
AERIAL CENSUS OF THE GASH-SETIT ELEPHANT POPULATION OF ERITREA AND ETHIOPIA

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ABSTRACT

A total elephant aerial count was carried out in south-western Eritrea and northern Ethiopia between 31 October and 16 November 1996 as a joint initiative between the Governments of Ethiopia and Eritrea. One aircraft covered approximately 4,952km², in the Gash-Setit region and the Sheraro region.

A total of eight elephants were counted, of which two were near Haicota along the Gash River and six were along the Tekezze River on the Ethiopian side of the border. The two elephant groups are considered one population, although there is a considerable gap between them. In Gash-Setit Province, these elephants are the only remaining elephants in Eritrea. This figure is less than expected and, as this was the first aerial survey to be conducted in the region at the end of the wet season, it is not safe to conclude that these are the only elephants present. A dry season aerial count is strongly recommended to determine the status of this elephant population more clearly. No elephants or their signs were seen in the settled area around Sheraro, but the two bulls seen at Haicota are likely to be responsible for crop-raiding in the adjoining cultivation. Two old carcasses were seen, which is an indication that some poaching has occurred.

INTRODUCTION

Despite the long years of war in Eritrea and northern Ethiopia, preliminary observations indicate that a remnant elephant population exists in the Gash-Setit Province (Hagos, 1993). According to Hagos (1993), this population crosses the Gash-Setit (Tekezze) River into Ethiopia and back on a seasonal basis. The existence of elephants in Gash-Setit is significant as it appears to be Eritrea's only elephant population, and it represents one of the northern-most populations of Africa's elephants which could be genetically different from the rest. Only Mali's Gourma elephants inhabit a more northern site (Said et al, 1995). As these elephants constitute a cross-border population, both the governments of Ethiopia

and Eritrea have taken a bilateral initiative to establish the current status of the Gash-Setit elephants with a view to protecting the species and its habitat.

Previous surveys of elephants in Ethiopia (e.g. Allen-Rowlandson, 1990; Manspeizer, 1994; and Lamprey, 1994) have not covered the Gash-Setit population. This paper describes the first elephant aerial survey to be conducted in south-western Eritrea and northern Ethiopia. The overall objectives of the survey were to obtain data on the current status of elephants, their numbers and distribution.

STUDY AREA

The study area is located in Gash-Setit Province of south-western Eritrea and northern Ethiopia. It was divided into two census zones, the Gash-Setit zone and the Sheraro zone (Figure 1). The Gash-Setit region is located at longitude/latitude N 150 13' E 370 29' and S 140 03' W 370 at its longest and widest points, respectively, and covers an area of 3,752km². The second zone is Sheraro, 50km east of the Tekezze valley. It lies at longitude/latitude N 140 33' E 370 55' and S 140 10' W 370 35', respectively, and covers an area of about 1,200km². The altitude within the survey areas ranges from 550m to 1,321m above sea level. The east and central parts of the Gash-Setit region are dominated by undulating hills and a chain of mountains, interspersed with isolated hills. The western part of the region, which borders Sudan, is generally flat. Sheraro area is generally flat with a few scattered hills. Northern Ethiopia has a rolling landscape with a few hills.

The dominant soil is black alluvial soil, although some hilly areas are surrounded with sandy gravel. These soils are drained by the seasonal Gash River in the north, and the Tekezze River (the only permanent river in the region) in the mid-south. The Tekezze River forms the boundary between Eritrea and Ethiopia. At the time of the survey, some drainage lines in northern Ethiopia still had running water, while only dry, sandy riverbeds were seen in the eastern Gash-Setit and Sheraro regions.

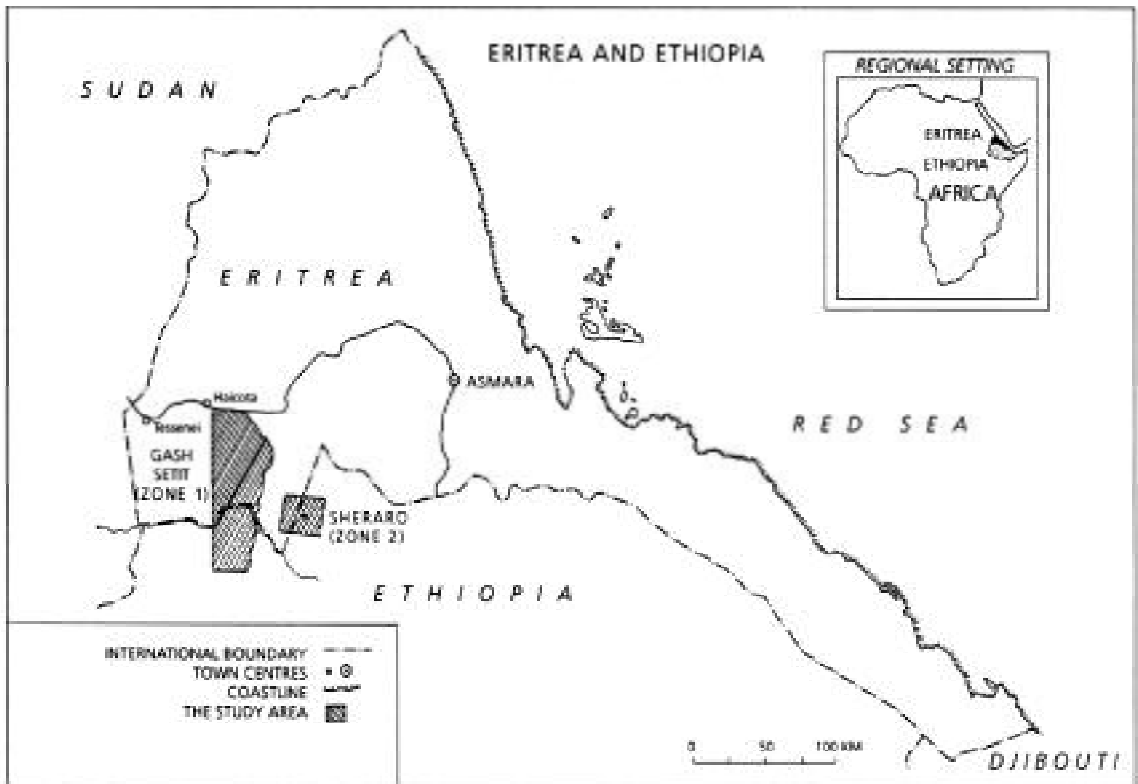


Figure 1. Map of the study area.

Flora

Detailed information on the vegetation of the area is scanty. However, Hagos (1993), Hagos (1995) and Butynski (1995) have given good general information on the vegetation of the Gash-Setit region. Basically, this is open country with scattered bushes, making it easy to count elephants from the air. Broadly, the vegetation comprises savannah bushland and patches of riverine vegetation dominated by doum palm (*Hyphaene thebaica*). Common trees are gum olibanum (*Boswellia papyrifera*), baobab (*Adansonia digitata*), *Balanites aegyptiaca*, *Gum arabica*, *Acacia seyal*, *Ficus sycomorus*, *Tamarindus indica*, *Tamarix aphylla*, *Ximania americana*, *Acacia seyal*, *Zizyphus spina*, *Acacia nilotica*, *Acacia tortilis* and *Acacia nilotica*. The Tekeze riverine vegetation is not well-developed and often is dominated by *Zizyphus spina* and *Hyphaene thebaica* (doum palm). Riverine vegetation along the Gash River is also dominated by patches of doum palm, which become thick in some places, particularly around Haicota. During this study, a reconnaissance ground survey was con-

ducted in the Haicota area, and it was observed that the doum palm provides shade and building material for local shelters. It is browsed not only by elephants (which were present at the time of the survey), but also by domestic stock. Additionally, the doum palm protects the river banks from erosion.

METHODS

Because information on other wildlife species was scanty, the entire census area was flown to determine large mammal species occurrence and distribution. It was agreed that only large mammals would be counted. Consequently, total aerial count, as described by Norton-Griffiths (1978) and Douglas-Hamilton (1996), became the obvious choice, the aim of which was to cover the entire surface of the defined census zone and to record individual elephants or groups of elephants and their geographical locations.

Total aerial counts rely heavily on the experience of both the pilot and the flight crews (Douglas-Hamilton *et al*, 1994; Litoroh, 1995). The flight crew and the pilot were

in training during this count, though the consultant was not. The flight crew and the pilot were instructed in their roles according to the protocol described by Norton-Griffiths (1978) and improved upon by Douglas-Hamilton *et al* (1994) and Douglas-Hamilton (1996).

A six-seat Beaver DHC-2 aircraft was used for the census. The aircraft and crew were based at Tessennei, which was the nearest airstrip to the census zone in order to minimise “dead” time. Out of 40hrs of flight time, 3.5 hrs were used on repeat counts while 7.27hrs were spent moving from Asmara to Tessennei, as well as getting to and from the survey area each day.

The survey was divided into two phases for technical reasons. The first phase started on 31 October 1996 and ended on 3 November 1996, when the aviation fuel ran out and the aircraft was due for service. The survey resumed nine days later, from 14 to 16 November 1996. Approximately 4,952km² were covered in 28.42hrs of survey time, giving a search rate of about 1 75km²/hr.

Census zones and counting blocks

The entire census area was divided into counting blocks, which were demarcated using a GPS. The initial survey area covered 1,500km² in northern Ethiopia and the Tekezzze valley, where a few elephants had been previously sighted (Hagos, 1993). However, in July 1996 elephants were sighted near Haicota along the Gash River, about 65km north of the Tekezzze valley. Prior to the aerial survey, a ground survey was conducted during which fresh elephant dung was spotted near Haicota. In light of this evidence, the census zone was extended northwards to cover Haicota. Additionally, based on hearsay on elephant sightings at Sheraro, about 50km east of the Tekezzze valley, it was agreed that the Sheraro area should be surveyed as well. Hence there were two census zones: the Gash-Setit region, covering south-western Eritrea and northern Ethiopia as zone 1; and Sheraro region as zone 2. Zone 1 was divided into three counting blocks (Figure 2). Blocks 1, 2, and 3 had an area of 687km², 1,702km² and 1,548km², respectively. Zone 2 had an area of 1,015km², and was a counting block of its own (Figure 3).

Flight paths

The flight lines were determined using the Magellan Global Positioning System (GPS), the NAV 5000D and a 1:100,000 map and were flown east-west. Ini-

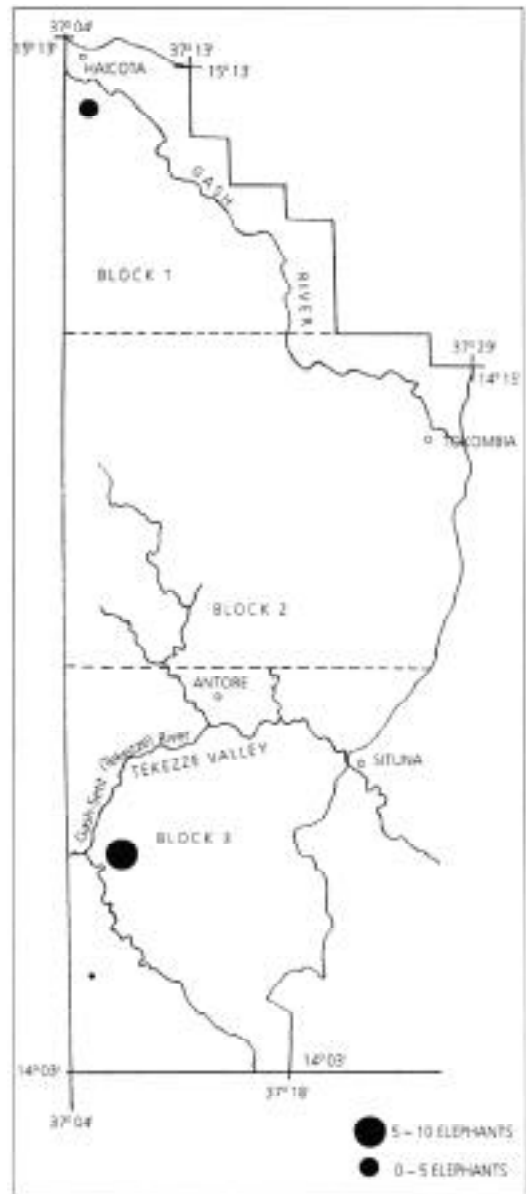


Figure 2. Counting block and distribution area map of elephants (Gash-Setit region).

tially, transects were spaced at one kilometre intervals, but it became obvious that they could be spaced further apart since livestock (sheeps, cattle and camels) encountered on one flight line remained readily visible on the next. Therefore, the transects were spaced at one nautical mile (1.8 km) for most of the study area, except along drainage lines with relatively thick vegetation, where they remained one kilometre apart. For reasons explained above, the aircraft flight

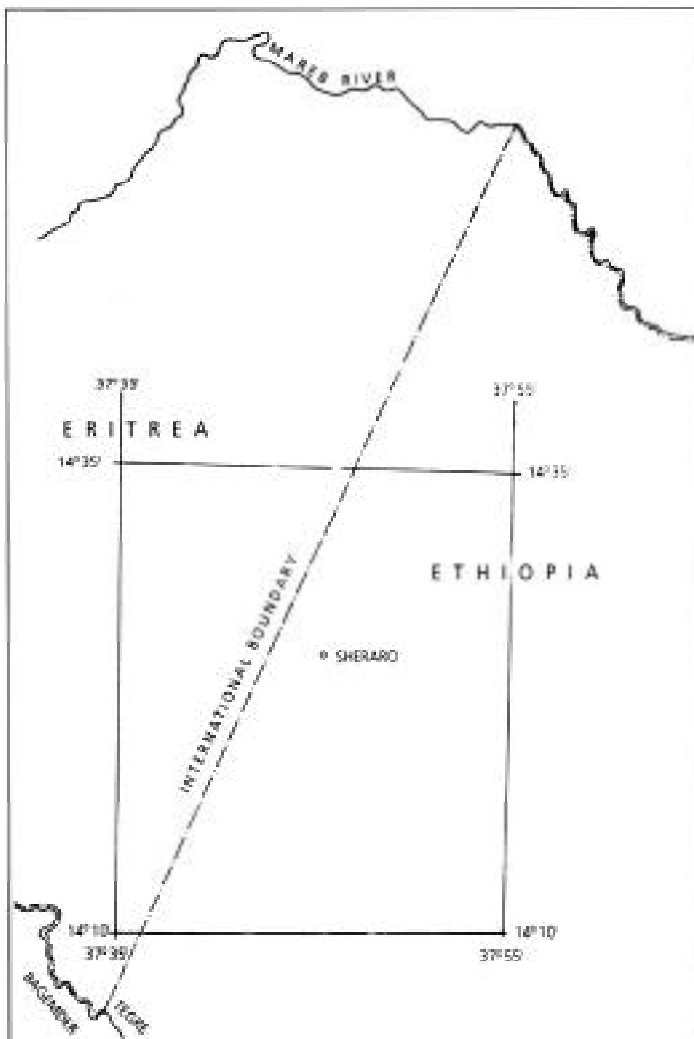


Figure 3. Counting block (Sheraro area).

paths are not shown. The aircraft flew at a speed of 160km/hr at a height of about 400ft above the ground.

The procedure for data recording was according to Norton-Griffiths (1978) and Douglas-Hamilton (1996).

RESULTS

Elephant numbers and distribution

A total of eight elephants were counted in the study area (Table 1). Two of these were bulls are probably over 40 years old. They were spotted near Haicota along the Gash River while six (three adult females and three six-to-twelve year-olds) were recorded along the Tekezze River,

on the Ethiopian side (Figure 2). Two elephant carcasses were seen. No elephants or their signs were seen at Sheraro.

The total number of elephants given is a minimum estimate and it is probable that the true figure for the area is slightly more. According to Norton-Griffiths (1978) total counts of elephants typically underestimate the true number by a factor of about 10%. However, this will vary depending on the vegetation cover, searching intensity, time for the count, observer skills and pilots. Some attempts were made to establish the level of these errors during the training exercise; block 1 was flown twice in the same day to see how many animals were seen by each set of observers. Both sets of observers returned the same count.

Table 1: Number of large mammal species counted during the survey.

Species	Number
Elephant	8
Greater Kudu	9
Waterbuck	7
Bushbuck	3
Oribi	2

All these species occur at low numbers, probably due to human activity in the region.

HUMAN ACTIVITY AND CROP RAIDING

Qualitative observations on human activity on the Eritrean side noted a heavy concentration of livestock in the Tekezze valley and along the Gash River although their numbers were not recorded. Cultivation on the hills as well as bush fires were observed. On the Ethiopian side, approximately 100km² of habitat were destroyed by fire during the survey period.

Crop depredation by elephants is reported mainly along the Gash River. Elephant dung piles observed near Haicota contained considerable amounts of sorghum. At a few sorghum farms visited, farmers use fire and beat empty tins to frighten elephants away. However, because elephants come at night when there is no guard, these methods are not particularly effective. Banana plantations are also raided, and at Haicota, one farmer had abandoned about 10 acres of bananas because of crop-raiding elephants.

DISCUSSION

The aerial census counted six elephants in the Gash-Setit region. This figure tallies exactly with the estimate of six elephants made by Hagos (1993) and is half the number video-taped by the National Environmental Management Plan (Government of Eritrea, 1995), but is significantly less than the 70 to 100 speculated (Said *et al.*, 1995). In Haicota the figure of two elephants counted does not favourably compare with the local hearsay or with guesses of five to ten elephants. While the number of elephants needs further investigation, there are at least eight elephants in the region.

For this survey, the primary bias is that while counting conditions were generally easy in the majority of the

census area, there is relatively dense woodland along the Gash River (near Haicota) where a few elephants may have been missed. Second, the majority of crew members, including the pilot, were surveying for the first time and therefore were inexperienced. Nevertheless, it is unlikely that many elephants were missed in view of two trial counts around Haicota. Third, since the count was interrupted, it is possible that if there were elephants in the uncensused area, they could have moved into previously surveyed by the time the second census resumed nine days later. The potential movement may have been caused by a large fire on the Ethiopian side, which destroyed approximately 100km² of range. While an overlap of 10km was surveyed, this may have been insufficient because the elephants and other wildlife counted earlier were not spotted again.

According to information provided by local people, the Gash-Setit area seems to be core elephant range, while Haicota appears to constitute only seasonal or periodic range. Thus, the two elephants found in Haicota are probably part of the Gash-Setit region population. Additionally, if hearsay information on elephant numbers is to be taken seriously, then it is possible that the range for these elephants extends beyond the census zone. If this is the case, elephants outside the counting block were missed. Since the survey was conducted at the end of wet season, water pools were sighted in some river valleys, and elephants could still have been dispersed and utilising these water sources. According to Leykun (pers. comm.), the Tekezze valley elephants probably have a linkage with elephants in Sudan. If this is the case, then some elephants may have moved to Sudan during the survey.

The sighting of two old carcasses along the Tekezze River and the killing of four elephants in late 1995 (Hagos pers. comm.) is an indication that some elephant poaching is continuing. However, there was no evidence that serious poaching of elephants had been occurring in the census zone. In Tsavo National Park in Kenya, where poaching was severe in the 1970s and 1980s, very old carcasses can still be seen today, which was not the case for the study area.

Although north of Sheraro appears to be typical elephant country, no elephants or their signs were found. The absence of water in this region probably discourages its use by elephants. Additionally, the level of settlement immediately south and west of Sheraro may also deter elephants. Unfortunately, there was

insufficient aircraft time available to cover all areas suspected of containing elephants. It is felt, however, that if elephants have been sighted at Sheraro, they probably come from the Tekezze valley.

While the Ethiopian side appears to have minimal human influence and remains essentially intact (apart from bush fires), the considerable human activity on the Eritrea side is likely to lead to habitat degradation in the medium and long term if not adequately controlled. Additionally, agricultural activities have led to human-elephant conflict in some areas like Haicota. The Eritrean Government has to address the issue of human-elephant conflict not only in the Tekezze valley and the surrounding hills, but also at Haicota. This points to the need for having a clear land-use policy in Eritrea to avoid a conflict of interests or the eventual loss of elephant range entirely.

CONCLUSIONS AND RECOMMENDATIONS

While the aerial survey thoroughly covered a large area, only eight elephants were seen. Contrary to high expectations, these appear to be the only remaining elephants in Eritrea. This elephant population is probably not viable unless there is contact with other viable populations. If there is continuous undisturbed habitat between Tekezze and elephant range in Sudan, then there could be the possibility of elephants occurring further to the west. Therefore, there is a need to conduct further surveys to determine if these elephants interact with those in Sudan.

If the Tekezze valley elephants are considered to be of conservation importance, then they need immediate protection for their survival. Hence there is a need to define a minimum viable population for elephant conservation, as pointed out by Sukumar (1993). This will help Eritrea and Ethiopia to determine the size of the protected areas which need to be established on either side of the common border. As small populations are likely to be at risk of losing genetic variability, the potential long-term problem of inbreeding in this population should not be ignored.

In view of the fact that these may be the only elephants in Eritrea, they should probably be viewed as a conservation priority by Eritrea and Ethiopia, and a core protected area should be established of about 250km² in

the Tekezze valley along their common border. However, this would mean displacing the local people from their land on the Eritrean side. This is a less severe problem for Ethiopia, as the Ethiopian side of the border is largely uninhabited. For Eritrea, participation of the local people in the entire decision-making process will be crucial to ensuring mutual understanding and a positive atmosphere. While Ethiopia has a legal structure in place for the gazettement of protected areas (Negarit Gazetta, 1972), Eritrea has no such laws. Therefore, Eritrea will need to enact comprehensive legislation which allows the legal establishment of protected areas.

Specific recommendations are:

- To obtain a complete picture of the Tekezze valley elephants, a dry season elephant aerial survey is strongly recommended. But, such a survey should be preceded by a ground survey to gather information on elephant distribution on both the Eritrean and Ethiopian sides. This ground survey will help delineate the relevant areas for aerial surveys, thereby minimising costs.
- Eritrea and Ethiopia should continue their regional initiative to census and manage this shared, cross-border elephant population. More detailed reasons for this approach can be found in Said *et al* (1995).
- In view of reports of elephant poaching, these elephants require immediate protection from both Eritrea and Ethiopia if they are to survive. For the moment, Eritrea could achieve this by making use of the existing security system in the country (e.g. the Eritrean defence force). Ethiopia already has a wildlife protection unit which could be deployed on its side of the border.
- Information on elephant movement is important for their conservation and management. While modern techniques for monitoring elephant movement (e.g. radio-tracking) may prove cost-prohibitive, such information could be obtained from local people in the short term. Local scouts should be hired to identify elephants and their movement.
- Eritrea and Ethiopia should establish a wildlife protected area of about 250km², preferably in the Tekezze valley, along the common border. As for crop raiding by elephants at Haicota, Eritrea should consider erecting an electric fence around the farming communities as a long-term solution. This option would protect people's property while allowing free movement by elephants.

- In view of possible cross-border elephant movements, the Ethiopian Wildlife Conservation Organisation (EWCO) and Eritrean Government should consult the relevant authorities in Sudan concerning a joint survey, as a long-term approach to managing this elephant population.

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