MANAGEMENT OF COMMENSAL BABOONS IN SAUDI ARABIA

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ABSTRACT

Following recent urban development in the mountains of south-western Saudi Arabia, local populations of *Papio hamadryas* have become dependent on provisioning around cities.

A comprehensive approach was undertaken to analyze the origins of the current human/baboon conflict situations. Practical solutions to situation-specific problems are proposed. These include male vasectomy and hormonal control of female fertility to lower reproductive rates in fast growing commensal groups, and the use of trained dogs and scare guns to repel baboons from crops and city outskirts. A management program that includes short term solutions to conflicts, and which also outlines ways to tackle the root causes of conflicts is discussed.

Key words : *Papio hamadryas,* commensalism, vasectomy, Saudi Arabia.

INTRODUCTION

Following recent urban development in the mountains of south-western Saudi Arabia, local populations of *Papio hamadryas* have increased in numbers around cities. The resulting conflicts between people and baboons add to problems already experienced in agricultural areas where crop raiding is widespread. The situation has prompted the need to develop a management program to minimize conflict between people and baboons without jeopardizing the future of the hamadryas population.

The first requirement in developing the program was to assess the distribution of wild, raider and commensal baboons. Baboon/human conflict situations were then investigated to find the causes of increasing conflicts with humans for food. Finally we suggest situation-specific solutions to reduce levels of conflict and an overall management plan to prevent the appearance of new conflicts.

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DISTRIBUTION OF WILD, RAIDER AND COMMENSAL BABOONS

The distribution of *Papio hamadryas* in Saudi Arabia was surveyed using standardized transect methods, including group counts, natural resources assessment and interviews with local people (Biquand *et al.,* 1992a).

Hamadryas baboons are distributed throughout the south-western mountains of Saudi Arabia, from the Yemen border to Al-Akhal, where vegetation is relatively rich and rainfall is higher than 150 mm per year. The highest densities of baboons are observed west of Al Baha where annual rainfall reaches 350 mm. Baboons are found wherever water and suitable sleeping cliffs are available, limited interaction with people has probably always occurred. However, human encroachment on baboons' natural habitat has brought these interactions to the point where baboons are now considered a nuisance. Conflicts are particularly severe in agricultural areas where baboon regularly raid crops, and increasingly around cities where large commensal groups thrive on human refuse or provisioning.

CLASSIFICATION OF BABOON/HUMAN CONFLICT SITUATIONS

The relative magnitude of baboon/human conflicts was assessed by inquiries (systematic interviews) throughout the hamadryas range in Saudi Arabia (Biquand *et al.,* 1992a). Only 21 % of 195 local inquiries reported baboon related problems. Another 14 % reported occasional crop raiding (raids occurring less than once a week), which is tolerated by people and does not need immediate action.

Two forms of baboon-human conflict situations requiring different approaches were identified : baboons raiding crops (raiders) and baboons raiding on garbage or being provisioned (commensal). Table I summarizes the differences between raider and commensal groups of baboons.

TABLE I

Differences between raider and commensal groups.

Raider groups	Commensal groups
Observed in rural areas	Observed around cities
Use alternate food sources	Handouts/waste is the main food source
Seasonal raiding	All-year presence on feeding sites
Small groups	Large troops
Flight distance 100-300 m	Flight distance 3-10 m
Repelling by dogs, shooting, guarding	No action to repel

Raider baboons occur in agricultural areas. Crops are not their main food source and raids occur only when crops are ripening. Raider groups are usually

small (1 or 2 one-male units) and farmers repel intruders with dogs or by shooting. Whilst raiding baboons are cautious and the flight distance of these groups on seing people is large (100-300 m).

Commensal baboons gather around cities or places of tourist interest. Provisioning or food gathered at rubbish dumps form the basis of their diet all the year round (see Boug *et al.*, in this issue) and group size can reach several hundred (Biquand *et al.*, 1992b). These large troops are the gathering of loosely associated bands, themselves consisting of several one-male units moving most of time together (according to the terminology of Kummer, 1968). In contrast to rural areas, people feeding baboons or dumping waste are not concerned with the results of their behavior and not ready or willing to give it up. No action is usually taken to repel baboons, which will only flee to a distance of 3 to 10 meters when disturbed by people.

CAUSES OF COMMENSAL AND RAIDER BEHAVIOR

The recent increase in both raider and commensal behavior by *Papio hamadryas* is attributable to different causes (Table II).

TABLE II

Determinants of the increase in raider and commensal activities.

Raider groups	Commensal groups
Extension of agriculture (more crops and less people)	Extension of cities (more people and more waste)
Overgrazing	Improper waste disposal Provisioning by tourists
Predator destruction	Predator destruction

Raiding has increased with a change in agricultural practice. Agriculture has become more intensive, with more food being grown on less land and relatively fewer people living in rural areas. This is compounded by extensive overgrazing, depriving baboons of part of their natural food sources (Biquand *et al.*, 1992a). An additional factor is the systematic destruction of baboon predators.

Commensal groups have increased in number and size with the extension of cities and with the concomitant increase in waste disposal problems. In addition local people or vacationers distribute increasing amounts of food to baboons. Predator destruction is also a factor.

The fundamental objective of our management program is to reverse the causes of increased human/baboons conflicts. This can only be achieved in the long term. In the meantime techniques to minimize conflict in areas where it is the most severe were proposed and tested (Table III).

TABLE III

A list of proposed solutions.

Without trapping	
Chemical repellents	Ineffective
Scaring sounds from predators	Ineffective
Trained dogs	To be implemented
With trapping	
Translocations	Restricted applications
Conditioned Taste Aversion	Restricted applications
Scare gun	Effective (?) needs collaring one baboon per group.
Population control	
Vasectomy males	Effective
Norplant-2TM females	Effective

TRANSLOCATION

Translocation is frequently proposed in other contexts (Strum and Southwick, 1986 ; Malik and Johnson, 1991), however few areas are available in southwestern Saudi Arabia where baboons could be transferred. Our census suggests that baboons occupy all suitable habitats available (Biquand *et al.,* 1992a). In addition, local people are likely to be adverse to receiving baboons because of the risk of crop raiding. The translocations achieved in Kenya (Strum and Southwick, 1986) or India (Malik and Johnson, 1991) exemplified the usefulness of the technique for small valuable populations ; in the case of the Saudi Arabian commensal or raider baboons large numbers can be involved and this solution is not viable.

CONDITIONED TASTE AVERSION

The technique of Taste Aversion Conditioning has been tried with success in Kenya by Forthman-Quick (1986). However, it has two major drawbacks making it inappropriate for our situation. First, baboons were able to detect lithium chloride in baits, and had to be restrained to permit application of the LiCl by intraperitoneal injection (Forthman-Quick, 1986). Baboons thus have to be trapped and treated one by one. The second major drawback is that taste aversion is specific to the food ingested at the time of treatment, and treating for several different food would be impractical. Moreover, if repeated for different food, overshadowing may occur and conditioning against the first food will weaken and disappear. Another factor is that strong aversion are only generated in highly flavored foods ; bland foods such as bread and rice commonly found in the diet of commensal baboons would result in only weak aversions.

OLFACTORY REPELLENTS

The ideal repellent would be a chemical which could stop baboons entering a given area, one which is persistent and one which does not need to be sprayed over the food items themselves. Several types of repellents are proposed by agrochemical companies, including plant extracts of unknown origin (eg. Hate4c™, Hors de mon Jardin™), AAprotect™ which is prepared from Zirame and which is active as a game repellent and fungicide ; and Curb™ which is derived from aluminium ammonium sulfate and whose action induces a chemical cauterisation-like effect on nasal membranes. Only one of the chemicals (Hate4c™) is supposed to deter baboons when sprayed around a given area. However, carefully tested at different concentration levels on captive hamadryas baboons none of the repellent compounds proved effective (Biquand *et al.*, 1989).

NOISE SCARING

We also tested the use of scaring noises that could repel baboons or at least make them feel insecure. Noise scaring is used in birds, where the broadcasting of alarm and distress vocalizations is an effective deterrent in several species.

Our trials took place at the municipal refuse tip of Taif, which supports a population of more than 400 baboons.

We selected calls of potential baboon predators (lion, leopard, hyena, wolf) and alarm calls of baboons. The acoustic stimulus was broadcast through a speaker concealed in the rocks, while we recorded from a distance the vocal response of baboons, and taped the whole scene on video. Stimulation tapes for each type of sound stimulus comprised of a two minutes stimulation followed by three minutes silence, this sequence was repeated three times. We observed no change in baboon's vocalization, no mobbing or running away and the baboon's interest in the broadcast sound seemed very limited. Baboons rarely react to predators by running away, rather they are more likely to mob and attack predators. We observed no mobbing of any sort in response to vocalization alone. Visual stimulation by the appearance of a predator appears to be important in eliciting a reaction. For instance, when a hyena encountered a baboon group, the baboon's reactions were intense including extended alarm calling and mobbing by males forming a circle around the intruder. In any case, a mobbing response rather than an escape response to recorded baboon predators or baboon distress calls might make the use of such vocalizations unsuitable to deter animals from crops.

A scare gun, producing detonations at random intervals was effective in repelling baboons in early trials presumably by an association between the blast and previous experiences of being shot. The drawback of the scare gun is habituation. To prevent habituation, the gun should be used only when baboons are in sight so that the baboons learn to associate the raid and the gun blast. As the same groups regularly raid the same places, it is possible to fit out a male baboon with a radio tag which will automatically release the gun only when the baboon is within the range of the receiver.

All of the group will thus be exposed to the detonations by the tagging of only one baboon.

An experimental system has been set up for trials (Fig. 1). The radio signal is received by a standard telemetry receiver from which peak values are directed to a data logger, which stores the tagged baboon's presence data. When the baboon is present for more than 30 seconds the gun is released for 3 minutes. If this prototype proves efficient, the trigger could be simplified, using specific vocalization patterns to release the gun (screams or grunt).

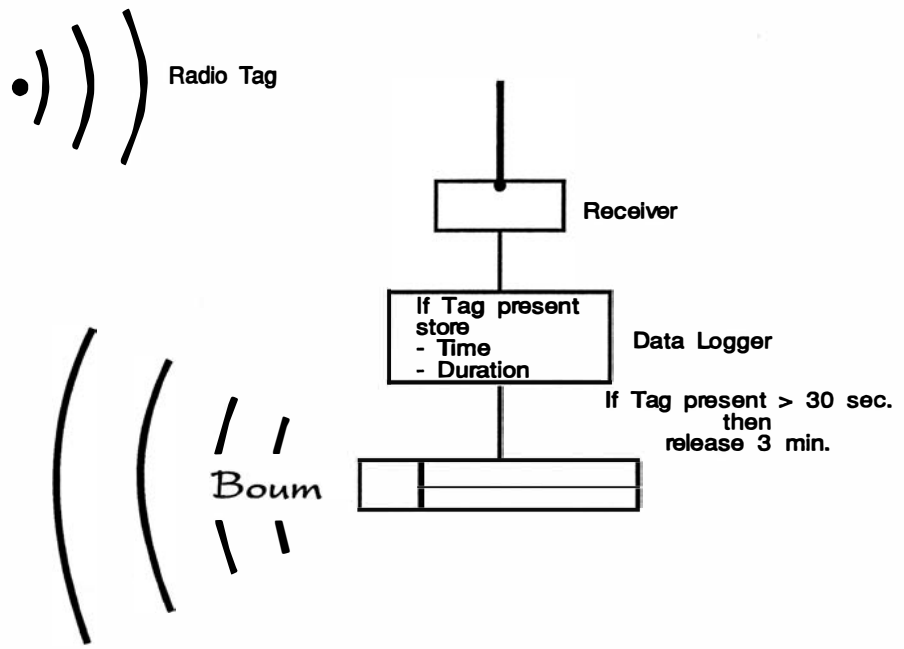

Figure 1. — Diagram of the experimental scare gun operation. As soon as a radio tagged animal is detected, the data logger starts a clock ; if the animal stays more than 30 seconds in the detection range, the scare gun is activated for 3 minutes.

TRAINED DOGS

Dogs and Arabian hamadryas are generally indifferent to each other when feeding on common food sources such as dumps, where a number of feral dogs wander among the baboon groups.

Nevertheless, during our inquiries with bedouin people we encountered several who had dogs for the specific task of repelling baboons. While these dogs were not purposely trained they would readily chase intruder baboons and occasionally grab young, and baboons carefully avoided these potentially dangerous carnivores. From these observations we recommend the use of dogs wherever possible to protect property or crops. We are similarly encouraging the creation of teams of trained dogs to guard outskirts of cities when house raiding by baboons is of concern (Boug *et al.*, 1991).

The concern about large commensal groups gathering around cities is their fast expansion rate, resulting from the abundant and reliable food supply. Among the options considered was the removal of commensal groups. However, extirpation of whole groups around cities where food sources are not themselves removed would just delay the problem. New groups from the wild would eventually discover the easily accessible resources and would replace groups as they were moved. In this way the feral baboon population may be seriously depleted by funnelling it towards resource rich city outskirts.

Sterilization appears to be the method of choice to stop the growth of commensal populations. We conducted a pilot study using male vasectomy to control reproductive rate. The social system of the hamadryas is based on long lasting one-male units and sterilizing the male should ensure that all the females within his unit are prevented from reproducing. The experiment was also intended to investigate whether extra unit matings would take place.

The experiment took place in Heet (Central Arabia) using an isolated group comprising five one-male units. Four males were vasectomized and one male remained fully functional (Fig. 2). After nearly four years, we observed that only

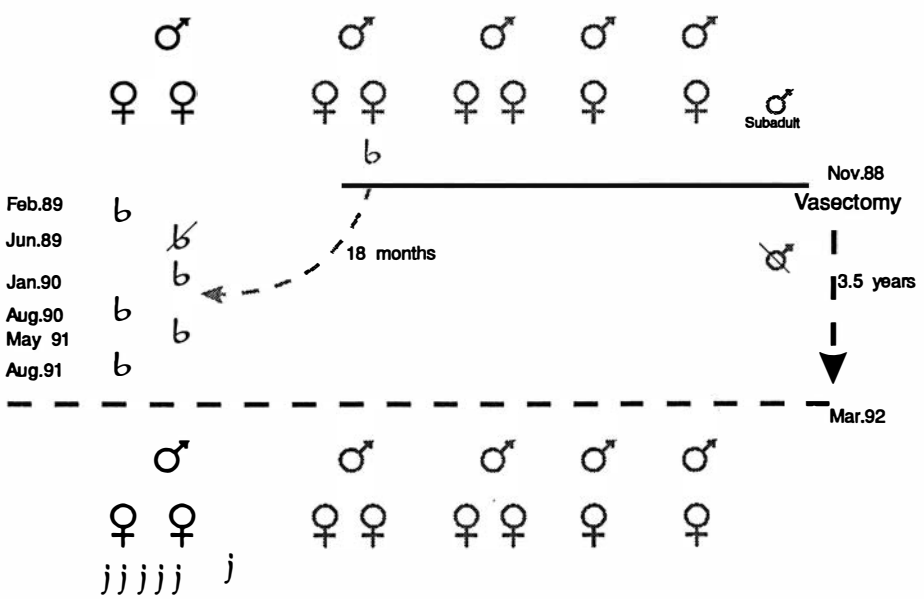

Figure 2. — The vasectomy experiment on an isolated group of *Papio hamadryas* in Heet, Saudi Arabia. Vasectomy of all adult males but one was performed in November 1988. The composition of units remained stable for 3.5 years at the time of our last observation. In the group whose male remained intact, births have continued. During this period, one subadult and a young baby died, from unknown causes. Another young conceived before vasectomy moved from his mother group to join in the fertile group.

the functional male had indeed reproduced, and that the composition of the others one-male units remained unchanged even though females with vasectomized males had not reproduced for four years. This observation shows the very specific link between male leaders and females in the hamadryas social system, where the male can effectively prevent mating by females within his unit with other males. The only individual move between units was a young born shortly after the vasectomy (from an earlier conception), this single young joined the fertile unit where peers were available (Fig. 2).

These results show the feasibility of vasectomy as a tool to effectively prevent population growth in *Papio hamadryas*. Application of this technique has started in several commensal groups.

The control of reproduction in females is easily performed with the use of progestin implants. Norplant-2™, an implant devised for human use is currently used to control fertility in several monkey parks or zoos. In the Saudi hamadryas, our trials showed that a single implant of 70 mg levonorgestrel suppresses oestrus in females. The effect is expected to last for two to three years.

Apart from the use of trained dogs, all effective methods discussed require trapping of animals, which is both costly and time and energy consuming (Table III). The goal of reducing human/baboon conflicts will only be achieved through a holistic management plan that tackles the root causes of the problem.

MANAGEMENT STRATEGIES

The fundamental cause of baboons shifting to human food consumption is linked to a reduction in natural food supply brought about by overgrazing, deforestation and enlargement of cities and villages, all extending human encroachment onto natural sites (Fig. 3). The reduction of natural food supply often coincides with a sudden increase in artificial provisioning of groups that come in contact with people. Random and possibly long-term meteorological variations (see Biquand *et al.*, 1992a) also participate in the regions subjected to local drought. The removal of predators compounds with these factors.

Consequently, actions should be taken to control, wherever possible, each of the causal factors as well as treating their effects (Fig. 4).

First, action should be taken at the local and regional level to discourage dumping, encourage garbage recycling and prohibit feeding baboons. Legislation may be necessary to achieve these objectives.

The baboon problem is a symptom of wider dysfunctions including overgrazing, deforestation and predator destruction, problems that can only be properly dealt with at a national level. The necessity of legislation to protect the environment in Saudi Arabia has only recently been recognized, and new laws are needed to protect endangered species and critical habitats, other priority areas for action should be the regulation of land use to prevent overgrazing and deforestation. An extended network of protected areas is currently being created that will hopefully result in local restoration of the lost equilibrium. The short term solutions (dotted lines in Fig. 4) will alleviate baboon pressure while these fundamental corrective actions are implemented.

All our actions will only be effective if endorsed by the people, and therefore we are initiating awareness campaigns to raise public consciousness. These

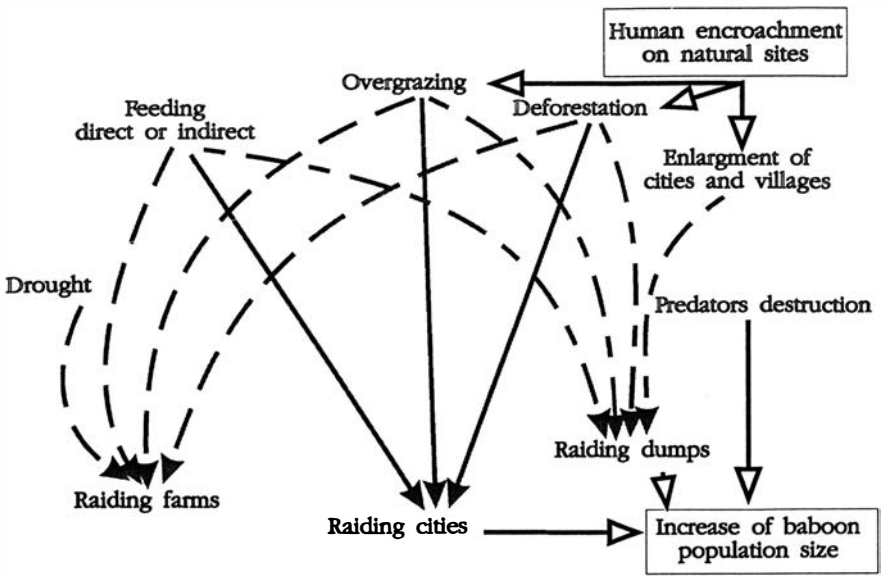

Figure 3. — The fundamental causes of baboon's raider and commensal behavior.

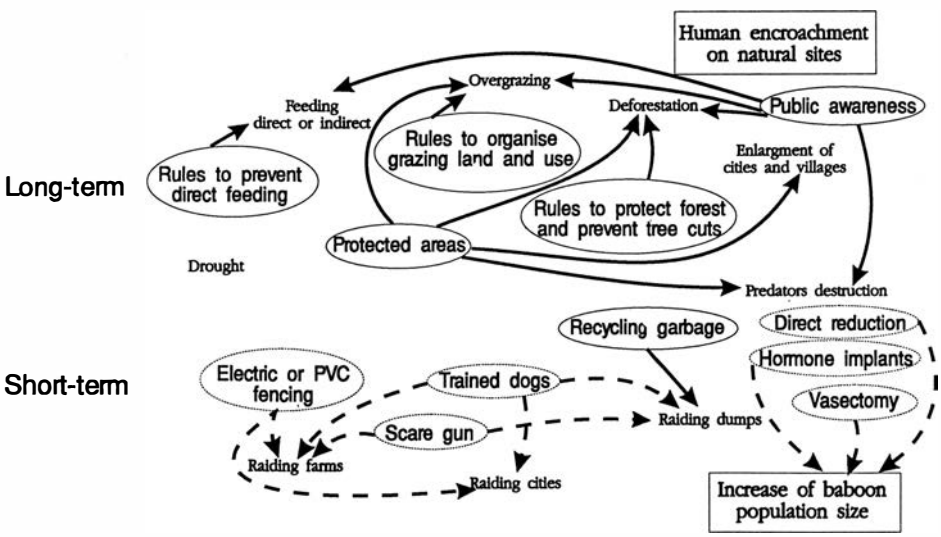

Figure 4. — The short and long-term solution to the problem of commensal and raider baboons. The long term solutions aim at the fundamental causes shown of figure 3 ; in the meantime, short term solutions aim at reducing baboon raiding pressure and population size.

campaigns presently include programs on television and advertising in national newspapers. They will be followed by informative displays on public-service bills as well as posters at feeding spots.

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RÉSUMÉ

Avec le récent développement urbain dans les montagnes du sud-ouest saoudien, certaines populations locales de *Papio hamadryas* sont devenues dépendantes de l'homme pour leur subsistance.

Nous avons mené une analyse globale de la situation et des origines des conflits homme/babouins en Arabie Saoudite. Parmi les solutions pratiques pour résoudre les situations de conflit, nous avons proposé et expérimenté la réduction du taux de reproduction par vasectomie des mâles et implantation hormonale des femelles, l'usage de matériel d'effarouchement acoustique (canon à gaz modifié) et de chiens spécialement entraînés. Un programme d'action a été mis en place comprenant des solutions à court terme pour parer aux situations de conflit déjà installées et des actions à long terme pour supprimer les causes fondamentales du commensalisme en Arabie.

Mots-clés : *Papio hamadryas, commensalisme, vasectomie, Arabie Saoudite.*

REFERENCES

BIQUAND, S., BIQUAND-GUYOT, V. & BOUG, A. (1989). — *Study of* Papio hamadryas *in Saudi Arabia, the problem of Commensalism.* National Commission for Wildlife Conservation and Development, Riyadh (Internal report, pp. 1-284).

BIQUAND, S., BIQUAND-GUYOT, V., BOUG, A. & GAUTIER, J.-P. (1992a). — The distribution of *Papio hamadryas* in Saudi Arabia : ecological correlates and human influences. *Int. J. Primat.,* 13 : 223-234.

BIQUAND, S., BIQUAND-GUYOT, V., BOUG, A. & GAUTIER, J.-P. (1992b). — Group composition in wild and commensal hamadryas baboons : a comparative study in Saudi Arabia. *Int. J. Primat.,* 13 : 533-543.

BOUG, A., BIQUAND, A. & BIQUAND-GUYOT, V. (1991). — An example of management of pest baboons around urban areas. *In :* A. Ehara *et al.,* (eds) *Primatologia today :* 39-40, Elsevier Scientific Publishing.

FORTHMAN-QUICK, D.L. (1986). — Controlling primate pests : the feasibility of conditioned taste aversion. *In :* Taub, D.M. & King, F.A. (eds) *Current perspectives in primate social dynamics :* 252-273. Van Nostrand Reinhold Company, New-York.

KUMMER, H. (1968). — *Social organization of hamadryas baboons. A field study.* S. Karger Basel (Switzerland), New-York.

MALIK, I. & JOHNSON, R.L. (1991). — Trapping and Conservation : Development of a translocation project in India. *In :* A. Ehara *et al.* (eds), *Primatologia today :* 63-64 Elsevier Scientific Publishing.

STRUM, S.C. & SOUTHWICK, C.H. (1986). — Translocation of primates. In : K. Benirschke (ed.), *Primates : The road to self-sustaining populations :* 949-957. Springer Verlag, New-York.