Review of the NPWS policy on the mitigation of commercial crop damage by flying-foxes

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ABSTRACT

Flying-foxes come into conflict with fruit growers when they raid fruit crops in response to limited native food resources. A standard technique used by fruit growers to deter flying-foxes has been to shoot the animals as they enter the orchard. This activity has been regulated by National Parks and Wildlife Service (NPWS) since the protection of flying-foxes in 1986. A NPWS Policy was developed on this issue in 1998. It provides for licences to be issued to harm a limited number of protected species by gunshot only. The policy does not cover threatened species.

The recent change in the conservation status of the Grey-headed Flying-fox from protected to vulnerable means that the NPWS policy must be adapted to address damage mitigation of a threatened species. The NPWS has considered a number of alternatives in its management strategy including ending licensed harm to flying-foxes, issuing licences under the Threatened Species legislation and encouraging farmers to prepare property management plans. The preferred NPWS position is to continue to issue licences under the National Parks and Wildlife Act 1974 for a further three years during which time farmers are expected to take all reasonable means to adopt non-lethal deterrent strategies. Important aspects of this new policy are ensuring that licensed damage does not constitute a threat to the long term survival of the Grey-headed Flying-fox, and improving compliance with the policy so that all harm may be quantified and the impact on the State-wide population properly assessed and managed.

Introduction

Management of the Grey-headed Flying-fox (GHFF) *Pteropus poliocephalus* poses a complex problem to government, conservation agencies and the horticultural industry and covers a broad range of issues including flying-fox ecology, habitat loss and damage mitigation. This paper will address one area of management, namely mitigation of damage to commercial fruit crops by flying-foxes.

Flying-foxes have been in conflict with fruit growers in Australia since European settlers began growing fruit trees (Tidemann *et al*. 1997). Although flying-foxes feed preferentially on the fruit, blossoms and nectar of native vegetation, they may seek out alternative food resources such as commercially grown fruit crops. This leads to loss or damage to commercial and domestic fruit crops each year. Although the degree of damage to crops and the locations of affected crops is inconsistent year to year, certain types of crop (e.g. lychee) receive damage each year and may be a new preferred food of flying-foxes. There are three species of flying-fox with ranges in NSW, the Black Flying-fox *Pteropus alecto*, the Little Red Flying-fox *Pteropus scapulatus* and the GHFF. While all three species will forage in fruit crops, the GHFF is most often implicated by farmers.

A variety of management techniques have been used by farmers over the years to reduce damage. However, the most consistently used and widespread method has been shooting flying-foxes either in the orchard as they attack fruit

Pages 39 - 46 in *Managing the Grey-headed Flying-fox as a Threatened Species in New South Wales*, edited by Peggy Eby and Daniel Lunney, 2002. Royal Zoological Society of New South Wales, Mosman NSW.

crops, or at a local camp (Hall and Richards 1987; Loebel and Sanewski 1987; Birt 2000). This activity went unregulated in NSW until 1986 when flying-foxes became protected species under the *National Parks and Wildlife Act 1974* (NPW Act). Since that time farmers have been required to obtain a licence from the NSW National Parks and Wildlife Service (NPWS) to legally harm flying-foxes.

In 1992, the Black Flying-fox was listed as a vulnerable species under the *Endangered Fauna (Interim Protection) Act 1991* (Lunney *et al.* 2000), a status it retained when this Act was replaced by the *Threatened Species Conservation Act 1995* (TSC Act) and licences to harm this species were no longer permitted. A brief moratorium was placed on the issue of all licences in 1997, followed by the development and implementation in 1998 of a NPWS policy on the mitigation of damage to commercial crops by flying-foxes. This policy is one part of a larger conservation strategy for flying-foxes in NSW. In this policy, the NPWS advocates the use of exclusion netting as the only reliable means to avoid crop damage by flying-foxes. However, it is understood that netting is not always feasible for all farmers and the policy includes provision for licences to be issued under Section 121 of the NPW Act to harm by gunshot only a limited number of the two species listed as protected at the time the policy was written (the Grey-headed and Little Red Flying-fox). Licences are issued with the proviso that farmers are to shoot to scare, however incidental harm through this practice is anticipated. This policy and its operation has been reviewed annually to develop the NPWS's understanding of flying-fox distribution, the impact of flying-foxes on the farming community and the impact of culling on flying-fox populations.

In May 2001, the NSW Scientific Committee made a final determination to list the GHFF as a vulnerable species. This has several management implications for the NPWS. In particular, the current policy on damage mitigation is no longer appropriate for the GHFF. This paper presents an overview of the licensing system that has been in place over the last three fruit seasons, including the number and distribution of licences and the minimum number of flying-foxes harmed each season; and discusses options considered by the NPWS for changes to this policy commensurate with the recent listing of the GHFF.

Policy review — comparison of the last three fruit-growing seasons

Fruit Crops

The fruit-growing season in NSW typically occurs between September and June, depending upon the crop and success of the growing season, although bananas may be harvested year round. The seasons covered by this review are September to June 1998/99, 1999/00 and 2000/01. Although a variety of fruit crops may be affected by flying-foxes, the predominant crops grown by orchardists that requested licences were stonefruit and lychee (Figure 1). Damage was also reported to guava, mango, banana, pome fruit and coffee crops. Farmers reported an average of 243 ha of damage to 446 ha of available fruit crop each year over the three seasons. Although the size of crop grown by farmers varied from less than 1 ha to 40 ha, the majority of farmers that applied for licences (up to 61%) had 5 ha or less of fruit crop. It is likely that the small holdings of such farmers made non-lethal alternatives, such as netting, not economically feasible where damage was inconsistent and unpredictable year to year (Slack 1990; Tidemann *et al.* 1997).

Licences issued

An average of 56 licences (range 44-92) were issued each season between 1998 and 2001 to an average of 49 properties (range 38-80). Distribution of licences was not uniform across NSW, rather more applications were received and licences issued in certain areas. The NPWS structure divides NSW into four Directorates, which are in turn each divided into four to five Regions. Figure 2 depicts the state-wide divisions of NPWS and the distribution of licences issued per Region in 2000/01. Most licences are typically issued in the Northern and Central Directorates, several licences issued in the Southern Directorate and few, if any issued in the Western Directorate. The pattern of distribution of licences across NSW mirrors the known distribution of the GHFF. While this species is highly mobile, and moves in response to available food resources, it is typically found east of the Great Dividing Range in NSW (Eby 1995).

The pattern of distribution of licences issued in NSW was generally consistent year to year, with some variation in the total numbers of licences issued (Figure 3). This variation was typically attributed to the quality of the fruit growing season and the availability of native food

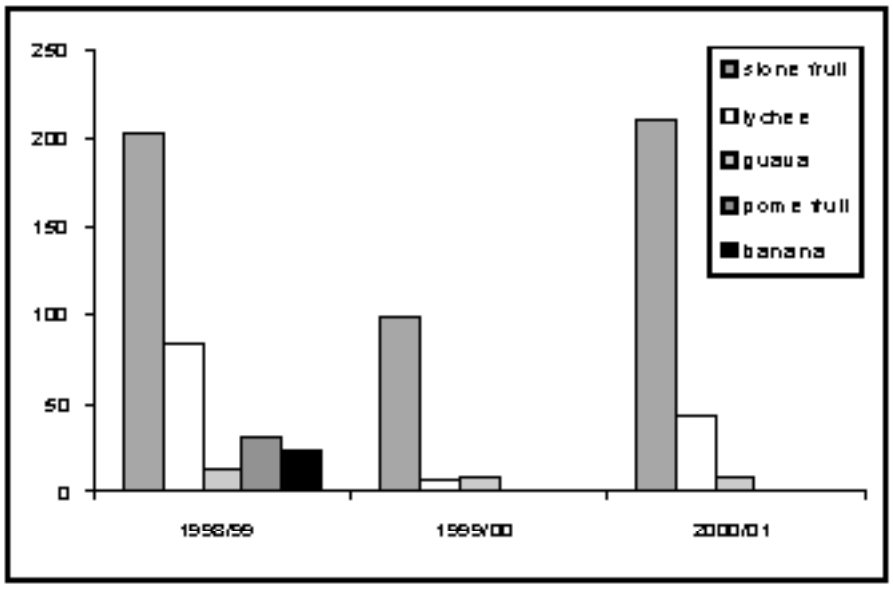

Figure 1 Type of fruit crop and amount of damage (ha) by flying-foxes in NSW over the past 3 fruit growing seasons

Figure 2 Regional distribution of licences issued to harm flying-foxes in NSW during the 2000/01 fruit growing season. NSW is shown divided into NPWS Directorates and Regions with the number of licences issued in each Region depicted in the white circles.

resources. For example, the 1999/00 fruit season was a very poor season for fruit crops. However, native flowering trees were widely available. Consequently, a decline in licences issued from the previous season was noted. The 2000/01 season was a much better fruit growing season, however native food trees were not available in abundance, leading to increased invasion of fruit crops by flying-foxes and an increase in the issue of licences. Other reasons for changes in the number of licences issued each year have included adoption of netting by more orchardists and use of other damage mitigation methods (Mandelc 2000).

It can also be noted from Figure 3 that the state-wide variation in total number of licences issued can be attributed to variations within Central Directorate alone. The number of licences issued in the Northern, Southern and Western Directorates were consistent over the three seasons. This may in part be due to the fact that the GHFF core area is in the northern part of the State and animals may move into more southern areas only in response to the sporadic availability of natural food resources and/or seasonal native food shortages in the North. Thus, the Northern Directorate can expect a consistent level of damage by flying-foxes each year while central areas of the State may only experience extensive damage in years when native food sources are scarce in the north and flying-foxes travel further afield in search of food.

Harm to Flying-foxes

The NPWS Policy allowed for each licence to be issued to harm a maximum of 50 flying-foxes. It was at the discretion of Regional staff to determine the number, depending on specific circumstances and needs, for which a licence was issued. A landowner could apply for no more than two licences per season, or a maximum total of 100 flying-foxes. In the past 3 years, licences were issued for an average of 2229 flying-foxes per year with an average of 1549 issued for GHFF (Table 1).

Farmers were required to return a Flying-fox Record Sheet (FFRS) to NPWS within one month of the expiry of their licence. FFRSs provided detailed information on the number of animals harmed over the season. Such information was vital to NPWS to assess the potential impact

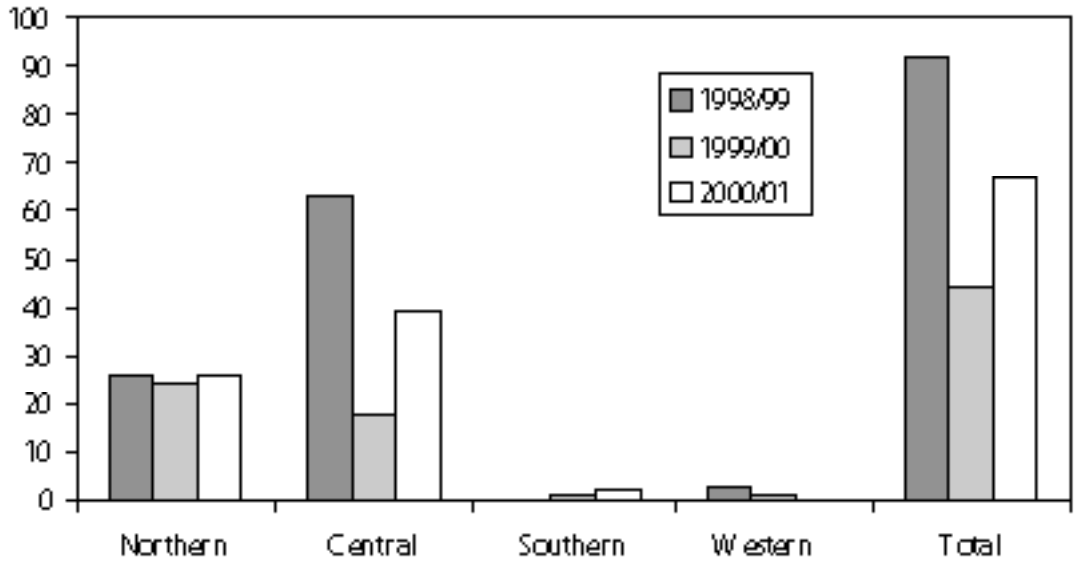

Figure 3 Number of licences issued by NPWS to harm flying-foxes in each of the NPWS Regional Directorates and overall for the past 3 fruit growing seasons.

Table 1 The number of flying-foxes licensed to be harmed in each of three growing seasons from 1998 to 2001 and the number reported harmed according to flying-fox return sheets (FFRS) received by NPWS from the licensed orchardists.

Species	1998/99		1999/2000		2000/01	
	Allowed	Harmed	Allowed	Harmed	Allowed	Harmed
Grey-Headed	1959	516	895	202	1793	864
Little Red	420	105	500	93	430	88
Unspecified	180	31	120	78	90	162
TOTAL	**2559**	**652**	**1515**	**373**	**2313**	**1114**
% of total allowed actually harmed	**23**		**25**		**48**	
FFRS received (%)	**41**		**44**		**67**	

on the population and to review the current policy. Unfortunately, compliance with this condition was not 100%. However there was some improvement over the three years (Table 1). Increased compliance in the most recent season was likely due to amendments made to the policy at the end of the 99/00 season. Such changes included an additional provision which stated that where an applicant of a s121 licence to harm flying-foxes has been in breach of a similar licence in a previous year, or had failed to submit a FFRS, these matters would be taken into account before the issue of any further licences. In addition, increased returns may have been actively encouraged by staff keen to provide information for the policy review in light of the listing of the GHFF.

Because not all FFRS were returned each year, we do not have an exact account of the total number of flying-foxes harmed in NSW. However, based on the returns received, it would seem that actual harm was less than that permitted by the licences. For example, in the most recent season 67% of the licencees returned their FFRS. The harm to flying-foxes reported in these records accounted for 48% of the total number of flying-foxes permitted to be harmed (Table 1).

Changes to management strategy

NPWS advocates non-lethal methods of crop protection (e.g. full exclusion netting) as the best option to reduce flying-fox damage. However, where this measure is not effective or practicable, the NPWS policy has permitted licensed harm of flying-foxes under s121 of the NPWS Act. The listing of the GHFF as a vulnerable species in NSW means that NPWS must reconsider its policy in light of legislative responsibility for this species. A licence under s121 of the NPW Act cannot be issued for a threatened species. However this does not change the nature of the problem. Despite concerns for its conservation, this species can cause extensive damage to crops. A management strategy is needed that will address both conservation objectives and the needs of farmers faced with financial loss.

There are several challenges to developing an appropriate management strategy that will encompass this issue.

- Flying-foxes are highly mobile species with widespread and variable distribution across NSW, Qld and Vic that is, in part, dependent on variable and unpredictable natural food resources (Eby 1995; Eby *et al.* 1999).
- There is a lack of definitive information on species biology and population assessment, making the impact of human caused mortality difficult to assess (Martin and McIlwee in press).
- It is likely that unlicensed harm by farmers far exceeds that permitted by the NPWS licensing system (e.g. Wahl 1994; Vardon and Tidemann 1995; Richards 2000) and there is no means of fully assessing and evaluating the impact of these unlicensed activities.

A management strategy must be able to capture all of these issues by endeavouring to improve our understanding of flying-fox ecology, determining whether resources can be predicted and reducing threats where possible. A number of these issues will be more fully addressed though the development of a recovery plan. However, this will be a lengthy process and the NPWS must establish a policy for managing crop damage in the interim.

The impact that unlicensed and unregulated culling may have on the GHFF population is of particular concern in formulating this policy. In the past, a number of farmers have operated outside the NPWS licensing system. This has resulted in an unquantifiable, but likely high annual mortality of GHFF on fruit crops (Wahl 1994; Antcliff 1998; Richards 2000). Antcliff (1998) noted that the 1997 moratorium on flying-fox licences by NPWS was ineffective because farmers continued to use this mode of deterrence to protect their crops. Thus, a confrontational approach that alienates the farming community may only be counterproductive if individuals operate outside any management system established. The NPWS is seeking to develop a system that will be acceptable to all stakeholders and lead to full compliance so that these impacts may be properly assessed and regulated.

There is a range of management options available to the NPWS, from ceasing to license the harm of GHFF to continuing with a system similar to the current policy. A number of options that have been considered are outlined below, noting positive and negative aspects and highlighting the NPWS favoured approach. It is likely that a combination of options may be useful in the development of a final strategy.

1. **Immediate moratorium on licensed shooting of flying-foxes**

   No more licences would be issued by NPWS and farmers would be required to seek alternative deterrents (e.g. netting, noise) or accept crop damage. While this option may appeal to conservationists, it does not fully address the issue of crop damage and current lack of effective deterrents other than netting. One serious concern for the NPWS in adopting this position would be the alienation of the farming community and the likelihood that shooting would continue, unlicensed, with no regulation and no means of assessing damage mitigation or impact on flying-fox populations. The NPWS proposes to work towards this management strategy, however the NPWS considers that it is inappropriate to cease licensing without allowing farmers adequate time to explore alternatives. It is proposed that any licensing system serve for a three-year interim period during which it is expected that all reasonable attempts will be made by orchardists to adopt non-lethal deterrents.

2. **Licences issued to shoot to scare only, no harm permitted to flying-foxes.**

   Such licences have been issued in one Region (Blue Mountains) over the last year, however there is no information available on the effectiveness of this method or on compliance with these licences. While this may be a suitable strategy for the future, further investigation is required on its effectiveness and likelihood of eliminating flying-fox mortality. Other research initiatives that may be considered include effectiveness of lighter ammunition, e.g. beads or buckshot, that would startle and scare off flying-foxes without causing serious harm. This option may be appropriate when used in concert with a range of non-lethal deterrents, (e.g. lights, noise) however, it requires further investigation on its effectiveness.

3. **Licences issued under s91 of the TSC Act 1995**

   A licence may be issued under s91 of the TSC Act to harm a threatened species. However, there is a number of considerations that must be addressed in using this system. An applicant is required to provide information to assist the Director-General of NPWS in making an assessment as to whether the proposal is likely to have a significant effect on threatened species, populations or ecological communities. The Director-General may then issue a certificate under s95 of the Act if the action proposed is not likely to have a significant impact on the species. Alternatively, if the action is considered to have a significant effect, the applicant may be asked to prepare a Species Impact Statement (SIS).

   There are several concerns with this approach. The application procedure requires the collection of extensive information on a property-by-property basis to determine the impact on the local population. However, definition of a local population is extremely difficult for such a highly mobile species and it will be highly variable. Additionally, where an SIS is required, it must be put on public exhibition for review. The NPWS requires a licensing system which allows for rapid processing of applications to enable effective crop damage mitigation. Under the current NPWS policy, growers only apply for a licence when damage is occurring. A licence may then be issued within 24 hours of the application when damage has been confirmed by NPWS staff.

   A system requiring a long lead time would mean applications would need to be submitted in anticipation of damage, resulting in more licences issued each season. Alternatively, farmers may operate outside the system when damage begins to occur. Further, there is no provision for assessing the cumulative impact of the action so that, on a property-by-property basis, impact may be considered insignificant, but on a Regional or State-wide basis, cumulative mortality from licensing could have a significant impact. These concerns make such a system unacceptable for effective management.

4. **Licences issued under s120 of the NPW Act (preferred NPWS option for the approaching fruit growing season)**

   There are provisions under s91 of the TSC Act to issue a general licence under s120 of the NPW Act to harm a threatened species under certain conditions, including a threat to life or property. Legal advice from NPWS Legal Division supports the use of this provision for mitigation of crop damage by flying-foxes, particularly where initial damage can be demonstrated and additional harm is expected.

   Under this option, the current operational

system would remain largely the same, including initial application and property inspection prior to the issue of any licence and establishment of a maximum quota per licence and per property (i.e. where a property is issued consecutive licences because of continued damage). Orchardists would still be required to complete and return information sheets on the number, species and gender of animals killed. Changes to the current system may include:

- Change to the maximum number of flying-foxes harmed per licence, the number of licences per property in any one season and the period of the licence.
- Additional information may be requested on FFRSs provided by property owners, including general response of flying-foxes to shooting and whether damage was reduced on nights when shooting was employed.

Issuing a s120 licence does not address the issue of cumulative impact on the flying-fox population either on a Regional or State-wide level. To ensure that the total impact of licences issued in NSW does not constitute a serious threat to the long term survival of the GHFF, NPWS intends to ensure that the total legal harm to this species sustained in 2001/02 does not exceed 1% of the current minimum population estimate for the east coast based on Australasian Bat Society counts.

Currently, there is limited information on natural birth rates and mortality rates for flying-foxes, however this information is needed to determine the impact of additional human caused mortality. Martin and McIllwee (in press) have conducted a population modelling exercise based on the existing information on flying-fox population parameters. They propose that an additional imposed mortality of greater than 12% to flying-foxes will likely lead to population decline. Based on this information, NPWS would take a precautionary approach in this initial year and limit licensed off-take to 1% of the state-wide population.

It is further proposed by NPWS that this licensing system be developed for implementation in the 2001/02 fruit growing season and serve a three year interim period. The policy would be reviewed annually and necessary changes made, in particular regarding Regional and State-wide quotas. At the end of three seasons it is expected that farmers would have made all reasonable attempts to adopt non-lethal deterrents and damage mitigation licences would only be requested in exceptional circumstances.

Finally, there are several factors critical to the successful management of the GHFF that will support both species conservation and the need for crop protection:

- An assessment must be undertaken to ensure that the total impact of all licences issued in NSW will not constitute a serious threat to the GHFF in NSW. While the maximum 1% off-take noted above for the first season may serve as an interim measure, a proper assessment of significance must be undertaken during this season and the policy amended accordingly.
- There must be a strong focus on ensuring compliance with this licensing system both by ensuring licensed orchardists comply with the conditions of their licence and that non-licensed shooting is actively discouraged. This may be addressed by a combination of the preparation of educational materials and targeted enforcement measures.
- We must continue to improve our understanding of flying-fox ecology and biology to develop a conservation strategy. This will include continued support for rigorous population estimates by the Australasian Bat Society and other areas of research on flying-fox population biology, ecology and predictability of natural food resources.

Conclusion

The conservation of flying-foxes in NSW is a complex management issue. As the species status changes, management strategies must adapt to meet conservation objectives, but also continue to address human/animal interaction issues. The NPWS has a variety of options to consider in the management of mitigation of crop damage by the GHFF. The current favoured position is to address all species of flying-fox under one system and develop a process of licensing under s120 of the NPW Act to address the problem in the current (2001-02) season. This system will be reviewed and assessed with a view to ultimately phasing out licensed harm to flying-foxes over the next three years.

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QUESTIONS & ANSWERS

DAN LUNNEY: It is open for questions.

CHRIS ALLEN (University of Sydney): There is obviously a problem with compliance in that it is largely self-regulatory. It seems you have people handing in forms in which they state the numbers are that they have taken. I was wondering whether the Firearms Act could be looked at in more detail for limiting the number of firearms that are going out, so that those who have a genuine need for the removal of pests are the ones that are given the licences.

KELLY WAPLES: That has actually been brought up recently, and again it is one of the good things about having this forum. We do need that kind of input, we need those suggestions. I think that it is a very good one. It would be an option to have just individuals who are licensed do the shooting, similar to the kangaroo management program – where they have professional shooters. That way you have a restricted number of people actually out there shooting and we might have better control. It is certainly an option worth discussing and considering.

CHRIS ALLEN: Also, I was wondering if it is possible to amend the Firearms Act to have more noise-producing firearms, ones which are not lethal for animals like flying foxes, perhaps licensing people for their use rather than for lethalfirearms.

KELLY WAPLES: Again, I think that is another very good point to consider - looking at something that might cause less harm but still actively deter, I think is certainly very worth looking at.

KERRYN PARRY-JONES (University of Sydney): Could I make a plea that animals shot in orchards be available for scientific investigation. We need to know their sex, age, etcetera to develop reasonable population estimates.

KELLY WAPLES: Yes, again I think that is a very good point. We have these animals being sampled, and it is certainly a very good way to get some scientific data.

DAN LUNNEY: They are all excellent suggestions and begin to cover issues that will be coming up in the plenary session. Kelly, thank you very much indeed.