

Forum

Luigi Fossati: A forgotten early primatologist and his observations on hamadryas baboons (*Papio hamadryas*) in Eritrea

Introduction

History of science is full of scientists whose work was not fully comprehended or was misjudged by their contemporaries and then eventually fell into oblivion (MAYR 1982). Gregor Mendel probably represents the most famous example of such kind. Luckily, his work was "rediscovered" around 40 years after the date of publication. A comparable phenomenon regards people who are not professional scientists but have an interest in zoology and decide to take notes, sometimes published in the form of diaries or popular books, on their experiences with animals. Such publications are often ignored by scientists although they may provide useful information on animals, particularly for observations collected in wild areas that now face high human disturbance but were relatively "intact" at the time of the study.

The aim of this paper is to describe some of the observations that LUIGI FOSSATI, an Italian army officer, collected on hamadryas baboons in Eritrea in the 1920's and compare them with what it is currently known on this species.

FOSSATI's observations on hamadryas baboons

LUIGI FOSSATI was enrolled in the Italian army based in Eritrea, an Italian colony until the Second World War, where he spent several years. By the time he moved to Eritrea he already had a strong interest in animals and the capacity and time available for detailed observations on baboons. Having returned to Italy in the late 1920's, he published several books and papers on hunting and on the behaviour of various Eritrean mammals and birds. His interests ranged from interactions between different species of mammals and birds (FOSSATI 1936) to the behaviour of little-known species of mammals, such as the aardvark *Oryctopus afer* (FOSSATI 1937). FOSSATI concentrated his observations on hamadryas baboons in the first six chapters of a book entitled "Uod Baracà" (FOSSATI 1930), meaning "wild sons" as a reference to the hamadryas baboons. This book, written in a non-scientific style, is thus the main focus of our attention.

The observations of FOSSATI were done on Mt Gaab in the Aidereso Valley, near Asmara (15.2°N, 39.1°E). The first thing to notice is that this book and his other papers remained totally unnoticed by the scientific community in Italy and abroad. GIUSEPPE SCORTECCI, a famous Italian biologist and explorers of arid regions, in the first volume of his encyclopaedia 'Vita degli Animali' ('Animal Life'; SCORTECCI 1953), did cite ZUCKERMAN (1932) classic work on the hamadryas baboons of London Zoo and his own observations on baboons in Northern Somalia. However, SCORTECCI completely ignored FOSSATI studies. Moreover, none of FOSSATI books and papers was cited in the classic account of YALDEN and colleagues on the mammals of Ethiopia and Eritrea (YALDEN et al. 1977, 1996).

In Uod Baracà, FOSSATI described various aspects of the behaviour of hamadryas baboons and the way he habituated them to his presence. For example, he noticed that by limping he could get closer to the baboons and increase their tolerance of him. The habitu-

ation process was also facilitated when baboons had not had any previous experience with hunters. Conversely, he had to leave the gun anytime he tried to approach troops living near human settlements to avoid scaring the animals. After the habituation period, most of FOSSATI observations were concentrated on a troop comprising around 300 individuals that tolerated his presence even at a short distance.

FOSSATI emphasised in his book the fact that adult males often interact with, and protect infants and juveniles. He also observed an adult male transporting a wounded juvenile during group movements. FOSSATI did not report any female transfer into a new group. Conversely, he observed that males moved to new groups when they reached adulthood at about 8 years of age and acquired females from the older males of the same or of a different band to form new "famiglie" (families). The author explained that dispersing males may spend long periods alone before joining a new group and they are thus more at risk of predation.

Overall, these observations partly support what has been found by more recent studies. Indeed, male-infant amicable interactions are often observed in baboons as they tend to reduce the risk of infanticide by other males, favour female mate choice or reduce agonistic male-male interactions (e.g., SMUTS 1985). Moreover, dispersion is now largely recognised as a factor that significantly increases mortality rate (e.g., PUSEY & PACKER 1987). It is interesting to notice that FOSSATI did not clearly state that females are the dispersing sex. Moreover, he did not explain whether males who had acquired one or more females from another male in the band tended to remain in the same band or to form a new one. We may imply that he considered the two things as equally likely possibilities. Recently, genetic analyses suggested that hamadryas baboons may represent an exception among Old World monkeys by being a female-biased dispersal species (HAPKE et al. 2001). This conclusion, however, needs to be supported by further analyses. Indeed, hamadryas females have been observed to either move from one-male unit to another in the same band or to be "kidnapped" by males from other bands (HAPKE et al. 2001, D. ZINNER pers. comm.). If this is so, the genetic structure of a population may indicate female migration although females only "voluntarily" move within the same band. This process cannot be considered as true dispersal if bands are equated to the multimale-multifemale troops of other Old World monkeys. Moreover, dispersing single hamadryas males have been observed joining hybrid olive baboon groups (PHILLIPS-CONROY et al. 1992). As such, these observations support FOSSATI's observations and indicate the need of further research on the topic.

An aspect of the social organisation of hamadryas baboons that FOSSATI apparently failed to describe is their complex social organisation. He did not observe or comprehend that baboons are organised into different social levels (i.e. one-male harems, bands and troops) which differ in size and in the genetic and social relationships among the animals forming such levels (ZINNER et al. 2001). This failure may be related to the fact that FOSSATI was unable to individually recognise most of the baboons, as he admits at the beginning of his book. However, the multi-levelled social organisation of hamadryas baboons is difficultly detected in Eritrea (D. ZINNER pers. comm.), suggesting that this social structure may not be as evident in the Eritrean population as it is in the Ethiopian hamadryas baboons (KUMMER & KURT 1963).

Interestingly, FOSSATI reported a realistic description of an association between a solitary baboon and vervet monkeys (*Chlorocebus aethiops*). He observed a dispersing male baboon following a group of vervet monkeys for some consecutive days and spending the night at close distance with them. The male baboon slept on the cliff and the vervet monkeys on the nearby trees. The two species were not observed to exchange aggressive behaviour while FOSSATI noticed some cases of inter-specific grooming (he did not specify whether grooming was mutual or unidirectional). The author also hypothesised that the main reason of such associations was the increased chances for the baboons to detect or mob a predator (a beneficial situation, particularly for solitary animals). When a leopard was spotted by the monkeys, during such an association, vervets moved to the small branches of the tree where they were sleeping while the baboon fled on the rocks.

Indeed, we believe that the most interesting part of the book is when FOSSATI describes the response of baboons to various predators. According to FOSSATI, leopards, striped hyenas, eagles, and pythons are all potential predators of baboons. The author considered the "Ah-

Uh" call as the most common alarm call for baboons. We believe this call to be a "wahoo" (the spelling is different but the pronunciation is similar in English and Italian), a call that baboons use in various context other than in the presence of predators (FISCHER et al. 2002). FOSSATI noticed that baboons responded in a different way according to the type of predator present. Interestingly, FOSSATI discussed how baboons also responded in the appropriate way to alarm calls given by other species (i.e. the vervet monkeys, *Chlorocebus aethiops*; the rock hyrax, *Procavia capensis*; the klipspringer, *Oreotragus oreotragus*; and some birds) and how such inter-specific communication was particularly beneficial for solitary baboons. Indeed, at the present state of our knowledge baboons seem to have a relatively limited range of alarm calls (CHENEY & SEYFARTH 1990, FISCHER et al. 2002). Baboons may thus obtain information about the type of predator present from the alarm calls of other species and not only from calls of conspecifics. FOSSATI recognised that baboons can clearly discriminate between predators and non-predators with a similar body shape or behaviour as, for example, the baboons emitted alarm calls when they observed an eagle but remained silent in the presence of vultures. It is also described a case of predation of a juvenile baboon from a Verreaux's eagle and how its mother and its supposed father tried to defend the juvenile from the predator attack. FOSSATI emphasised as just weaned juveniles are most vulnerable to eagle predation. It is important to notice here that the first description of the Verreaux's eagle as a potential predator of baboons (ZINNER & PELÁEZ 1999) was published in a scientific journal more than 70 years after FOSSATI's observation. Interestingly, ZINNER & PELÁEZ studied hamadryas baboons in approximately the same area where FOSSATI conducted his study. The honey badger (*Mellivora capensis*) is included among the potential predators of baboons and FOSSATI reported a case in which one honey badger was killed by an adult male baboon while attempting to catch a juvenile monkey. These observations anticipate of many decades more detailed accounts on predator response in baboons. Indeed, the capacity of baboons and other primates to discriminate between potential predators and non-predators, the referential meaning of alarm calls and the different behavioural response of monkeys to the various calls have only been demonstrated in the last 30 years (CHENEY & SEYFARTH 1990). The inclusion of the ratel as a potential predator of baboons has, to our knowledge, never been reported in the scientific literature and it thus needs to be confirmed.

Conclusions

All the information contained in FOSSATI's book demonstrates that he had the capacity for detailed, reliable and precise observations on baboon behaviour. We thus believe LUIGI FOSSATI merits to be fully recognised as one of the first students to conduct long term observations on the behaviour of wild primates and his fascinating books to be rediscovered by scientists and by the general public. He was a precursor in behavioural ecology studies on wild animals in a period when field work was rare and dangerous. We stress here the importance of early observations, conducted when the human impact on habitat characteristics was minor or irrelevant, for our comprehension of various ecological and behavioural processes. Throughout his book, FOSSATI also showed a remarkably positive attitude towards monkeys, unusual for his time. Unfortunately, his lack of any academic status, and his non-scientific writing style, probably determined his observations to remain unnoticed by the scientific community. We hope that, through this paper, FOSSATI may be included in the history of primatology and his observations help to improve our understanding of the behaviour of hamadryas baboons.

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