Field Guide – Survey Training Workshop
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Field skills

1. Recording data

Use a pocket-sized field book to record and describe any unusual observations that you think need mentioning. These are observations that are not easily described by lists of numbers and categories and any observations for which there is no category/ space on the data sheet (e.g. animal behaviour, trees fruiting, trees cut down illegally, snare lines, carcasses, descriptions and sketches of tracks, unusual events, daily activities, etc.). Every page in your book should be numbered and dates, times, waypoint numbers, GPS positions etc. (as on the datasheet) should be recorded together with your observation. No page should be torn out and should you make a mistake, cross your writing out, rather than erasing the information (with a rubber). The information recorded in the field books should be entered into an excel spreadsheet (either separately or together with the information recorded on the datasheets) and stored electronically. Data collected in the field should be entered into excel sheets on a regular basis (preferably on a daily basis – e.g. in the evenings after a day in the field, or at the end of each field trip, if no electricity/ laptops available while in the field).

2. Walking line transects

To collect data when walking line transects, you need to be at least four people and at the most 6 people (Fig. 1):

- Person (1) (on the line) follows the direction of the transect with a compass
- Person (2), (on the line) 5 meters behind person (1) with a compass and a GPS to guide the group
- Person (3) (on the line) at a maximum of 10 meters behind person (2)
- Person (4) (on the line) is 5 meters behind person (3)
- The presence of the fifth person (5) and / or the sixth person (6) is optional, 5 meters away from the line transect, just behind the fourth person

The group consists of a minimum of four people. The additional two people participate in data collection, and in addition, are responsible for the safety of the group. If a machete is necessary, then this will be given to person (1), who is also equipped with a compass and binoculars. Although the machete makes a lot of noise and can cause extensive damage to the environment, it may be necessary in certain situations. Person (1) looks ahead and his/her task is to direct the group and detect nests in front of him.

Person (2) is equipped with the topofil, compass and the GPS. He/she looks ahead into the same direction as person (1). Person (3) is responsible for taking notes and recording data on the datasheets, he must also carry binoculars to look for chimpanzee nests in trees. Person (3) should also look back occasionally (in trees) to check that no nests have been missed. Person (4) focuses on the ground and looks for tracks, dung, and
other signs of great apes. All four people strictly stay on the line and look for great ape activity on and next to the transect line.

Persons (5 & 6) zigzag across the transect line, looking for great ape nests on the line and next to the line, but not moving further away than 5m on each side of the line. They should also look /and listen for great ape activity nearby. Thus, everyone in the groups has a specific task assigned to him/her, but all members of the survey team look out for nests, droppings, great apes and anthropogenic factors that need to be recorded on the datasheet.

![Fig. 1 Positioning of members of the survey team along the line while walking the line transect](image)

When nests are found, group members measuring perpendicular distances and investigating the nest site should look for fresh dung and hairs left behind at the site. When the group hears or sees great apes, two group members (positions (5) and (6)) may leave the transect line and follow the great ape sign (vocalization, individual(s)) and look for and collect fresh dung/feeding remains/hairs left behind by the animal(s), while the remainder of the team continue walking the transect. The groups rejoin when the two team members return (same day or next day only).

**Note:** while walking in the forest, try not to make any unnecessary noise, be vigilant at all times, do not smoke and do not leave rubbish or any other human wastes behind. ☺

For reasons of visibility, it is best to collect data between 7:30 in the morning and 16:00 in the afternoon. Apart from signs of great ape presence, all human signs should be recorded as these may aid in explaining the distribution of great apes across space. Once a member of the survey team detects something, the team stops and everybody, except the person with the topofil (2) (see Fig. 1), comes together to record the necessary data. After data collection, everybody returns to their original positions on/near the line.
Choose the transect line(s) that you want to walk on a specific day 24 hours in advance. When you have successfully navigated to the start of the transect line, install the topofil. Then take a GPS position from the point of departure (record the position on the data sheet!) and begin your observations at point 0m, once the survey team has been positioned correctly. Walk the transect line and record data and measure perpendicular distances until the topofil indicates the distance that equals the length of the transect line (e.g. 1000m), but only stop surveying when each observer has reached the end of the line. Then take another GPS position, record in on the data sheet under “End of transect” and cut the topofil. You must now navigate to the start of the transect line that you want to walk next and follow the same procedures.

2.1 Measuring perpendicular distances

Perpendicular distances are measured to great ape nests in trees or on the ground, as well as to direct observations of great apes. If nests are high-up in trees, then perpendicular distances are measured to the position on the ground that is directly under the centre of the nest and not just simply to the stem of the tree (Fig. 2). If there is more than one nest in the same tree, then one needs to record perpendicular distances to each nest, as well as nest decay stage for each individual nest. At each nest site or direct observation, a GPS position (waypoint) is taken with an individual waypoint number and measurement of longitude and latitude. To overcome the problem of autocorrelation (i.e. when you find one great ape nest, you are likely to find more, because great apes occur in groups/clusters), you should take perpendicular distance measurements to each nest in the group and record each one of these measurements on the datasheet (one and the same nest group I.D. number, but different nest I.D. numbers). For purposes of analysis, one can calculate average perpendicular distance for the group/cluster of nests.

Perpendicular distances should be measured accurately and precisely with the tape measure. It is important to always measure at a 90 degrees angle to the topofil (which is where the line is). When you observe a group of great apes directly, note and record the position of the tree where you first saw the group (unless you can determine the centre point of the group). You then measure the perpendicular distance to that tree.

When walking a line transect, also record the GPS position after every 100m of line transect and note this position, the time, the transect and stratum name etc. on the data sheet.
2.2 How to deal with obstacles on the line

When you encounter an obstacle on the transect line that cannot be traversed (stream, big tree, etc), you need to navigate around it (Fig. 3). When you get to the obstacle, cut the toposfil and walk around it (you don’t have to collect data while moving around the obstacle) until you get back to the transect line. To do this, walk exactly 90 degrees or 270 degrees from the direction you were travelling. When you have gone beyond the obstacle, measure the distance you have deviated from your transect and proceed along your original compass bearing. When it is possible, turn 90 degrees or 270 degrees again and walk the same distance back to the original line. Then turn one last time back to your original compass bearing to follow your original course. At this point you tie the toposfil to a tree and start surveying again. You need to notice the distance from when you cut the toposfil (take a waypoint at this location) and when you start surveying again - you can do this by calculating the distance between the waypoint when you cut the toposfil and when you started surveying again with your GPS. The distance that you did not survey will be subtracted from the transect length. Proceed in the same manner when encountering further obstacles until you reach the end of the transect line (e.g. when your toposfil/ GPS indicates that you have reached the end of the line transect). Thus, in the end, a 1000m long transect may be only e.g. 764m in length, because you excluded the areas where obstacles did not allow you to stay on the line.
Note: When you encounter obstacles, such as bushes or small trees, you can look into the bush/ tree etc. to make sure that you did not miss any nests, walk around it and back onto the line and include this area into your surveyed transect area.

### 2.3 Using the topofil and the measuring tape

The topofil is an important tool with which one can determine the distance travelled even if the GPS does not have signal. However, care needs to be taken when using the topofil as wrong installation of the topofil may yield incorrect information about the distance travelled along the line transect. Use the topofil as follows:

Make sure that the topofil displays correct distance values by measuring a length with the tape measure and walking the same distance with the topofil, checking that the value displayed by the topofil matches the value measured before you started walking.

When you are at the beginning of your line transect, tie the thread to a tree and make sure the counter is on zero. Always have the thread wound 3 three times around the small spool. Be careful with the thread, it tears easily. If you cut the threat by accident, walk back to the point where the threat broke and start with new thread by tying it to a tree at this point. If you have been walking for a while without the topofil without noticing that it broke, go back to the last waypoint and measure the distance to this point, then reset the counter and walk the remaining distance to get to the end of the transect. Note this on your data sheet, i.e. that the topofil broke, the distance at which it broke and the distance to the end of the transect line.

For instance, let’s say you are supposed to walk a 1000m transect, your topofil broke and the last waypoint you had taken, was at 400m. You walk back to the waypoint and measure that you walked 300m, which means that your topofil broke at 700m. You tie the
thread to a tree at 400m, reset the counter and walk back to 700m (which will show on the counter as 300m). You then start surveying again and walk the remaining 300m to the end of the transect line at which point your counter will show 600m (instead of 1000m). To avoid such delays, always walk slowly with the topofil, to not break the thread before reaching the end of the transect line.

Use the tape measure to measure perpendicular distances from the transect line to the detected object. Make sure that you lay the tape measure on the ground if possible and that you accurately read the distance. If the detected object is not too far from the line, you can estimate that the tape measure is perpendicular to the transect line, but if the detected object is further away, then use the compass to determine a 90 degrees angle to the transect line (e.g. if you are walking North, then either East or West would be perpendicular to the line).

### 2.4 Other materials

Use the binoculars to look at objects such as nests that are far away. Binoculars allow you to get a close and detailed look at objects such as chimpanzee nests that may high up in trees and thus too far away from you observe closely. You can sharpen the image that you are looking at through the binoculars by turning the wheel between the eyes.

The data collection sheets are very important as they contain all the data recorded in the field. Make sure you record all information and do not leave any spaces blank. If you have nothing to record then indicate this with a hyphen “-“. Don’t loose or break datasheets and enter the data recorded on the data sheet on your laptop/ desktop as soon as possible (preferably daily) and don’t forget to make back-up’s of your data (e.g. save your data on the C-drive, a memory stick, a CD and/ or another computer).

Use the notebooks to take notes of interesting things that you observe in the forest or if there is no more space on the data sheets for comments etc. For instance, use the
Notebooks to record (GPS positions) and describe information useful for managers/guards, including illegal human activities such as poaching, tree felling, etc.

Note: Be careful with all the equipment given to you for surveying great ape populations. If you notice that a specific item needs repairing, report this as soon as possible, so that it can get fixed. This way you make sure that all the equipment is functional at all times and that all members of the team can rely on the equipment. Try to keep technical equipment such as GPS’s, laptops, binoculars, etc. dry at all times (e.g. put it into zip bags or hardcover bags with silica gel).

### 3. Principles of navigation

#### 3.1 Using the GPS
3.2 The key functions of the GPS and battery installation

<table>
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<th>Unit Operation</th>
<th>Battery Installation</th>
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</thead>
<tbody>
<tr>
<td><strong>Key Function</strong></td>
<td><strong>The GPSMAP 60Cx operates on two “AA” batteries (not included), which are located in the back of the unit. Alkaline or NiMH batteries may be used (see the Owner’s Manual to set the battery type). Stored data is not lost when the batteries are removed.</strong></td>
</tr>
<tr>
<td><strong>POWER/BACKLIGHT Key</strong> - Press and hold to turn unit On/Off. Press and release to adjust backlighting.</td>
<td>1. To remove the battery cover from the back of the unit, turn the D-Ring 1/4 turn counter-clockwise and then pull the cover away.</td>
</tr>
<tr>
<td><strong>IN/OUT Zoom Keys</strong> - From the Map Page, press to zoom in or out. From any other page, press to scroll up or down a list.</td>
<td>2. Insert the batteries, observing the proper polarity. A polarity diagram can be found molded into the battery compartment.</td>
</tr>
<tr>
<td><strong>FIND/MOB Key</strong> - Press and release at any time to view the Find Menu Page. Press and hold for MOB feature.</td>
<td>3. Reinstall the battery cover by inserting the bottom slot over the tab at the base of the unit and reinserting the locking pin in the back of the unit.</td>
</tr>
<tr>
<td><strong>MARK Key</strong> - Press and release at any time to mark your current location as a waypoint.</td>
<td>4. Turn the D-Ring 1/4 turn clockwise to lock the cover in place.</td>
</tr>
<tr>
<td><strong>QUIT Key</strong> - Press and release to cancel data entry or exit a page.</td>
<td><strong>The Micro SD Card used for storing detailed mapping data is located beneath the batteries. Refer to the Owner’s Manual for detailed information.</strong></td>
</tr>
<tr>
<td><strong>PAGE Key</strong> - Press to cycle through the main pages. Press when using the on-screen keyboard to close.</td>
<td><strong>When replacing batteries, use only new or fully charged batteries. Do not mix Alkaline and NiMH batteries. Rechargeable batteries may have less capacity than disposable batteries.</strong></td>
</tr>
<tr>
<td><strong>MENU Key</strong> - Press and release to view options for a page. Press twice to view the Main Menu.</td>
<td><strong>Extensive use of backlighting and/or WAAS as well as key beep tones will significantly reduce battery life.</strong></td>
</tr>
<tr>
<td><strong>ENTER Key</strong> - Press and release to enter highlighted options, data or confirm on-screen messages.</td>
<td><strong>ROCKER Key</strong> - Move Up/Down or Right/Left to move through lists, highlight fields, on-screen buttons, icons, enter data or move the map pan-</td>
</tr>
</tbody>
</table>
3.3 Three important functions when utilizing the GPS

3.3.1 Marking your location as a waypoint and using the map page

Marking Your Location as a Waypoint
A waypoint is a geographic location that you specify, it can be your current location, a point on the Map Page or any item from the Find Feature database. Waypoints are saved to the Find Menu.

1. Press and release the **MARK** key to display the Mark Waypoint Page. Observe that your current position is assigned a map symbol, a unique identification number, a date and time of recording, location coordinates, and if available elevation and depth.

2. To save the waypoint to the Waypoints List, use the **ROCKER** key to select “OK” and press **ENTER**.

   To personalize the Waypoint, refer to the “Using Waypoints” section of the Owner’s Manual.

Using the Map Page
The Map Page displays a detailed map of the area around your current location. You can view your progress when moving or navigating to a chosen destination. The **IN** and **OUT** keys allow you to change the map scale and the configurable data fields provide navigation information.

1. Press the **PAGE** key to cycle the Main Pages until the Map Page is displayed.

2. Press the **MENU** key to view options for the Map Page.

3. Begin to move about and observe the Position Arrow ▲ on the map. Use the **ROCKER** key to move the Panning Arrow ◄ to highlight a map item or view more map area.

   Refer to the Owner’s Manual for more details.
3.3.2 Finding a destination (waypoint)

Finding a Destination (Waypoint)

You can search for a destination using the Find Menu. A destination can be any map item such as a Waypoint, City, or Point of Interest (restaurant, museum, etc.) available from the map database. Without downloaded detailed map data from Garmin MapSource®, only waypoints, cities, interstate exits, and geocache points can be used as destinations.

1. Press the FIND key to display the Find Menu.
2. Use the ROCKER key to select the Waypoints icon and then press ENTER to display the list of waypoints. By default, the list shows only those nearest to your current location. Press the MENU key to view the options list.
3. Use the ROCKER key to scroll through the list until the desired waypoint is highlighted. Then press ENTER to display the information page for that waypoint.
4. Use the ROCKER key to select the “Go To” button at the bottom of the page. Then press ENTER to begin navigation to the waypoint.
3.3.3 Navigating to a waypoint

Navigating to a Waypoint

When using “Go To” to navigate, a direct line (or course) is created to the waypoint. The direction you are to move is the heading (N, S, E, W). If you stray off course you can use a bearing (compass pointer) to be redirected toward your destination. The Map, Compass and Trip Computer Pages use these elements to direct your navigation efforts.

1. Press the PAGE key repeatedly until the Compass Page is displayed. This page contains a “Bearing Pointer” and a “Compass Ring.”

The Bearing Pointer indicates the direction to go and the Compass Ring rotates to indicate North orientation when you begin to move. Digital Data fields at the top of the page display selectable navigation information such as speed, distance to go, elapsed time, etc.

2. Press the QUIT key to move to the Map Page and observe your progress toward the waypoint. A Bearing line displays on the map and the Position Arrow moves as you move.

3. Press the QUIT key again to move to the Trip Computer Page. This page provides travel data such as a trip odometer, maximum speed, etc.

4. To stop navigation, press the MENU key with the Compass or Map Page displayed, then select “Stop Navigation” and press ENTER.
3.3.4 When the GPS indicates that satellite reception is insufficient

With the new GPS units available on the market (e.g. GPSMAP 60Cx), you should not experience any problems of not getting satellite coverage. Sometimes when you switch your GPS on in the mornings, it may have difficulty finding satellites, then walk to an open area until the GPS finds all the satellites – once it found the satellites, it should not give you any problems in the forest when walking the line transects. However, should you nevertheless encounter problems with the GPS, you can try and sit on the ground and put the antenna on your head – that usually works quite well.

3.4 Using the compass and maps

3.4.1 How does a compass work?

The compass, just like the GPS, is an important tool to be used during surveys. It helps us to keep a certain direction and allows us to move through the forest efficiently. The compass consists of a box containing a circular needle, where the red always indicates north (the magnetic north). A compass has four cardinal points (north, south, east and west) and the mid points between them (north-east, south-east, etc.) (Fig.5). The compass has 360 degrees, which are divided into four quarters, i.e. 90, 180, 270, 360 degrees. Directions between 0 and 90 degrees are between north and east, all directions between 90 and 180 degrees are between east and south, all directions between 180 and 270 degrees are between south and west and all directions between 270 and 360 degrees are between west and north. 360 and 0 degrees are the same direction. 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 degrees.
3.4.2 Finding out what bearing an object is from the observer

Make sure you hold the compass correctly so that the needle turns freely. If you hold the compass at an angle, the needle may get stuck. Face the object in question (so that the “direction of travel arrow” points to the object) and rotate the dial of the compass so that the north end of the needle exactly superimposes the north of the compass dial. The bearing should be read off the line that says “read bearing here” (Fig. 6).

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**Compasses have three main uses:**

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

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**Fig. 5** The four cardinal points of a compass also expressed as degrees, as well as the directions in-between the four cardinal points.
3.4.3 Keeping on a bearing

If you want to approach a distant object on a bearing, look along the line of the bearing and select a landmark. This is important a distant object in the forest may not be visible during much of the trajectory. The landmark could be a tree, rock, building etc. and you should walk towards that landmark. When you reach the landmark, use the original bearing again and choose another landmark on the same line. Repeat this step until you get to the distant object. When you walk a transect line, it is important that the compass bearer immediately re-directs the person in front (with the machete) if he/ she deviates from the direction of the transect line.

**Note:** the person in front of the team should cut as little vegetation as possible 😊

The person behind the “cutter” (position (2)) should look through the compass with one eye and with the other eye looking at the back of the cutter so as to superimpose the compass on the middle of the back of the person in position (1) (the “cutter”). The “cutter” (1) should look back along the line from time to time with his/ her own compass and read a back bearing, i.e. to check that the direction is 180 degrees from the transect direction.

![Flat plastic plate compass showing direction of travel arrow](image)
3.4.4 Calculating a bearing and the distance between two points from a map

When you lay the compass on a map, make sure that the north of the map points to north (by moving the map around until the needle showing north of the compass is aligned with the north of the map). If the map has parallel lines, you can line it up with the compass easily. 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, making sure the “direction arrow” is pointing in the direction of travel. The dial of the compass should be turned so that the “N” written on the dial is exactly to the magnetic north indicated by the red pointer of the needle on your compass. The parallel lines within the circle of the dial facilitate this. You can then read off the bearing as described previously (see Fig. 7).

![Fig. 7 Taking a bearing off a map using a flat plastic compass](image-url)
To calculate the distance between two points on a map, you measure the distance between the two points of interest on the map (in cm or mm) e.g. with a ruler or with the side of the compass, which also has a millimetre scale. You then refer to the scale on the map and measure the length of the scale (use the same unit (either cm or mm). For instance it may say on the scale that 23mm of scale bar equal 1.5km on the map (in reality). Let’s say your walking distance is: 46mm (distance between the two points)/23mm (length of the scale bar)*1.5 (distance marked on the map scale) = 3km.

A numerical scale (such as 1/65000) indicates that 1cm on the map represents 65000cm (= 650m) in reality. If you measure 46mm = 4.6cm when walking distance is 4.6cm*65000 = 299000cm = 2990m = 2.99km. On average, the time that is needed to walk about 1km is less than 30 minutes in primary and relatively penetrable forest as in most of Taï National Park. For 3 km, one would need between 1h15min and 1h30min. So if you know how far you need to walk and approximately how much time you will need to cover this distance, start looking for landmarks when you think you must be close to your destination (e.g. road or the camp). It is often difficult to walk in a straight line, because of obstacles (trees, rivers etc.). To constantly correct your direction, target objects (e.g. trees) far ahead of you and when you get to the object, make sure that you are still walking in the correct direction.

3.4.5 Magnetic and true north

Compasses point to magnetic north. True north may deviate from this by 10, 20, or more degrees. A good map will usually indicate this deviation somewhere. If magnetic north is east of true north, then you need to add the deviation to your reading - if magnetic north is west of true north, then you need to subtract the deviation from your reading. Assume we're hiking in central California where magnetic north is about 15 degrees east of true north. Add 15 + 105 (e.g. the bearing you read off your compass) to get the true bearing: 120 degrees.
Literature sources


Stratum | Transect L.D. | Nest group L.D. & Waypoint # | Nest L.D. | Time | Type of observation (dung, nest, spoor, vocalization, direct observation) | Species? | Size of spoor width / height of dung | Nest decay stage | If nest in tree – what tree species? | Distance along transect & Perpendicular distance to nest | Longitude (UTM) | Latitude (UTM) | Habitat | Remarks & comments

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