

CHAPTER 1 – INTRODUCTION: THE CONTEXT OF CONFLICT AND OUTCOMES

This is the first major study of the Buton macaque (*Macaca ochreata brunnescens*) and although it focuses on the issue of crop-raiding, is also the first to draw together the results of five years of student projects on the behaviour and ecology of this species. The majority of the Sulawesi macaques, unlike most macaque species, have been little studied, and the Buton macaque in particular has had only one short (17 day) study previously published (Kilner 2001). These macaques are endemic to two islands off South-east Sulawesi and their status, population and ecology are effectively unknown (see chapter 3). The Buton macaque is not considered a primary crop pest by either the Buton Department of Agriculture (pers. comm.) or in the literature (Whitten *et al.* 1988). However, following preliminary studies in 1999, when extensive crop-raiding was witnessed in villages near a protected forest area, this study was conceived in order to establish the extent of any damage and the perceptions of local people towards this.

It is fast becoming dogma that conservation will only work when the views of local people are considered and that these views are incorporated into plans to manage and conserve wildlife and wild places (see however Oates 1999). This is part of a wider recognition globally, that conservation and development policy conflict arises because differences in knowledge, understanding, ideas and beliefs between stakeholders determine their perceptions of the problem and the possible solutions (Adams *et al.* 2003). Thus it is not possible to, for example, simply analyse the economic interests of people in relation to claimants' rights to a resource; different people will perceive the landscape and resources in different ways. Management effectiveness will always be hampered by incomplete

knowledge and understanding of complex social and natural systems (Adams *et al.* 2003). Thus new strategies have been developed, often referred to as ‘community conservation’, to achieve this goal (Adams and McShane 1992; Hackel 1999; Infield and Namara 2001). Management of protected areas often brings hardship to poor, rural communities bordering protected areas due to lost economic opportunities, exclusion from potential resources and damage and depredation to crops and livestock by wild animals (Infield and Namara 2001). Conflicts between the needs of conservation programs and local needs for development are common problems, and have been approached through ICDPs (integrated conservation and development programs) (IIED 1994; McShane and Wells 2004; Woodman 2004). With rapidly increasing populations living in areas of high biodiversity and conservation interest, living in poverty and relying on subsistence farming, conflict between conservation priorities and or the species of conservation concern, is likely to increase. Contradictions between the demands for increased development, production and economic security, and needs of wildlife conservation have led to rejection of conservation efforts by communities living around protected areas in Africa and Asia (see for example Abrahamson 1983; FWI/GFW 2002; Hackel 1999; Infield and Namara 2001). Conflict may exist on a community level in terms of priorities for investment and aid between local development and conservation (Balmford *et al.* 2001; Hackel 1999). Conflict may also occur on an individual level and can take the form of depredation of livestock and crops by wild animals or human death and injury. Conflicts over habitat use may develop, for example access to water holes. Tourist lodges, temples and roadsides are other potential areas where conflict can occur. Disease transmission, competition, for example between fisheries and wild sea mammals, trapping for the biomedical trade and hunting for bush meat are also potential conflict areas (see for example Barnes 2002; Bertram and Ginsberg

1994; Lee *et al.* 1986; Robinson and Bennet 2000; Sillero-Zubiri and Switter 2001; Sitati *et al.* 2003; Southwick and Siddiqi 1998).

The existence of interactions between humans and wildlife, such as close encounters, crop damage or depredation of livestock by wild animals, does not automatically mean that conflict is present. The term conflict, which is so often used to describe these interactions, might in fact contribute to the escalation of such relationships into a conflict situation (Lee 2004). By using that label in studies there is the implication, *a priori*, human-wildlife interactions are negative and animosity exists. First and foremost it is necessary to establish whether such an interaction actually leads to a conflict situation, before assigning such provocative labels. It is very easy to witness a situation where a wild animal is taking crops from farmers' fields and immediately assume a conflict exists. Perhaps 'conflict' does not exist. If it does not, then it is important to understand the perceptions driving this view.

The relatively small (approximately 4520 km²) island of Buton is the last stronghold of the Buton macaque. The original land cover was predominantly lowland forest (<1000m altitude) of semi-evergreen rain forest, with high tree species diversity, on limestone karst substrate (O'Donovan, pers. comm., Milsom, pers. comm.). With increasing clearance of land for farming, this species of monkey is of conservation concern. Ambonese transmigration camps have appeared in recent years, further eating into the forest (pers. obs.). A recent proposal to upgrade two of the forest reserves in central Buton to National Park status means that although their habitat may be potentially saved, there is a possibility of increased animosity towards wild animals by those farming the forest edge (see chapter 8). It is therefore vital to assess the impact of the Buton macaque on farmers' fields, to investigate perceptions towards the macaque and to distinguish whether

macaques are really a problem or are just perceived as such. If macaques are deemed to be a significant threat to livelihoods or if conflict does indeed exist, it is vital to begin to develop suitable management strategies and to understand the causes and dynamics. If we hope to conserve species it is essential to understand any conflict in order to manage it, or to develop strategies for conflict mitigation. It was with this in mind that this study was conceived.

Cercopithecoids are frequent crop pests (see chapter 3), and in some places are classed as vermin, for example baboons (Mascarenas 1971). Generalisation of diet has probably enabled this; they are all opportunistic frugivores with increased intelligence and manipulative capabilities (Chivers 1986; Gautier and Biquand 1994). Terrestrial species are also more likely to raid crops than arboreal species (Sillero-Zubiri and Switter 2001). Crop-raiding does not necessitate the development of any particular suite of novel behaviours and thus many primates might be capable of using species-specific behaviours most often used outside the raiding context to take advantage of this abundant food resource (Warren 2003). Macaques, in particular, are commensal with humans across their whole range. Many species of macaques possess all the traits which enable them to successfully exploit agricultural resources, namely being primarily terrestrial with an ability to utilise arboreal habitats, generalised opportunistic frugivores, living in complex social groups, and possessing cheek pouches to store food and therefore maximise food acquisition (Sillero-Zubiri and Switter 2001). Macaques have been classified by Richard *et al.* (1989) as weed or non-weed species, according to their ability to exploit human resources. However, the Sulawesi macaques are not considered to be weeds and studies of *M. nigra* have suggested it is intolerant of human disturbance (Rosenbaum *et al.* 1998). Chapter 3 discusses what little is known about the socio-ecology of the Buton macaque in

the context of other macaque species and primate pests. In chapter 8, the designation of the Buton macaque as a non-weed is challenged.

Farmers' perceptions regarding wildlife damage provide valuable information for determining ways to mitigate conflict. This topic is explored in detail in chapter 5. However, validation of crop depredation is required in order to support or refute farmers' perceptions. Wildlife damage management policies and strategies can then be enacted, if necessary, to reduce or eliminate conflicts between agriculture and wildlife. In chapter 4, exclosure plots are used to determine maximum potential offtake by macaques, while vegetation transects are used to measure damage in farmers' fields. Measured damage is then compared directly with perceived damage. Predictive models for crop loss are then developed based on geographic and crop variety factors, which can ultimately be applied to the human perceptions (see chapter 8).

Chapter 5 focuses on the attitudes and perceptions of the farmers towards monkeys and crop loss. Demographic variables and socio-economic factors are investigated in relation to these perceptions. General attitudes towards monkeys are discussed and predictors for perceived damage levels are determined. Social factors, power, perceived exclusion, gender, wealth and knowledge, i.e. education, may be extremely influential as underlying determinants of attitudes (Infield 1988). These social factors are explored in detail.

Among most primates, food abundance and quality are key factors influencing general socio-ecology (Altmann, S.A. 1974; Terborgh and Janson 1986). Thus any primate that is able to exploit a predictable, geographically concentrated and rich food resource, such as crops, will probably show differences in activity patterns, range use and sociality (Asquith 1989; Musau and Strum 1984; Oyaro and Strum 1984; Strum 1994). The activities and

behaviour of Buton macaques specifically in the context of proximity to farms are examined (chapter 6). Since little is known about these macaques outside the context of the farms, these data represent a first attempt to explore behaviour at the level of the age-sex class for this macaque. Farm behaviour is also used to develop a raiding profile for the monkeys (sensu Crockett and Wilson 1980; Maples *et al.* 1976). Characterising raiding behaviour can contribute to the development of conflict reduction strategies, and to understanding the potential consequences to and responses of the monkeys if raiding is prevented.

Human activity on farms will affect the likelihood of monkeys raiding that farm. The impact of humans on raiding has not been assessed before using direct observation, and typically relies on reports from farmers as to their activities on the farms. In this study focal farm surveys were used to both record the monkeys' behaviour on the farms, as well as human and dog activity. Human activities were then related to frequency and duration of raiding (chapter 7).

The ultimate goal of most studies on crop damage by wildlife is to suggest methods to reduce any crop loss, and although this was not the primary goal of this thesis, potential methods are discussed based on the findings of this study. Studies on the effectiveness of various deterrence techniques have been carried out for other species, for example the efficacy of hunting, feeding and fencing as a deterrent to European wild boar (*Sus scrofa*) (Geisser and Reyer 2004). However systematic studies of methods of deterrence are lacking for primates. The focal farm surveys and the recording of human activities enabled all instances of deterrence on those farms to be recorded. Although the effectiveness of these deterrents was not systematically evaluated, they have been related to the raiding activities of the monkeys on those farms in an attempt to explore avenues for further

investigation (chapter 7). A small pilot study assessing the effectiveness of a particular deterrent, active patrolling, is also described in chapter 7.

In the final chapter, the ‘reality’ – what the monkeys do, when they do it, and how often – is placed into context with what the humans do, and what the humans think. In this first synthesis I have tried to link real-time perceptions with real-time damage, and explore when and why mismatches between perception and reality occur. This is the first attempt to directly explore the connection between perceptions and over- or under-estimates of damage, and is vital to enable management plans to address the attitudes driving any conflict. Potential routes for further study and possible management solutions are also discussed.

1.1 STUDY AIMS

Ultimately this study aims to investigate crop-raiding by the Buton macaque both in terms of what the monkeys are actually doing, and the attitudes and perceptions of the farmers towards them. It is an attempt to directly and quantitatively compare perceptions and reality with a view to understanding how to manage the situation in the long term, in order to conserve this primate.

1.2 SPECIFIC AIMS

Chapter 3

- § Collate the short-term studies on the Buton macaque to produce a basic profile of the socio-ecology and population abundance of this species.

Chapter 4

- § Quantify potential maximum offtake by macaques and pigs using enclosure plots.

§ Assess levels of crop damage by macaques in farms and develop predictive models for this loss.

§ Directly compare measured damage to estimates provided by farmers at the time of study. Many studies rely on recall of farmers to report damage events over the preceding month. This is the first attempt to do a direct, real-time comparison, hopefully negating the danger of recall bias.

Chapter 5

§ Determine perceptions towards monkeys both as crop pests, and in general and relate this to socio-economic, demographic and crop damage factors to develop predictive models.

Chapter 6

§ Investigate the raiding behaviour of the Buton macaque and characterise raiding.

Chapter 7

§ Assess the impact of human presence as a factor in preventing or reducing raiding by macaques.

§ Assess the influence of specific active deterrents on patterns of raiding.

Chapter 8

§ Synthesise perceptions and reality to assess the impact of the Buton macaque as a crop pest and determine if a human-wildlife conflict exists in this area.

§ Suggest future avenues of research to develop management strategies for the Buton macaque.