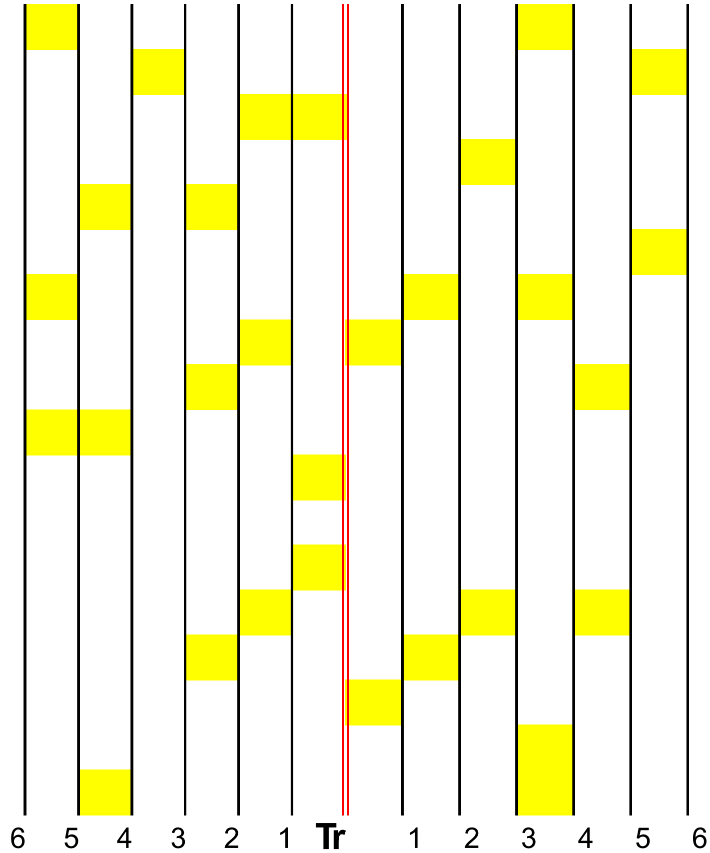


Fig. 6.5.16. Diagram of the "false dung" transect layout. There are 30 "dungpiles", each represented by a yellow block. Each band (metre, 2 metres, 3 metres) has 5 "dungpiles" within it when both sides of the transect are included. So this represents 100 metres of the layout on the ground.

The trainees should now form pairs. Each pair goes down the transect out of sight of the next pair. The trainees make sure trainee groups are well spaced out. The trainees are told only to measure the perpendicular distance between the transect and the centre of each false dungpile accurately. They should come back with the data collected; and make a frequency histogram of the results. Some people will get it right first time. Others will have "spikes" or "heaping".

They should then go and do it **again** (fieldwork, then histogram construction) from the other end of the transect (this reduces the chances of them remembering where each pile is). People who made errors the first time will learn how to improve their own data-collecting accuracy.

8.5.3 Downloading GPS data

The basic instructions for this can be found in Chapter 5 (GPS) and in the manuals for the GPS and for most downloading programs. The essential thing to remind trainees is that they should not wipe the memory of the GPS unit unless they have made at least two digital copies of the tracklog and waypoints and that these copies are in two separate places. If there is a possibility to do so, the waypoints can also be burned onto a CD at the end of each mission to make a relatively robust third copy.

8.6 Team management and logistics

Training should start by explaining to the trainees that the success of each mission, and often the lives of the team, depends on the responsible behaviour of all members of the team. A document entitled Ethics and Philosophy for Conservation exists in both French and in English which can be given to each trainee as a guide to responsible, ethical behaviour in the field (Annexe 6.ii: (Inogwabini 2005).

A team normally consists of a team leader, his or her assistant, and the rest of the team. If the training course is aimed at team leaders, fieldwork should give every person a turn at being team leader for a whole mission. The best way to organise this is to try and have as many short missions as there are trainees. If there are ten trainees, they can be divided into two groups, and each group has one or more trainers. A local field assistant who speaks a local language can accompany each group, as tree species may not be known by the members of a team if they are from another part of the country, and if hunters or other people are encountered in the forest, it is good to have a local person with the team to facilitate communication.

For each short mission and for each team, then:

Randomly name a team leader, and an assistant team leader, and assign people to the team. If there are two teams going out at one time, divide the trainees as equally as possible between the two teams. If there are some very experienced people and some with less experience, ensure each team contains both. If there are people from the same project, country, or organisation, split them up between teams. This way experiences can be shared among the trainees.

Decide how many days the mission should last. A week or less can be good, as it allows for more short missions (and therefore more chances for each person to be team leader).

The team leader should have a hard backed notebook in which all the planning details for the mission should be noted (predefined waypoints, team members, emergency phone numbers if a sat phone is to be carried, daily menus and tasks, etc). See below for details.

Ask the team leader to organise the following tasks with his or her team members:

- <u>Decide on the route to be taken, together with the other members of the team</u>. Waypoints should be assigned in advance, including all campsites, important river crossings, where any transects will be undertaken, where any deviations will be undertaken to avoid cliffs, marshes, etc, if appropriate. This should be done as a group, where everyone has to look at a topographic map, decide on campsites, and ensure that they have all measured, and verified, the number of kilometres to be walked every day. For each campsite, care should be taken that distances between them are sufficiently short to arrive before nightfall. Teams should be reminded that normal walking speed is faster than normal recce speed, which in its turn is about four times as fast as transect speed. If a transect survey is being carried out, often one transect is followed by (and sometimes preceded by) recce walks, and then after about 15:30pm as the light becomes less reliable, normal walking to the pre-planned campsite. Alternative campsites should be selected before and after the ones on the plan, in case of slow progress and/or no water in smaller streams. A good policy is to remind trainees that they should aim for watercourses at a reasonable distance downstream from the source, to avoid arriving at nightfall at a dry valley!

- <u>Ensure each team member has a map, with the waypoints marked, on their own map, and have a written list of these waypoints.</u> These should be carried in a waterproof map case.

- <u>Ensure that two copies of the mission order and any required Government paperwork have been printed out.</u> A copy will be carried by the team leader and another copy by the assistant team leader. It is good policy before every training trip that the local village representatives are informed, as the sudden appearance of a group of scruffy military-style people from the forest can be very alarming in some countries.

- A daily menu should be worked out with all team members participating. This will usually involve a rotating menu of rice/ manioc flour/ pasta and some protein source (normally dried fish/ corn beef/ tinned fish). A set budget should be communicated to the team, whatever is the norm in your country/ region per person per day for forest rations. Quantities should be carefully worked out by the group, using a model. See section 5.1.1.2 for more details on this. What is important here is that all team members participate in the menu construction, and then also participate in calculating the total number or weight of each item required per mission. Oversight of the budget and the menu should be carried out by the trainer, to help avoid "beginner's mistakes" (such as underestimating the amount of food needed for a five-person team for a week-long mission). Ensure that enough salt is packed, and that reliable forms of fire and light are packed (several lighters, several torches, and spare batteries).

- The total weight of the food to be carried, plus the weight of the camping and scientific equipment should be calculated and each person assigned items by the team leader. Each person's bag and its weight should be appropriate to his or her size and height: someone carrying too much or in a bag too long or short for them will not learn very much if most of their concentration is on chafing rucksack straps or the sheer effort of battling it up hills. The team leader should ensure that he or she has a list of the contents of every person's bag, and that the weight of each will be lessened each day (so all bags get progressively lighter as the mission goes on). The team leader should also supervise the packaging- items that risk damage by water or that may ruin other items by contact (flour/ salt/ matches/ oil/ peanut butter/ scientific equipment) should be in appropriate containers or waterproof bags.

- Assign a specific role to each team member and write it in the planning notes. This is good to do by day, so that each person has a turn at carrying out specific tasks. Each day, one person should be "Navigator", that is to say compass-bearer, who directs the cutter along transects and who directs the team during recces. One person should be given the role of "cutter", (this is for transects only) which gives experience to the trainee of how little really needs to be cut to allow the transect to be walked, and how to react to the directions of the navigator. The role of First and Second observers should be rotated daily so that everyone has a chance to record data and to help with measurements. In the evening, when the campsite is arrived at, four main tasks are required: (i) downloading data from the GPS and entering data (if a downloading system exists); (ii) setting up the tents (or hammocks); (iii) collecting wood and water; (iv) cooking and washing the dishes afterwards. The team leader should organise who will do what task for each day of the mission, so no-one has to do the same task each day. The First Observer should take care of data downloading and storing the GPS, notebook and other scientific equipment for the night, in a waterproof place. The other team members should do the other tasks. The team leader is responsible for ensuring that the silica gel is dried out every three days to ensure the functioning of electronic equipment (batteries/ GPS/ digital camera etc) carried with the team.

For all the above steps, the trainer should oversee this whole process closely, but may choose to let some degree of "learning by experience" happen, only interfering when any dangerous decisions are being taken. A good policy is to interfere most in the planning of the first training mission if many people are inexperienced, and then let people make their own mistakes during the subsequent missions. Mistakes are extremely useful training tools, if they are relatively small ones, and provide memorable lessons- and often very funny ones in retrospect- for the rest of the person's field career!

8.7 *Developing interview skills*

This guide was prepared for the person(s) responsible for selecting, training and supervising field teams. It is written from an applied social science perspective. The guide includes recommendations for selecting field researchers, preparation exercises and on the ground trouble shooting ideas. It is intended for trainers/researchers familiar with social science research methods in the context of natural resources management.

8.7.1 Selection of field researchers

- University students or university graduates
- Former interviewers, research assistants or surveyors
- People with experience in community outreach and communication
- School teachers

When recruiting in the field, school teachers and people who have participated in other surveys or research activities make good candidates.

8.7.1.1 Evaluation of candidates

8.7.1.1.1 Previous experience in field methods

Asking candidates about their past research experience is one way to evaluate their potential as field researchers and interviewers. Past experiences in research can be discussed in group or individually with each candidate. At this stage, the trainer can get a general picture of the candidates' experience by talking about past fieldwork, methods employed in the past, geographic areas of work, etc. If carried out in a group, this discussion can also give the trainer(s) an initial idea of how the candidates interact with their peers.

8.7.1.1.2 Assessment of literacy and oral expression

It is important to assess the level of literacy of the candidates and their ability to understand and interpret the questions of the interview and observation guides. A practical way to evaluate candidates' capacities to understand the research guides is to have them fill in a questionnaire themselves. When research activities include household questionnaires, candidates can complete one of these with their personal information.

Suggested instructions: The correct application of research instruments requires familiarization and understanding of the topics we are studying. In order to assess your understanding of these instruments, we would like you to fill this questionnaire with your personal information (as a self-administered questionnaire). If any of the questions are unclear or if you are unsure about the format of the answers, please mark these questions. At the end of the exercise we will have the opportunity to address and discuss them.

The trainer can do a brief presentation of the questionnaire, explaining each part. When exercises that require specific instructions, such as paired comparisons, are included in the questionnaire, the trainer must explain to the candidates how to complete them.

After the candidates complete filling the questionnaires, the trainer can ask them if they have any questions concerning the questionnaire. The trainer can use both the questionnaire and the questions raised by the candidates to gage their level of understanding of the written questions, the cues, and the response formats.
After the trainer clarifies issues raised by the candidates, the evaluation of candidates can proceed to the second step: having the candidates interview either the trainers or each other.

Suggested instructions: Now that you have completed the questionnaires yourselves we would like to see and hear you interview somebody else. Please assume that the interviewee is not familiar with the subject and has never seen the questionnaire. Begin with the introduction and proceed as if you were in the field.

At this stage, the trainer can evaluate the candidates' capacity to express themselves orally, their style for posing questions, and the way in which they engage the interviewee. This is a valuable exercise to evaluate whether candidates that appear experienced in their CV and successfully completed the written questionnaire, also have the people skills necessary to conduct interviews.

8.7.1.2 Selection of candidates

The three activities described in the previous section can help the trainer(s) select the best possible members for the field team. While previous experience is an important asset, candidates' capacity to understand the questionnaires and their ability to engage participants should be the principal elements to consider when selecting interviewers. It is important to include at least one female interviewer in the teams, particularly if research activities include focus groups and/or interviews with women. Finally, candidates should have a clear understanding of the field conditions before accepting to participate. Candidates must know what to expect during field work in terms of logistics, facilities, physical exercise, diet, etc before accepting the post of field researchers.

8.7.2 Training of field researchers

The assessment exercises used to select the field researchers/interviewers will have provided them with an initial idea of the content and methodology of the research activities. Before continuing with the revision and study of research tools, it is important to assess their existing knowledge on the subject. At this stage, it is also important to detect possible bias and potential problems.

8.7.2.1 Assessment of past experiences and identification of bias

This exercise resembles the assessment suggested for the selection of candidates but includes more detail, discussion and participation of the field researchers. It is important to assure the candidates that not knowing about a subject is OK. Diversity of opinions and disagreement should be encouraged, as a first step to exercise tolerance and openness to future participants' responses.

1. Past experiences in research: Where, when, with whom. What sort of methods, timeframe, positive lessons, problems and constraints. How would they improve it? (include logistics)

2. Knowledge on the subject: What do they know about the topic of research?

3. Perception on participants: Do women make good informants? Why or why not? Who makes good informants? Why? Urban and rural? Literate and illiterate?

4. What do they expect to learn during the research activities? What do they think will be the outcome of the research activities?

This is an important step to not only assess the level of skills but also to understand interviewers' bias and preconceptions and address them. Identified bias and prejudices can, at the same time, become subjects of discussion and learning opportunities for the field team (for example, attitudes toward female participants, illiterate farmers, minorities, etc.). Each identified biased must be analyzed and discussed in order to reduce the risk of it influencing the development of research activities.

8.7.2.2 Presentation and discussion of the research plan

After assessing field researchers/interviewers' experience and knowledge of various areas and research methods, the trainer can present the research plan. This presentation must include:

- the context of the research activities: general information on the program or project under which research activities fall, previous work done on the subject, information on the geographic area where the study will take place, available information and other resources, existing knowledge gaps, etc.
- the research goals,
- practicalities of fieldwork, including time frame, logistics, organization of teams, languages to be used, etc.
- proposed methodology, and
- data entry, analysis and reporting

Field researchers' questions and their past experiences conducting field work can help improve the research plan. By discussing the details of fieldwork, the trainer(s) can adapt preparation activities to address specific gaps and questions raised by the research team.

Previous exercises and discussions with the field researchers will have provided the trainer(s) with a clear idea of field team members' skills, strengths and weaknesses. Even when a field team has had extensive field experience, it is important to review each of the research methods included in the plan.

8.7.2.2.1 Introductions and protocol

Trainers and field researchers need to agree on a standard formula for introducing themselves in the communities or areas of study. Trainers can enumerate key components to include in the presentation such as the name of the organization(s) leading research activities, the goals of these activities and the future applications of the information gathered.

Field researchers need to feel comfortable with the different aspects of the research protocol, including how to respond to questions concerning the research activities, the practical applications of the data being collected, and the legitimacy of their presence in the area. Field teams also need to prepare official documents and other letters and forms to present to local authorities upon arrival in the field site.

8.7.2.2.2 Observation and field notes

Observation is a key component of field research. Because observation appears as a "natural" activity, it is important for the field researchers to understand the difference between casual, every day observation, and observation with the purpose of documenting a phenomenon or an event.

Field work conditions and logistics may be such that opportunities to return to field sites for additional data collecting are very limited. Good observation skills can thus improve the quality of the information collected. Observation can enrich the understanding of the context where phenomena take place. It can also identify issues relevant to the research goals not foreseen in the original research plan.

Ideally, trainers and field teams should have enough time to develop and practice observation skills before heading for the field. However, the reality of field research in natural resources may require the use of observation guides. Observation guides constitute a useful tool for field researchers, improving the chances of getting as complete as possible descriptions of the area and topic(s) under study. Schensul, et al (1999:96-114, vol. 2) provide useful descriptions of the different uses of observation in the field. These categories can help trainers create observation guides adapted to specific research goals. Schensul, et al. categories include:

- Observation of settings,
- Observing and documenting events and sequences of events,
- Counting, census-taking, and mapping, and
- Observing indicators of social difference

Observation guides can also improve note-taking habits. Trainers must emphasize the importance of writing down what is observed as soon as the opportunity arises. Practicing observing and note-taking is important before heading for the field. Field teams can test and improve their skills by observing every day activities, comparing notes, and identifying gaps. These exercises can help stress the importance of **triangulation**[1] by showing the role of observation in the appraisal of a phenomenon. Observation exercises can also aid trainers to highlight the importance of documenting details.

8.7.2.2.3 Interviewing

Field researchers need to familiarize themselves with the interview guides and feel comfortable asking questions before beginning field work. Reviewing the interview guides together can help improve the format and sequence of questions. Field researchers can also contribute to the interview guides by providing cues and suggestions for eliciting answers from participants.

Practicing the interviews with one another can help the field researchers familiarize with all the questions. The trainer(s) must be present during these practices in order to identify mistakes. Trainer(s) can also take place in the role playing exercises, acting as a "difficult" participant. The following points can improve the quality of the data collected by the field teams:

a. Let people talk, keep your intervention to the minimum possible
b. Allow participants the time to think about their answers
c. Provide cues if participants do not understand the question
d. When answers are too brief or general, ask for examples

Asking for examples is a useful technique to complete information because examples help both the interviewer and the participant talk in concrete terms about a subject.

Depending on the characteristics of the field site and the research plan, the research team may have to **translate questions** and conduct research in more than one language. Questions need to be translated in advance, tested and reviewed by more than one person before printing the final version. Translating in-situ can lead to misinterpretation of questions and to differences between interviewers that would make results difficult to compare and use.

[1] Triangulation consists of combining different methodologies to improve validity. Triangulation can also be achieved by having various researchers study the same phenomenon.

8.7.2.2.4 Anticipating problems and hurdles

Field researchers that have some experience will be able to talk about possible problems and hurdles to expect in the field. The trainer(s) must facilitate a discussion on how to address these and other possible problems or difficulties including:

+ Time constraints (for example, what to do if the participant is available only for a short period of time)
+ A participant changes his/her mind about participating (how to ensure participants they are free to stop at any time and that they can choose not to answer certain questions)
+ What to do if observations contradict information provided during interviews (taking additional notes of these contradictions, having alternative questions to discuss the subject, etc.)
+ Practical and logistical problems (a field team member falls ill, local authorities do not authorize research activities, etc.)

8.8 Data Management

After the first part of the training course, where trainees learned (or were reminded) how to calculate basic descriptive statistics, draw graphs both by hand and using excel, they should be introduced to data management before going on to analyses.

8.8.1 Good organisation

First and foremost is *keeping chaos at bay*. Too often people with little computer experience tend to save files to "My documents" as that is the Windows default, and then "My Documents" gets full of all types and formats of information, impossible to manage. The basic computer course outlined in Section 6.4.3 should have shown people how to organise data and information in a nested, logical way. We suggest a framework (Fig. 6.8.1), used by the MIKE programme and by the WCS Central Africa Monitoring programme since about 2004, for a standard data organisation. Any structure will do of course, but it saves a great deal of time if people exactly where things are when they store (and search for) information.

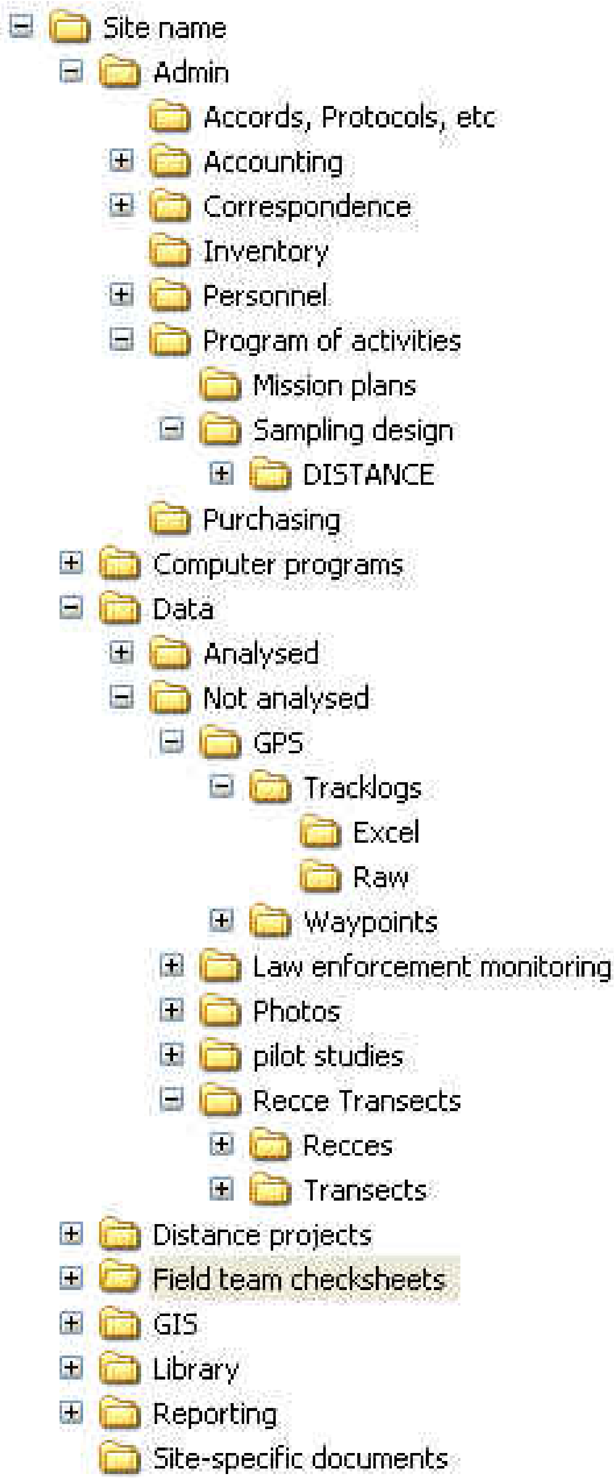


Fig. 6.8.1. Suggested file structure for data and information in a monitoring program.

8.8.2 Backups

Regular backups are essential. We advise that there is a master copy of the data on a reliable computer, and that at the very least, at the end of each day, this is backed up onto a dedicated hard drive. For the moment we will assume that the master copy and the hard drive are in a field station or Park headquarters. At night the hard drive should be stored in a sturdy waterproof case (such as a Pelican case) in *a separate building from the main computer*. This way, if one building is robbed/ catches fire, the day's data is not lost. If two copies can be made at the end of each day, so much the better. It is fairly easy to obtain automatic backup programs that back up one or multiple copies of files every time the master copy is changed, and this is also a good idea

8.8.3 Checking data

When data is entered manually even by skilled people, roughly one in a hundred keystrokes is a mistake. With less experienced typists, the ratio will be even higher. After the data have been entered, it should all be checked, preferably line by line, to ensure what was in the notebook is what has been entered into the database. Excel's "Filter" and "Pivot table" utilities are an excellent shortcut here, as one can see where typos have crept in.

The second place where there are likely to be gaps in the data is where tracklogs have been downloaded. If the signal is lost there may be parts of recces or transects where there is no data. This has to then be filled in by hand either using waypoints that may have been successful where the tracklog failed, or by interpolating the line (not easy). The essential is that every line is georeferenced. Follow the instructions in Chapter 5 for how to add the tracklog to each observation: this should be done using data collected on day trips to start with (use the data collected on the transect practice in section 6.5.2.)

This is possibly the most boring part of data treatment, so the trainers should be careful to explain the "garbage in, garbage out" principle. If data is wrong, then analysis will be wrong, and, importantly, the conclusions that are drawn from these data will be wrong and may lead to conservation mistakes when decisions and actions are taken based on these conclusions.

8.9 References

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Annexe 6.i. Example of a three-month training course.

Subject	Month 1				Month 2				Month 3			
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
Arrival- logistics-introduction of trainees and trainers	■											
Site visit, one or two days- information by local staff & field trips.	■											
Why do protected areas need research and monitoring programmes?	■											
Sampling, bias, stratification, data analysis - theory and practice. Collect data in forest to subsequently analyse in class (leaf sizes, tree diameters, etc)		■										
Care in observing and recording data		■										
Navigation- theory and practical classes. Day trips or overnight camping.		■			■							
Basic computer use course, emphasis on Excel. How to write trip reports.			■	■								
Transects- presentation and fieldwork: transect cutting, collecting data along transects (day trips only)					■	■						
Data entry and examination of frequencies					■	■						
Wildlife health, elephant and ape dung collection techniques. Theory and fieldwork					■							
First Aid training					■	■						
Pre-trip field work logistics (planning of food, medical, and communications)					■	■						
Field trip into National Park: 2 or more groups. Recces and transects, camping							■					
Post-trip kit cleaning and checking equipment								■				
GPS data downloading, recce and transect data entry, checking, cleaning								■				
Pre-trip field work logistics for second trip (planning of food, medical, and communications)								■				
Second field trip into National Park: 2 groups. Recces and transects, camping								■	■			
Post-trip kit cleaning and checking equipment									■			
GPS data downloading, recce and transect data entry, checking, cleaning									■			
Pre-trip field work logistics for second trip (planning of food, medical, and communications)									■			
Third field trip into National Park: 2 groups. Recces and transects, camping									■	■		
Post-trip kit cleaning and checking equipment										■		
GPS data downloading, recce and transect data entry, checking, cleaning										■	■	
Report writing										■	■	■
Exam, discussions of the learning process, evaluation by trainees of the course, return of trainees to their countries/ sites.												■

Annex 6.ii. Ethics, philosophy, and conservation in the field.

Conservation ethics for researchers and fieldworkers.
Why speak of ethics in ecological research?

Inogwabini Bila-Isia, 2005

Introduction

The fundamental reason which justifies the inclusion of ethics into conservation research comes from the concept of the responsibility that we must have for nature. We all carry out ecological research because of our own personal convictions. We are an integral part of the natural world within which we are living, even before we are *Homo sapiens*, « the man that thinks ». Nature conservation is a relatively recent subject, caused by the necessity to revise our vision of life, as humanity has reduced the living conditions of the Earth by its consumerism, abusive and disrespectful use of its natural resources.

Although there has been a general increase in awareness of the danger in which the planet now finds itself, « conservation » is still the concern of a mere handful of people. Researchers and conservation fieldworkers are part of this handful. We are conservationists before we are researchers. We use science as a tool to evaluate and to plan our actions. Our acts, our lifestyles, and our thoughts influence our effect on biodiversity. We should therefore always think of the consequences of whatever we do on the biodiversity that surrounds us. We should always think : Which of my acts could be damaging to the integrity of the ecosystem within which I am working ? What can I do to minimise or eliminate the negative impact of my acts on nature ? Having the responsibility of a team leader, what is the moral standpoint that I should have so as to avoid having a negative impact on nature conservation ? What day-to-day behaviour should I have vis-à-vis my colleagues in the team in order to have a good team spirit and a good work atmosphere ?

All these questions should be a daily reflection for a field ecologist, apart from fundamental scientific questions. It is not ethically admirable to say « I am only a researcher, conservation is for others ». It is even counterproductive not to give justice to the site where one works, and for which work one is paid !

All the norms of research management and management of field teams come from these principles, and each morally responsible researcher should remember them. The ethical guidelines that follow are based on these principles. They will be by no means complete, but the list should serve as a guide.

8.9.1.1 Responsibility

To be responsible is to be answerable for your actions. We refer not only to the legal definition of the concept when we speak of responsibility. Responsibility is an important part of ethics and should be in everyone's moral conscience. We have a heavy responsibility towards the natural world. This responsibility demands behaviour which minimises the impact of our work on the environment. We must not carry out activities which could compromise the health of animals, cause unnecessary loss of vegetation, etc. Briefly, our responsibility to nature means that we must, at the very least :

- Avoid throwing rubbish away in the forest ;
- Not hunt in protected areas (PA) ;
- Not fish in protected areas (PA) ;
- Avoid buying bushmeat to feed teams ;
- Increase awareness in teams of the need to have a good conservation ethic ;

- Dig a WC for every camp, below the camp and far from the river ;
- Burn, then bury all empty tin cans ;
- In general : keep clean habits, and do not do anything that you would not do in your own house or your own bedroom.

8.9.1.2 Respect for Nature, Honesty, Sincerity, and Morality.

We know the needs of forest teams. These needs are: energy for cooking, space for camping, open space for drying clothes, tents, etc. All these needs are perfectly normal and require appropriate field solutions. However, we have an obligation to remember why we are in the field in the first place: Conservation! This obliges us to have respect for nature even when we have to use a little of it to survive in the forest. We should always think of the rights of the natural world, and we should respect these rights.

Respect of this principle means that, for example, in a field camp one should ***only use deadwood for cooking; set camp in an area where the absolute minimum of vegetation cutting is necessary; to avoid making camp furniture (****tables, chairs, plate drying racks etc).*

We should also be honest and sincere in our engagement in conservation. Of course, we work for a salary in order to live. But we should remember that the salary that we are paid for conserving wildlife must never be used to turn against conservation. It is ethically better to use the resources and time that you have in the field to carry out or to encourage activities which are good for conservation than to do the opposite. A concrete example is that we know many people in Africa carry out commercial extraction of forest products to gain money. They use their position and even their monthly salary to carry out conservation. One should render justice to nature. This means that conservation funding, even if it is your own salary, should never be used to start commerce in wildlife products that will damage the ecological stability of the areas where conservation is being carried out. It is as if a doctor that you pay to cure your illness used the money to buy a product that will poison you! It is exactly the same thing! It is immoral and dishonest.

Respect for nature means that you should not let yourself be tempted to destroy plants or animals for simple pleasure. In the animal kingdom, fish suffer the most from this human frailty. Often we poison lakes with products that choose neither the size or the species of the victims. Even using hooks or nets does not avoid this lack of choice. Our responsibility means that we should consider every action of our forest team.

We should thus use the proverb '*in the forest, leave only footprints and take out only data and photographs"* dixit : **Sierra Club**).

8.10 Responsible organisation of a forest field team

The role of a team leader

'There are no bad soldiers, there are only bad leaders" said Churchill. This reminds us of the level at which we have responsibility. The team leader has on his shoulders the entire responsibility of the success of the field mission. He or she is responsible not only for the data collection but also the management of the whole team- including all the particularities of human nature. This implies that he or she should even manage the life of his team whilst in the field. He should act with a sense of responsibility, with a rational, and humble approach. A sense of responsibility, because the decisions he takes affect the lives of his whole team, the success of the mission, and the future of the conservation work. Rationality, because hasty decisions generally lead to damage. Humility, because no-one knows everything and we are extremely tiny in respect to nature. A team leader who does not listen to the point of view of all members of his team because he is arrogant or does not consider it necessary, will finish by poisoning the work atmosphere. This often means that conservation activity is

damaged. This simple fact can lead to bad "propaganda" against conservation in the long term. So, be aware of the fact that our individual acts can have strong and unwanted effects against conservation. Our sense of responsibility as team leaders should thus be built following the steps outlined below:

Good mission planning

: This is an absolutely essential step and should be done very carefully. It is useless to rush things, as time that you think you are saving in the planning step will end up being lost in the field. The essential steps in planning are as follows:

- Define the itinerary and hours of work
- Rational budget of the mission,
- Buy the necessary food and equipment
- Supervise the packing
- Assign clear roles and tasks and write them down in your notebook
- Control consumption and periodically verify the stock.

Keep the equipment clean and safe

- Electronic equipment needs to be kept dry
- Clean everything after use
- Supervise equipment cleaning

Good team behaviour

- Show leadership: master your itinerary, know how to move in the forest, master the objective of your mission.
- Keep team discipline: keep quiet in the forest, keep the group together when walking in the forest, know how and when to take a decision.
- Mutual respect: ex. Use a common language, encourage team spirit, etc.

Clearly define roles

- Always show a good example to your team
- Clarify the role of each team member
- Always have a checklist of material that you have taken with you and the roles of each team member

A daily evaluation of your activities

- Check your itinerary continuously (keep consulting the map, and mark where you are)
- Review your field notes each evening.
- Regularly check the mammal guide (to confirm your observations)
- Share cartographic information.

A good 'diplomatic' approach: know how to resolve conflict within the team, and know how to present the case for conservation to local and traditional authorities when there are contentious situations..

Wisdom to remember: 'be modest: the further you go in Science, the more insignificant you realise you are'.