Kenya's Initiatives in Elephant Fertility Regulation and Population Control Techniques

Joyce H. Poole

Abstract

During the last two decades, Kenya's elephant population was reduced by poaching from some 170,000 to 24,000 individuals. As a result of the 1989 ivory trade ban and increased protection efforts by Kenya Wildlife Service, the illegal killing of elephants has now essentially stopped. As the country's elephant population gradually recovers from the years of poaching, some populations, and particularly those that are fenced, may eventually need to be regulated. The Kenya Wildlife Service is opposed to the culling of elephants, except where absolutely necessary, for several reasons including: ethical considerations; the negative impact that killing elephants in our protected areas would have on tourism; and the destabilising effect that culling would have on population dynamics. We are, therefore, embarking on a programme of research and development to produce humane methods of elephant population control. The Kenya Wildlife Service is looking into a range of new technologies including abortion, contraceptive vaccines and steroid implants or solutions. In evaluating the different options we will pursue methods that are both practical and feasible and ensure that we develop a programme that will not cause undue stress to the elephants nor disrupt social behaviour.

Introduction

Between 1973 and 1989 Kenya's elephant population was reduced by poaching for the ivory trade from some 170,000 to 24,000 individuals (Poole *et al.*, 1992). As a result of the 1989 ban and increased protection efforts by Kenya Wildlife Service (KWS), the illegal killing has essentially stopped (KWS elephant mortality database). As Kenya's elephant population gradually recovers from the years of poaching, some populations may eventually need to be regulated. While Kenya's elephant population is now a mere fraction of what it was twenty years ago, there are pockets that are approaching a situation of "too many" elephants.

For example, *in* some areas of the country, elephants sought refuge from poaching by concentrating in parks and reserves thus creating compression and localised habitat destruction (eg: Amboseli National park; Maasai Mara Game Reserve). Other areas outside parks that were previously inhabited by elephants have now been turned over to agriculture. Since the cessation of poaching elephants have started to return to their former range and in doing so they have come into conflict with a newly settled and expanding human population (eg. in Taita Taveta District near Tsavo; across Laikipia District). In other parts of the country, formerly pastoral peoples are being encouraged to settle and are turning to agriculture, thus creating conflict between elephants and people where they were formerly compatible (eg. the Maasai in Narok and Kajiado Districts; the Pokot and Turkana near Nasolot and S. Turkana Reserves, the Samburu near the towns of Isiolo and Maralal; the Rendille and Boran around Marsabit Reserve). In still other parts of the country, the Government has degazetted segments of forests to provide land for the landless creating "island farms" in the middle of elephant habitat or "forest peninsulas" surrounded by farms, thus providing a perfect situation for crop raiding to thrive (eg. around Mt. Kenya Forest; Aberdare Forest; the Mau Forest; on the Siria Escarpment). Finally, from recent surveys undertaken by KWS during the last two years, it is clear that elephants living in forests survived the years of poaching better than savanna dwelling elephants. It is also around the forests of Kenya that the best arable land is found and thus conflict between elephants and people in these areas is intense (eg. Shimba Hills Reserve; Mt. Kenya Forest, Aberdares Forest).

To reduce the injury and damage to human life and property and to ensure support for wildlife conservation in general, KWS has decided to fence several parks, reserves and forests (eg. Shimba Hills Aberdares Forest Mt Kenya Forest. Mwea Reserve). The concern is that in solving one problem we may be creating another. Once fences are erected, the concentration of elephants in one area may lead to

habitat destruction and loss of biodiversity. KWS will be initiating studies in several of these areas to monitor the impact of elephant density on high and low rainfall habitat from savanna bush to forest.

In some of these areas, particularly savanna habitats, it is expected that some form of elephant population control will eventually be required to prevent "undesired" loss of habitat. In some areas of Africa, this problem has been dealt with through culling schemes. KWS considers this solution to be unacceptable for several reasons including: ethical considerations, the negative impact that culling would have on the behaviours of elephants and thus on tourism and the destabilising effect that it would have on population dynamics. KWS has therefore resolved to embark on an immediate programme of research and development to produce humane methods of elephant population control. The overall programme objective is to develop a method of elephant fertility regulation that is a humane alternative to culling.

Potential Contraceptive Methods and Population Models

The concept of regulating the fertility of non-human animal species is not new. In recent years techniques for fertility regulation of domestic and wild species have made considerable advances. Fertility regulation has been successfully carried out in animals ranging from dogs, cats, racoon, white tailed deer, elephant seals, and domestic and feral horses. Thus, the concept of fertility regulation (or "family planning" as it has been dubbed), for elephants is not as alien as it may initially seem. However, elephants do present particular problems (they are large, dangerous, highly mobile, intractable, and have a not altogether typical reproductive system), and even if a suitable, practical method is developed, it is recognised that in some environments no fertility regulation approach will be possible or applicable (Poole, 1992).

Fertility regulation approaches will be targeted at females rather than at males. There presently are no "male" approaches that have a likelihood of maintaining or reducing existing populations. Behavioural data suggest that even if a large number of males were removed from the population and only a few reproductively intact bulls remained, a high number of pregnancies would still result. The programme will therefore investigate several different approaches to contraception for female elephants including pregnancy termination, immuno-contraception and steroids. It will be necessary to develop techniques that do not require anaesthesia for contraceptive delivery since immobilisation would be disruptive to elephant behaviour and would be expensive as well as dangerous to personnel and the targeted elephants. However, occasional anaesthesia will be necessary during the developmental studies for assuring the delivery of certain compounds, collecting biological materials and for assessing the impact of new delivery darts.

KWS is considering several different techniques including pregnancy termination using a compound known as RU 486, immunocontraception, and a steroid approach. We are collaborating with a number of different institutions and individuals to develop the different methods and to model their effects on elephant populations. Each of the different approaches has its own particular advantages and drawbacks (Poole, 1992).

For example, while pregnancy termination using RU 486 (which is now used widely by women) could be ready for testing within a few months and could increase the interbirth interval by two years, it would have to be fed to an individual elephant, making it impractical for use except in small populations where habituated individuals could be trained to take the drug embedded in a piece of fruit.

Steroid hormones, on the other hand, can be delivered orally, injected or implanted. But the potential problems of a steroidal approach include delivery, health effects and incorporating sufficient steroid into implants to suppress reproduction in a species as large as the elephant (Brown *et al.* 1992). It may prove difficult to produce an implant of acceptable size and shape for remote delivery of steroids for use in elephants. Elephants produce low circulating concentrations of progesterone, therefore, it is possible that the species is hypersentive to exogenous progestin, and a relatively small dose may well suppress ovarian activity. Since routine anesthesia is not acceptable, this approach must rely on the development of a new dart implant. The first study will be to develop a technologically efficient dart for the intramuscular administration of a chemical delivery implant. Additional studies will determine 1) the ideal steroid for suppressing reproductive

activity in elephants, and 2) the technical feasibility of incorporating sufficient steroid into a silastic implant that could be delivered within the technical limitations of the implant dart.

Contraceptive vaccines have the advantage that they can be either reversible or permanent, depending upon the nature of the immunological approach and the immunogen which is used for immunisation (Dunbar, 1992). Immuno-contraception has been successfully used in a number of wild species and is seen as being the most likely to succeed in the longer term. However, the development of an appropriate contraceptive vaccine for use on wild elephant populations will undoubtedly require five to ten years of research. The first phase of the study will involve captive animals and will aim to determine the feasibility of injections into skin versus muscle, the presence of adverse tissue reaction to delivery and if antigen injection elicits an immune response. The second phase will be a field study with the aim of determining whether the vaccine induces short or long-term infertility.

The efficacy of any fertility control technique is dependent upon the numbers and ages of individual elephants treated. In most areas of Kenya we would be aiming to maintain elephant numbers at their present level. We are thus primarily concerned with reducing rates of population growth. Two general strategies may be pursued to achieve this, one is to increase the age at first reproduction, the other is to increase inter-birth interval. In some areas it may be possible to apply techniques that lead to decreases in fecundity through increases in both inter-birth interval and age at first reproduction.

Preliminary calculations based on demographic parameters derived from the well studied Amboseli population (Dobson, 1992; Moss 1992), suggest that increasing the average age of reproduction by two years (from 13 to 15 years old), and increasing inter-birth interval from four to six years, would be sufficient to hold most populations at a constant size. Techniques that induce abortion at around 12 months of pregnancy should produce an increase in interbirth interval from four to six years in individual females. In any population each female would need to be treated only once every six years, so in a population of around one thousand elephants, sixty to eighty mature females would be treated each year. In contrast, if an immunocontraceptive is developed that leads to female sterility, the eventual treatment of thirty percent of mature females should be sufficient to hold a population at a constant level. These numbers may be reduced if a significant proportion of young females are induced to abort their first calf.

Although fertility control may reduce the size of elephant populations, their rate of decline will be determined by their overall mortality rate; thus, even if births are halted completely it may take twenty-five to thirty years for the population to decline by fifty per cent (Dobson, 1992). This calculation emphasises the importance of developing a fertility control technique that may be applied as soon as possible.

Discussion

Contrary to recent accounts in the press, Kenya is not suddenly suffering from an overpopulation of elephants. Our concern is that over the course of the next few years we will have several elephant populations enclosed by fences. Under this circumstance, it is likely that in the longer term we will face a problem of habitat loss caused by high densities and restricted movement of elephants. Our interest in developing a programme of elephant fertility regulation comes from a belief that there are better ways to deal with the problem of "too many elephants" than to repeatedly kill off a proportion of the population. Developing a feasible and humane method of elephant fertility control will require a number of years and dedicated teamwork. We welcome the collaboration of others who are interested in achieving a similar objective.

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