

elephants were selectively hunted, rather than randomly poached.

We are presently working on three interrelated topics which could bring some degree of stability to the ivory trade, and, in turn, to elephant populations. First, we are preparing models to show how much more ivory would result from selective hunting, rather than indiscriminate slaughter, of a national herd. Bigger animals carry larger tusks and large tusks are worth more per kilo than small, because ivory carvers prefer them. Selection for older animals, especially males, would undoubtedly be the most profitable alternative for exporting nations.

By legislating minimum, average tusk weights on export and import consignments of commercial ivory, we could ensure such selectivity and, more importantly, conserve the reproductive capacity of elephant populations. The minimum weight requirement is a "safety-net", widely used in fisheries management, which could prevent

overharvesting, even though we are not sure of how many elephants there are. Finally, we need some way to define trade and conservation standards. Ian Parker's earlier suggestion of an ivory council involving trade associations seem to offer good possibilities, especially if it were modelled after the International Whaling Commission. We are now exploring the prospects to see whether an ivory council could realistically, within CITES legislation, and under the security of responsible conservation bodies, provide the best forum to regulate trade in the interests of ivory traders, carvers and conservationists.

Zimbabwe has an admirable conservation record. In this newsletter we highlight three projects to show how its success in wildlife planning and conservation depends on detailed research and monitoring.

David Western

## Zimbabwe Completes Tenth Year of Elephant Radiotracking

The Department of National Parks and Wildlife Management in Zimbabwe has just completed their annual re-collaring programme for elephant in the Sebungwe Region. Some 30 elephants whose radio collars were over two years old (2 years and 4 months, to be precise) were located by radio-tracking using a Supercub, darted from a Zimbabwe Airforce Alouette III helicopter, and fitted with new radio collars which will last until 1985. The operation lasted three days, with about 10 elephants being collared each day. To save on flying hours, the helicopter is used only for firing the tranquillising dart and for transporting the radio-collar team to the darted animal. The fixed-wing aircraft does all locating work, watches the darted animal until the drug takes effect, and checks that the animal recovers after treatment with the antidote.

All tagged elephant in the Sebungwe are on a two-year replacement cycle of radio collars. In 1984 a different cohort of about 30 animals will be due for new collars. This is a long term programme with known study animals dating as far back as 1973. Indeed, the first animal darted in this recent operation was a cow named "TV", who was first fitted with an experimental collar in 1973, and filmed for the television programme "Untamed Africa" produced by John Hanks. She is currently carrying her fifth radio collar.

Apart from the major issues arising from the different projects in the Sebungwe, there is a wealth of interesting minor information which comes from examining the immobilised animals repeatedly over many years. For example:

(i) Animals rapidly replace broken tusks. On 8 occasions we have noted that a tusk a foot or more shorter than the intact tusk will grow to be equal in length to the other tusk within two years.

(ii) Three years ago we began punching the ivory of each animal at the lip-line. The punch marks move down the tusk with growth, and we are now using these as a means of measuring the rate of growth of the tusks at the lip-line.

(iii) We notice that our measurements of shoulder height using Law's technique vary by as much as + 5 cms on successive occasions. As most of the animals are



Figure 1. Young bull elephant with radiocollar and identification notches cut in collar.

mature females it is unlikely that they are growing or shrinking and we are forced to conclude that the measurement is affected by the recumbent posture of the animal.

(iv) The teeth of each animal are checked and an attempt is made to identify the molars and describe the number of cusps in wear. Whilst this is wildly erratic in the majority of cases, it has however been of interest where very old animals have been encountered. We have been able to measure accurately the length of the molar and note the time until death. This will be an ongoing study with the cohort.

(v) Lactational status varies with the population sub-unit. Elephant in the Sengwa Wildlife Research Area are almost invariably lactating: out of some 200 females immobilised over the past 12 years, only one or two have ever been found without milk. In contrast, perhaps half of the adult female elephant in the unprotected communal lands of the Sebungwe have been found not lactating. This suggests that the unprotected animals are breeding less frequently.

Radio-tracking has been used for a number of projects in the Sebungwe Region. Originally started by David



Figure 2. Fitting a radiocollar to an elephant. Author in left foreground.

Cumming in 1968 during a study of warthog, it has been applied to lion, kudu, impala, buffalo and black rhino. Experimental work on elephant transmitters began in 1971, and by 1977 collars were lasting up to two years and giving adequate ranges especially, 10 km ground-to-ground, 30 km with base-station masts, and 50 km plus from an aircraft.

From 1975 to 1979 the radio-collars at Sengwa were used in a detailed study of elephant movements, home range and group associations. In 1980-82 major culling operations were carried out in Sengwa and Chirisa, and the radio collars were used to monitor the immediate response to culling, and are still being used to detect the long term changes in home range which may arise from the population reduction. All the current elephant projects in the Sebungwe arise from population management problems, and are described briefly below:

(i) **The Total Tagged Population of Sengwa** (Craig, Coulson, Gibson, Martin). The Sengwa Wildlife Research Area population was estimated at about 600 animals prior to the culling operation in 1980. After the removal of some 400 elephants in 1980, local air surveys still showed in excess of 400 remaining. Whether this was due to an original underestimate, or to immigration during the cull, was unresolved. However, the strategy used in 1981 was to tag a number of study herds totaling some 250

animals, and remove all untagged groups. After a further 400 had been removed the SWRA was left with the present situation where all herds are tagged with at least one collar, and we now have a cohort suitable for answering long term questions of population dynamics and spatial organisation.

- (ii) **Seasonal Movement in and out of Chirisa Safari Area** (Craig, Coulson, Gibson, Martin). As mentioned above, immigration may have been a factor confusing the outcome of the Sengwa population reduction. In 1981 six elephant herds were tagged inside the boundary of Chirisa Safari Area, and six in the surrounding Gokwe Communal Land, with a view to monitoring movement in and out of the protected area. This project has been running for two years, and is tending to show that none of the Chirisa herds ever leave the Safari Area, while the herds in the Communal lands seldom seek sanctuary in Chirisa.
- (iii) **Home ranges in Chizarira National Park** (Mackie). As a logical extension to the work in SWRA and Chirisa, 8 cow herds were tagged in the eastern and southern parts of Chizarira in 1981 to establish home ranges. This population appears to be more or less discrete, and the project will be allowed to wind down in 1983.
- (iv) **Seasonal movement in and out of Matusadona**

on similar basis to (ii) above, and is covered in a separate article by Russell Taylor in this newsletter.

Elsewhere in Zimbabwe, radio-tracking of elephant is being used in the following projects:

- (i) Hwange National Park: Some 30 odd collars are being used to examine the intensity of habitat occupation around artificial watering points, and movement to and from Botswana on the western boundary of the Park. (Conybeare, Monks)
- (ii) Gona Re Zhou National Park: A study of male elephant (10 collars) was initiated in 1982 to examine the role of elephant carrying large ivory versus large-bodied males and other males in breeding success. (Sharpe)
- (iii) Mana Pools National Park: 12 collars are being used to monitor movements of animals from the Zambesi Valley flood plain to the Escarpment. This is a management study arising from the need to identify the sub-populations causing woodland damage in the Escarpment area. So far the study has shown little

traffic between the Zambesi River and the high ground, leading us to believe that separate populations occupy the two habitats. (Dunham)

Other large mammals being studied are buffalo in the Zambesi Valley (12 collars-Swanepoel), and black rhino in the Gona Re Zhou (5 collars-Sharpe). In total about 140 animals are being tracked in Zimbabwe with the largest group being the Sebungwe elephant (70 collars). This is made possible by advanced technology frequency synthesised receivers with 128 channels. These receivers are specially adapted for radio tracking, possessing an input sensitivity ten times higher than most competing equipment, and front-end attenuation for range determination.

Recently we have supplied equipment outside Zimbabwe for elephant and rhino studies in the Luangwa Valley, Zambia (Dale Lewis and Nigel Leader Williams), elephant in the Kasungu National Park, Malawi (Hugo Jachmann, Richard Bell) and cattle in Botswana (Nick Abel, ILCA).

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## Seasonal Movement of Elephant in and around Matusadona National Park, Kariba

**National Park** (Taylor). This project was started in 1981

Matusadona National Park on the southern shores of Lake Kariba is one of a number of protected wildlife areas set amidst communal land in the northern Sebungwe region of Zimbabwe. In terms of the Park policy which seeks, *inter alia*, to conserve representative woodland habitats, it has been necessary to manage the elephant population in Matusadona. Management action thus far, achieved largely through culling, has been confined mainly to the valley area of the Park, where physical barriers, namely Lake Kariba and the Zambezi escarpment, limit elephant movement and dispersal. In the highlands of the Park, above the escarpment, there are no barriers to movement southward (Fig. 1). Nevertheless elephant destruction of woodland habitats in the highlands, compounded by the effects of uncontrolled wild fires, requires that some form of management action be taken.

It had been apparent for some time that the elephant population in the Matusadona highlands was not necessarily resident but that elephant moved in and out seasonally. This was evident from the seasonal distribution data of elephant in the northern Sebungwe, gathered during aerial surveys. The very large discrepancy in wet and dry season elephant numbers in the highlands confirmed that there was a wet season dispersal. However, little was known about the nature of this dispersal. Moreover, elephant are a valuable resource in the surrounding communal land where both financial and protein benefits accrue to the local community through commercial safari hunting and an annual offtake of crop-raiding elephant. Large scale culling operations within the

highlands of the Park could possibly damage the resource, limiting the availability of elephant in the communal land. Worse perhaps, management action could create a vacuum into which elephant would continue to move, without solving the habitat problems in the Park and simultaneously draining the communal land of a valuable resource.

The choice of management options clearly depended on understanding better the nature of seasonal movement in and out of Matusadona. With this objective in mind, twelve elephant cows were radio collared in June 1982. A Piper Super Club and an Airforce of Zimbabwe Alouette III helicopter were used to locate and immobilise elephant cows, preferably herd matriarchs in family units. Each cow was fitted with a collar supporting a radio transmitter encased in glass fibre, built by R.B. Martin at the Sengwa Wildlife Research Institute. Six elephants were collared in the Matusadona escarpment and highlands and six to the south and west of the Park's southern boundary. Since the collaring operation there have been regular tracking flights using a Super Cub, usually at two-weekly intervals. Each collared elephant, with its own transmitter frequency, is located using a receiver carried in the aircraft, the locality marked on a map and notes made on herd size and structure. Of the twelve elephant originally collared, eleven have been regularly located. One elephant was "lost" shortly after collaring, probably due to transmitter failure, so that only three fixes on its movement were obtained. A second elephant was accidentally shot by a safari operator, but the collar was replaced shortly afterwards on another elephant. Of a possible total 168 resightings (14 tracking flights x 12 elephants) 125 resightings have been made, a success rate of 74%.