

**Modelling Primate Crop-Raiding - Perceptions of Risk, Actual Risk and the
Implications for Conservation**
Final Report – December 2008

Introduction

Crop-raiding is a form of human-wildlife conflict which directly affects local people's perception of and support for conservation initiatives^[1-3]. Insects, rodents, birds and antelope are frequently cited culprits, due to their impact on cash crops^[4, 5-13]. However, in areas of high conservation concern primates are commonly significant pests^[14-19] and perceived as the most serious risk to subsistence farmers^[20]. Crop-damage causes economic loss, opportunity cost and promotes negative perceptions towards species of conservation concern^[1, 20-23]. Primates dominate amongst pests that damage crops, particularly around African and Asian reserves^[24]. Primates are responsible for crop-losses of up to 70% of an individual farm^[19] and 60% of annual harvests^[23]. Management of protected areas often brings hardship to communities due to lost economic opportunities, exclusion from resources and crop/livestock damage by wild animals^[25-27]. The absence of effective and locally acceptable methods of combating human-wildlife conflict has led to negative perceptions towards conservation initiatives and protected areas^[3, 21, 28-30]. Given the trend for community-based conservation, interdisciplinary approaches which focus on the social aspects of human-wildlife conflict are needed.

This project investigated the social, cultural and environmental context of crop-raiding to understand both the actual risk of primate crop-raiding and farmers' perceptions, and tolerance, of it. It worked with ten villages bordering the Lambusango and North Buton Reserves, Buton, South-east Sulawesi to examine perceptions of crop-loss to primates and actual crop-damage levels by wildlife at the same time. Farms were monitored weekly to assess damage and a predictive model of the spatial and temporal nature of primate crop-raiding will be developed that could assist with developing mitigation strategies. Semi-structured interviews, focus groups and participant observation were used to examine perceptions of household and individual risk of crop-damage by wildlife, factors shaping these perceptions and their influence on coping strategies. This project also explored both actual and perceived effectiveness of buffer crops as a mitigation strategy whilst also evaluating other potential solutions. Additionally this project evaluated a conservation management program by comparing perceptions of local people to wildlife and conservation around two reserves. One reserve has no active management program, and the other has a program involving core conservation zones in the forest, sustainable business development, ecotourism and education programs^[31].

Aims

By studying villages surrounding two reserves on Buton, Southeast Sulawesi, with different conservation management regimes this project aimed to:

- Determine farmers' perceptions and management of crop-raiding risk and the impacts on their livelihoods

- Measure the scale, position and frequency of actual crop loss
- Develop a GIS model to predict the risk of crop-raiding
- Evaluate buffer crop planting for reducing primate crop losses
- Determine and compare farmers' perceptions towards wildlife between the reserves

Methods

Research took place in ten villages surrounding Lambusango and North Buton reserves which contain endemic species of conservation concern, including the Buton Macaque (*Macaca ochreata brunnescens*). The Lambusango Reserve has a management programme (Lambusango Forest Conservation Programme – LFCP) but no investigation of its impact on farmers' perceptions of the wildlife or reserve is being conducted. The North Buton Reserve has no management programme and suffers pressure from transmigrant camps and illegal logging. The LFCP has implemented ginger (*Zingiber officinale*) planting to provide sustainable business opportunities, and prevent primate raiding, despite little evidence of effectiveness^[32, 33]. The actual and perceived effectiveness of ginger as a buffer will be evaluated, as will its financial benefit.

Methods for examining attitudes towards raiding risk, crop damage, wildlife, local authorities and the influence on coping strategies included semi-structured interviews with individuals, focus groups^[34-36], and participant observation (at least 20 – 40% of farming households). Risk-ladders and maps will ultimately be developed based on risk identification, estimation and evaluation^[37]. Social indicator maps of social networks^[38] will explore social capital as a coping mechanism. For farms within 500m of the forest there will be bi-weekly visits to GPS record crop-damage. A site-specific GIS (ArcGIS) will be created for study villages with grid systems superimposed to analyse variables including crop type and distance from geographical features. Predictive maps will aid future management by identifying factors that increase raiding risk. Finally, data from farmers' interviews will be overlaid comparing real and perceived risk in a spatial-model. The information from focus groups will be analysed qualitatively and quantitatively exploring the perceived effectiveness of ginger as a buffer crop. The GIS model will show actual crop loss allowing exploration of significant differences in crop loss between farms with or without ginger. A unique aspect of this project is the comparison of reserves with different conservation management strategies. Differences in perceptions between the reserves will be explored, controlling for factors such as ethnicity, religion, wildlife contact etc. Likert scales will be used to explore specific attitudes by asking farmers to rank agreement to statements.

Ethics

Participation was voluntary and fully explained. Agreement to participate was accepted as informed consent, however subsequent reports will contain no names. Data is confidential and securely stored. Although discussion of mitigation may have raised expectations, growing ginger was already part of a management programme and significant liaison between villagers and the LFCP already occurs. Approval from

Oxford Brookes University's ethics committee was obtained prior to fieldwork (<http://www.brookes.ac.uk/rbdo/research/researchethics>)

Timetable

This project spanned a total of 18 months (May 2007 – end Oct 2008). The fieldwork was split into two 6 month periods at the start and end of the study during which the interview work took place, as well as recording of crop-damage. During the intervening 6 months ongoing monitoring of farms continued by the field assistants, with the researcher making regular contact and two site visits.

Outcomes

Research Outcomes

1. Weekly monitoring of crop-loss to wildlife took place in over 380 farms around both reserves. As mentioned in the progress report it was decided to also record presence or absence of damage due to disease and natural, climatic factors in order to indicate the relative importance of damage by wildlife versus other factors.
2. Final, follow-up semi-structured interviews and focus group discussions were held in each of the ten study villages. Between 25 and 45 farmers in each village were interviewed and four focus groups were conducted per village. The interviews were held with the same individuals as the first round of interviews (June - Sept 2007). The focus groups often involved participants not involved in the first round of focus groups. As the purpose of these focus groups was to get more varied, community wide perceptions of the issues discussed this was preferable. These interviews and discussions examined perceptions of household and individual risk of crop-damage by wildlife, factors shaping these perceptions and their influence on coping strategies. Attitudes towards wildlife, local authorities and crop-raiding were also be explored. Farmers were asked to identify and rank possible risks to their crops
3. Since returning from the field in November 2008 the Researcher has continued data entry. The priority at present is to input all of the remaining crop-monitoring data and begin to develop a GIS for the project. The Researcher secured funding to attend a further, tailor-made advanced course on spatial modelling with ArcGIS 2009.
4. Closing meetings were conducted in each of the ten villages, with the head man in each village and then with the community as well. Closing meetings were also held with the local forestry department and the counterpart Universities.

Training/Education outcomes

As previously mentioned in the previous progress reports perhaps the most important educational achievement of this research project was the progress of the permanent field assistants. None had previously worked on a long term conservation project and by the end of this project they were experienced at collecting crop loss data, using a GPS (including

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data transfer), focus group facilitation, conducting interviews/ village meetings and using a PC.

Further presentations were given to staff and students at my Indonesian counterpart Universities – Universitas Nasional and the University of Haluoleo. Biology textbooks were given to the library of both as a token of my gratitude for supporting the project. I also gave a seminar at Universitas Padjadjaran, Bandung.

Throughout the project several Indonesian university students were involved in the study; one from Universitas Nasional in Jakarta, and one from the local University of Haluoleo in Kendari. They were with the project for 2 – 3 months under supervision of the Researcher. Both collected data for their dissertations and at present a paper is being co-written with them for publication in an Indonesian journal. Both have gone on to secure jobs either within a conservation/research organization in Indonesia or with the local forestry department. In addition a recent graduate from the University of Haluoleo conducted a small study under my supervision in January 2008 and then again from June – August 2008.

Conservation Outcomes

This project will provide baseline data for future research into the impact of crop-raiding primates upon local communities and conflict mitigation strategies. This is vital if we are going to progress in the field of human-wildlife conflict. With data from three planting seasons, incorporated into a predictive GIS, future projects will be able to thoroughly examine the impact of crop protection methods over time.

As mentioned in previous reports it is still too early to assess the impacts of the project on local conservation action. However the mere act of holding community meetings and discussing these things is bringing conservation issues to the fore of local people's minds (judging by comments made to me after such meetings). Interestingly a high degree of tolerance to primate raiding seems to be present in the interviews, this will be critical for primate conservation. Issues such as crop disease, natural factors (notably flooding) and insect pests are larger concerns for the local farmers than large vertebrate raiding.

Vital links were made with Indonesian Universities, government agencies and local NGO's. In addition to working closely with the Universities mentioned above (providing training for young Indonesian scientists and conservationists) and with the LFCP, the Researcher is involved in a local Butonese NGO, Lawana Ecotone. Members of this NGO were involved in the project, attending community meetings, assisting with data collection and transfer and liaising with local governments. These connections and training will assist in future conservation projects run by the NGO.

An important conservation achievement of this research, aside from potential findings when the data is analysed, was the involvement of local people in this conservation research project. It has opened up lines of communication between researchers, NGO's and the local farmers on Buton which it is hoped will be maintained and expanded further in the future. Only with effective dialogue between local communities and conservation organizations or researchers can conflict mitigation and wildlife protection succeed.

Other accomplishments

The researcher is currently preparing a manuscript with one of the Indonesian students and the counterpart scientist for submission to an Indonesian scientific Journal.

Results

There is still a large body of data to be inputted and analysed but preliminary results suggest that:

- a. Predictors of crop raiding are in line with previous studies. Proximity of farm to forest borders and type of crop grown (sweet potato, maize and banana) increase likelihood of raiding by monkeys and pigs.
- b. Farmers were more concerned about crop disease, insects and natural factors (flooding) than large vertebrate damage in general.
- c. Monkeys were a significant pest but high levels of tolerance were observed amongst local farmers.
- d. Conservation knowledge was much lower in villages around the North Buton Reserve than those surrounding the Lambusango reserve. Despite this, perceptions towards conservation and the reserves are more positive around the North Buton Reserve. Perceptions around the Lambusango Reserve are more negative, despite the presence of a conservation management program around that reserve. In depth data analysis will hopefully shed more light on these issues.
- e. One village, Wabou, has started to encroach into the reserve. The village itself was established in 2000, without permission, within the limited production forest close to the reserve boundary. Farm land has now encroached into the reserve. These findings were presented to and discussed with the local forestry department who were already involved in finding a solution to this, together with the local government.
- f. There was early abandonment of the ginger growing scheme by many farmers due to lack of a market for the ginger. However where possible ginger farms were included in the study and farmers originally involved in the scheme were included in focus groups and interviews. Initial assessment of the data suggests that the ginger growing scheme was not successful. Lack of a market for the crop (owing to cheap, imported ginger from India) and lack of training in how to farm it has led to dissatisfaction amongst those initially recruited into the scheme. There were, understandably, high levels of frustration surrounding the failure of this scheme.

Publications – Although not directly arising from this project two articles have been submitted which relate to this study and another is in preparation.

Priston N. E. C. and Underdown S. J., In press, A simple method for calculating the likelihood of primate crop-damage: An epidemiological approach (*International Journal of Pest Management*)

Priston, N.E.C, submitted (under revision), Exclosure plots as a mechanism for assessing primate crop damage. (*International Journal of Pest Management*)

Priston N. E. C. and Lee P. C. (in prep), Monkeys and farms: alternative perspectives for understanding crop-raiding, (*International Journal of Primatology*)

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