Pest, or Passenger Pigeon? The New South Wales Scientific Committee's assessment of the status of the Grey-headed Flying-fox

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ABSTRACT

On 4 May 2001, the NSW Scientific Committee made a Final Determination to list the Grey-headed Flying-fox *Pteropus poliocephalus* as a Vulnerable species in New South Wales on Schedule 2 of the *Threatened Species Conservation Act*. The Committee made this determination because, in its view, the species 'is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate' (TSC Act, Section 14). In this paper we first describe the procedures for nominating species for inclusion on the Schedules of the TSC Act and the role of the Scientific Committee in the assessment and listing process. We then chronicle the steps taken in the listing of the Grey-headed Flying-fox, and briefly review the evidence on which listing was based. This evidence included data on the overall decline in numbers of the Grey-headed Flying-fox in New South Wales, numerical declines at regularly-visited camps, continuing loss of habitat, and culling. Listing the Grey-headed Flying-fox as a Vulnerable species triggers the need for preparation of a Recovery Plan. By having regard to the biological, social and economic consequences of making the plan, it should be possible to obtain broad participation of stakeholders to achieve effective species recovery.

Introduction

Much of the impetus for this forum on the Grey-headed Flying-fox *Pteropus poliocephalus* can be traced to 4 May 2001, when the New South Wales Scientific Committee made a Final Determination to list the species as Vulnerable on Schedule 2 of the *Threatened Species Conservation Act 1995*. This determination was expected to be controversial. On one hand the Grey-headed Flying-fox is perceived by some to be a common pest that is in need of control rather than conservation. On the other hand, there is clear evidence that this flying-fox fulfils the criteria for listing as Vulnerable, and that a slide toward Endangerment will inevitably occur unless the threats to the species' survival can be abated. This paper was prepared for the forum to outline how the NSW Scientific Committee arrived at its unanimous decision to list the Grey-headed Flying-fox as a Vulnerable species.

Listing species that are at risk of extinction provides flags for taxa that need management attention. Thus listing is often an important first step in recovering threatened species to a state of viability in nature. Lists can be developed at any scale (e.g. local, state, national, international) and can be divided into categories such as vulnerable or endangered that may help to prioritise management actions. Although the value of listing has been questioned (Diamond 1987) and the focus on species rather than habitats or ecosystems has been criticised (Franklin 1993), species remain pragmatic units of conservation and their listing drives conservation effort in many parts of the world (Caughley and Gunn 1996; Doremus and Pagel 2001; Gärdenfors 2001).

Pages 20 - 28 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.

In New South Wales threatened species can be listed as Endangered, Vulnerable or Presumed Extinct (not located in nature over the last 50 years) on the Schedules of the *Threatened Species Conservation Act 1995 (TSC Act)*. In this paper we describe the process for nominating species for inclusion on the Schedules of the Act, the role of the Scientific Committee in the assessment and listing process, and the steps leading to the listing in May 2001 of the Grey-headed Flying-fox *Pteropus poliocephalus* as a Vulnerable species on Schedule 2 of the *TSC Act*. We also review the evidence used to evaluate the status of the Grey-headed Flying-fox, and the implications of listing. In 1932 Francis Ratcliffe estimated that the numbers of Grey-headed Flying-fox were in the order of "many millions" in eastern Australia. Numbers in 2001 are much less than in Ratcliffe's day, and are continuing to decline. Rate of decline provides a reliable indication of the likelihood of extinction, irrespective of starting population size (Caughley and Gunn 1996; Dickman 1996). The demise in 1914 of the Passenger Pigeon *Ectopistes migratorius*, once the world's most abundant bird, is a salutary reminder of how rapidly extinction can occur (Quammen 1996). This event also provides a lesson that we should manage the Grey-headed Flying-fox now while recovery is possible.

Consideration of issues under the NSW Threatened Species Conservation Act

The *Threatened Species Conservation Act 1995* sets out the definitions and criteria that are used to assess the conservation status of a species that has been nominated for listing on the Schedules of the Act. A species may be listed as Endangered (Schedule 1) or Vulnerable (Schedule 2) depending on the likelihood of extinction. Species listed on either Schedule are collectively known as threatened species.

A species can be listed as Endangered if it meets one of three criteria. The first two criteria are for species still surviving while the third deals with extinct species. A species is considered Endangered if it will become extinct in NSW unless the factors or circumstances that are currently threatening its survival are stopped or either its population size or habitat has been reduced to a level that places it in immediate danger of extinction (Section 10, *TSC Act*). A Vulnerable species is defined simply as a species that will become Endangered if the current threats to its survival are not stopped (Section 14, *TSC Act*).

The Scientific Committee established under the *TSC Act* determines if a species meets the criteria for listing. This Committee consists of 10 scientists with expertise in biology, ecology and population genetics that have been drawn from specified institutions, government agencies and independent professional bodies (Section 129, *TSC Act*). The Committee forms an opinion about the status of a species by reviewing the nomination, seeking any available scientific studies, seeking expert advice, commissioning additional scientific studies and consideration of other listing processes at a State or federal level (Dickman 1997). The Scientific Committee's decisions are made independently of the Minister for the Environment and consideration of social and economic issues forms an integral part of the Recovery Planning process that follows listing, but under the Act they are not considered in the listing process.

The Scientific Committee can receive nominations from any member of the public to list a species on the Schedules of the *Threatened Species Conservation Act*. Nominations come in about equal numbers from individuals, organisations with an interest in conservation and from government and local government bodies. The Scientific Committee also generates its own proposals when reviewing the Schedules or rewriting an existing proposal. A nomination can be rejected by the Scientific Committee on a number of grounds, including the information supplied being insufficient or vexatious (Section 21, *TSC Act*).

After consideration of a nomination, the Scientific Committee prepares a Preliminary Determination that is placed on exhibition for at least 35 days and submissions are invited from the public. Before making a Final Determination the Committee must take into consideration all submissions that have been received for a Preliminary Determination (Section 21, *TSC Act*). Once a Final Determination has been made, the result is published in the Government Gazette and state-wide and appropriate local newspapers (Section 24, *TSC Act*).

The Grey-headed Flying-fox Chronicles

The nomination to list the Grey-headed Flying-fox *Pteropus poliocephalus* as a Vulnerable species was received in December 1997 and the Scientific Committee sought advice from a range of specialists on the nomination and the information contained within it. The nomination was based on the apparent drop

in the total number of flying-foxes from previous estimates and concern over the rapid clearing of critical winter habitat in south-eastern Queensland and north-eastern New South Wales.

This process of seeking external advice can move quite slowly, particularly when a number of different views about a nomination become apparent. With the nominator's agreement the assessment process was deferred for nine months to allow for additional counts to be made of the population size.

During this time there were a number of other assessment processes happening in parallel to determine the status of the Grey-headed Flying-fox. At the national level, Environment Australia had organised a number of expert meetings to consider the status of bats in Australia and this led to the publication of The Bat Action Plan in May 1999 (Duncan *et al*. 1999). This publication gives the national status of the Grey-headed Flying-fox as Vulnerable, but as yet this species has not been listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act* (1999) and is still being considered by the Commonwealth Threatened Species Scientific Committee.

The Victorian Scientific Advisory Committee formed under the *Flora and Fauna Guarantee Act 1988* was also considering a nomination of the Grey-headed Flying-fox in that State. Like the NSW legislation, the Victorian Act has to consider only the portion of the population that is found within Victoria, and the Scientific Advisory Committee published in May 2000 a preliminary recommendation to list the species as Vulnerable.

Further research was also conducted during this period, especially on providing population estimates using coordinated counts of all known Grey-headed Flying-fox camps both in New South Wales and Queensland, plus work on the ecology of the species during winter when it is largely concentrated in south-eastern Queensland (Eby *et al*. 1999).

In April 2000, a one day workshop was held at Sydney University to discuss the status of the Grey-headed Flying-fox. This workshop came about because the Australasian Bat Society conference was held in the Hunter Valley during the previous week and this brought to NSW most of the Australian experts on flying-foxes. Participants were asked to provide a written paper on some aspect of the Grey-headed Flying-fox and these were discussed in a round table manner on the day. These papers formed the basis of the workshop proceedings that were made available through the Society's webpage (*http://batcall.csu.edu.au/batcall/abs/home.htm)*. Some flying-fox experts were not able to make the workshop and their written input was sought as well.

Based on this accumulated body of information, the NSW Scientific Committee proceeded to prepare a Preliminary Determination to list the Grey-headed Flying-fox as a Vulnerable species, and this appeared on 17 November 2000 with an exhibition period lasting until 5 January 2001. Notices of the Preliminary Determination were published in 27 newspapers circulating throughout the known and likely range of *P. poliocephalus*. Over 400 submissions were made to the Scientific Committee about the Preliminary Determination, which represents the second best response from the public consultation process to any matter nominated to the Committee. These submissions ranged from one page form letters stating a for or against view through to lengthy ones prepared by consultants on behalf of organisations. It was the submissions between these extremes that usually were of most use to the Scientific Committee as they contained personal observations on trends in flying-fox numbers and local information on threatening processes that were operating. A number of submissions also contained detailed data on the impacts and economic consequences of flying-foxes and, while this information could not be considered under the Act by the Scientific Committee in relation to listing, it will provide valuable input to the Recovery Planning process.

After consideration of all public submissions, the Scientific Committee proceeded to a Final Determination to list the Grey-headed Flying-fox as Vulnerable on 4 May 2001 (Appendix 1). The Determination sets out the Committee's view that there has been a dramatic decline in the population size of the Grey-headed Flying-fox and that several threatening processes, including clearing of winter habitat, fragmentation of native food sources, 'recreational' shooting and the direct culling of animals are leading directly to the species becoming endangered.

How robust is the Final Determination?

The Scientific Committee must ensure that a species meets the criteria set out in the *Threatened Species Conservation Act* before it can be listed on the Schedules. For a Vulnerable species the wording of Section 14 of the Act states:-

"A species is eligible to be listed as a vulnerable species if, in the opinion of the Scientific Committee, the species is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate."

There are no absolutes or numbers or thresholds set down in the NSW legislation to define Vulnerable or Endangered, and this is appropriate for criteria that must cover fauna from invertebrates to mammals and plants from fungi to flowering plants. The important matters to be established are that there has been a decline in the population within NSW and if the factors which have caused that decline continue to affect the species within the foreseeable future, then the species continues to be endangered and will move from having a status of Vulnerable to an Endangered status.

For most fauna, there is no baseline observation of an original population size on which to measure population decline, and reduction in range and/or habitat is often used as a surrogate measure. Uniquely, the flying-foxes are a group where baseline studies were conducted in the 1930's by Francis Ratcliffe and his scientific work gives an insight into the numbers of flying-foxes that were present, even after the clearing of the "Big Scrubs" of the NSW coastal plain (Ratcliffe 1931, 1932). Research during the 80's provided an estimate that was much lower than Ratcliffe's "many millions" but the species was still considered numerous (Parry-Jones 1993). It has only been possible through an enormous collaborative project with many volunteer participants that the intensive counting of all known camps within a few days has been able to produce the most accurate measure of the current population (Eby *et al.* 1999). It may also be a sad reflection of the status of the species that it is now possible to count Grey-headed Flying-foxes because the number of camps and their size has been greatly reduced. These three point estimates have large error bars around them but the trend is clear; the Grey-headed Flying-fox is in decline and at a rate that is significant.

The key threatening process for Grey-headed Flying-foxes is the loss of habitat, particularly of the dependent winter nectar sources found in coastal Queensland. The past 20 years have seen urbanisation of the coastal plain from Coffs Harbour to Maryborough with the paperbark swamps being preferentially cleared to make way for canal estates. This transformation has been documented by Carla Catterall and others of Griffith University (Catterall *et al.* 1997) and has impacted on all forest types. There has also been the ongoing loss of the remnant rain forest patches that are favoured by Grey-headed Flying-foxes for camps. This is partly because of clearing of the floodplains for further sugar cane production and partly because urbanisation and camps do not mix. This clearing of habitat continues unabated despite the provisions of the *Native Vegetation Conservation Act* in NSW.

The impact of culling on flying-fox populations remains a contentious issue even if it is not the major threatening process. The only published information on the rate of cull of Grey-headed Flying-foxes in NSW suggested that 70,000 flying-foxes were being shot each year in the early 90's (Vardon and Tidemann 1995). Licences to shoot flying foxes have been issued by the NSW National Parks & Wildlife Service since 1986 but the returns showing numbers of animals killed are considered to be under-estimates of the level of mortality. For a species in decline it is likely that the impacts of culling are more severe now than they were 20 or even 50 years ago because there is now much less feeding habitat available; less habitat for camp sites; the horticultural crops being protected are defended more vigorously as they have a higher market value; and there are greater opportunities for recreational shooting from the large urban areas. These factors all compound to make the individual effects more severe and they are unlikely to abate in the near future.

To assist in decision-making about the status of nominated species, the Scientific Committee often uses the IUCN Red Book assessment of status. The Grey-headed Flying-fox was the first time that we had used this approach on a highly mobile mammal species that had been once very abundant. In many ways this species is more like a migratory nectarivorous bird in its biology. Using the IUCN Red Book assessment is not straight forward and requires careful consideration of a number of key aspects of the biology of the species. In some cases that information is not

available nor readily obtainable, but the IUCN criteria have been tested on a broad range of species and have been shown to be very robust. The internal assessment undertaken by the Scientific Committee gave a status of Vulnerable to Endangered, while a published assessment by Harry Parnaby (2000) placed the species as Endangered at the national level with the NSW population being Critically Endangered.

Passenger Pigeons and recovery plans

The Passenger Pigeon *Ectopistes migratorius* belongs to a different vertebrate class than the Grey-headed Flying-fox, and was indigenous to eastern North America, but its decline provides some instructive parallels with that of *P. poliocephalus*. Two centuries ago the Passenger Pigeon was almost certainly the most abundant species of bird in the world. Several accounts from the late eighteenth century reported that flocks would darken the sky for hours as they flew overhead, and around 1810 ornithologist Alexander Wilson estimated that there were over two billion birds in a single flock (Schorger 1955). The species exploited patches of forest and prairie to obtain seeds, nuts and berries, moving to new patches as old ones became depleted. The species began a precipitous decline in the 1880's due to loss of habitat, a broadscale and concerted culling campaign, and possibly the effects of epidemic diseases and forest fires (Schorger 1955; Quammen 1996). The last wild bird was shot in 1900, and the last living bird survived in captivity until 1914.

Although the rate of decline of *P. poliocephalus* has been much slower than that of the Passenger Pigeon, and the species still numbers many thousands, the extraordinary demise of the pigeon suggests that we cannot be complacent about the future of the Grey-headed Flying-fox. The Vulnerable listing of *P. poliocephalus* triggers the need for preparation of a Recovery Plan, and this in turn provides the opportunity to address the population decline as well as the impact of the species on producers and other stakeholder groups. Under Section 57 of the *Threatened Species Conservation Act* , the Director-General of the National Parks and Wildlife Service, in preparing a Recovery Plan, must have regard to the objects of the Act, the social and economic consequences of making the Plan, and how to use available resources most effectively and efficiently to achieve conservation goals. The Director-General is also to consider any measures by which the public may co-operate with the conservation goals of the plan.

We are optimistic that the recovery planning process will be an effective and timely instrument to prevent the Grey-headed Flying-fox from becoming Australia's Passenger Pigeon. It should also provide an excellent opportunity for co-operative management that involves all stakeholder groups.

Acknowledgements

Assessment of the status of the Grey-headed Flying-fox was undertaken by the entire Scientific Committee, and we thank all our colleagues on the Committee for their careful considerations and comments on the manuscript. We also thank Sue Chate, the Committee's Executive Officer, for further comments, facilitating discussions, compiling data and preparing replies to the submissions; Greg Richards for helping to organise the workshop at the University of Sydney, and the many experts who provided information to assist the Committee in assessing the status of *P. poliocephalus*.

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APPENDIX

Set out below is the Final Determination for the Grey-headed Flying-fox that was gazetted on 4 May 2001.

Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the Grey-headed Flying-fox, *Pteropus poliocephalus* Temminck 1825, as a VULNERABLE SPECIES on Schedule 2 of the Act. Listing of Vulnerable species is provided for by Part 2 of the Act.

The Scientific Committee has found that:

The Grey-headed Flying-fox occurs primarily along the eastern coastal plain from Bundaberg in Queensland, through NSW and south to eastern Victoria. A colony has also established in Melbourne (FFG SAC 2001). Small numbers may occur as far west as Warrnambool (Menkhorst 1995). Regular movements are made over the Great Dividing Range to the western slopes of NSW and Queensland.

This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000). Grey-headed Flying-foxes also feed on introduced trees including commercial fruit crops.

Grey-headed Flying-foxes are relatively long-lived mammals, with the average age of reproductive animals being between six and 10 years. They have a low rate of recruitment as sexual maturity is reached after at least two to three years and generally only one offspring is produced each year (Martin *et al*. 1996).

Grey-headed Flying-foxes congregate in large numbers at roosting sites (camps) that may be found in rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas. Individuals generally exhibit a high fidelity to traditional camps and return annually to give birth and rear offspring (Lunney and Moon 1997; Augee and Ford 1999). They forage opportunistically, often at distances up to 30 km from camps, and occasionally up to 60–70 km per night, in response to patchy food resources (Augee and Ford 1999; Tidemann 1999).

Grey-headed Flying-foxes show a regular pattern of seasonal movement. Much of the population concentrates in May and June in northern NSW and Queensland where animals exploit winter-flowering trees such as Swamp

APPENDIX

Mahogany Eucalyptus robusta, Forest Red Gum *E. tereticornis* and Paperbark *Melaleuca quinquenervia* (Eby *et al*. 1999; P. Birt and L. Hall, pers. comm.). Food availability, particularly nectar flow from flowering gums, varies between places and from year to year.

Historically, Grey-headed Flying-foxes had a greater range in Australia and numbers were estimated as being in the "many millions" (Ratcliffe 1932). Counts of flying foxes over the past decade suggest that the national population may have declined by up to 30% (Birt 2000; Richards 2000). Regular visits to flying-fox camps during this period have shown a marked decline in the numbers of animals using several camps (reductions of 31% to 94% have been recorded at five camps, Eby 2000; Hall 2000; Parry-Jones; P. K. Eby pers. comm.). It has also been estimated that the population will continue to decrease by at least 20% in the next three generations given the continuation of the current rate of habitat loss and culling (Martin 2000).

The main threat to Grey-headed Flying-foxes in NSW is clearing or modification of native vegetation. This removes appropriate camp habitat and limits the availability of natural food resources, particularly winter-spring feeding habitat in north-eastern NSW. The urbanisation of the coastal plains of south-eastern Queensland and northern NSW has seen the removal of annually-reliable winter feeding sites, and this threatening process continues (Catterall *et al*. 1997; Pressey and Griffith 1992; P. Clarke, unpublished data). In NSW less than 15% of potentially suitable forest for the Grey-headed Flying-fox occurs in conservation reserves; only 5% of roost sites are similarly reserved (Hall and Richards 2000).

The use of non-destructive deterrents, such as netting and noise generators, to limit flying-fox damage to fruit crops is not universal in the horticultural industry. While licences are issued to cull limited numbers of Grey-headed Flying-foxes, uncontrolled culling using destructive methods such as shooting and electrocution occurs and large numbers of bats are culled (Vardon and Tidemann 1995; Richards 2000). The impact of destructive methods has not been measured but is likely to be greatest in those years when natural food is scarce. Also, culling has a disproportionate impact on lactating and pregnant females (Parry-Jones 1993).

The species is also threatened by direct harassment via shooting at roosts, the destruction of camps and by being possible carriers for viral pathogens (Lunney and Moon 1997; Tidemann 1999).

Grey-headed Flying-foxes face potential competition and hybridisation from Black Flying-foxes, Pteropus alecto, as this species is extending its range south into northern NSW (Webb and Tidemann 1995). Colonisation of northern NSW may be assisted by the flexible reproduction of *P. alecto* and dispersal from largely intact northern habitats (Vardon and Tidemann 2000) into more fragmented habitat in the south.

In view of the above points, the Scientific Committee is of the opinion that the Grey-headed Flying-fox, *Pteropus poliocephalus*, is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate, and is therefore eligible for listing as a Vulnerable species.

Dr Chris Dickman Chairperson
Scientific Committee

Gazettal date: 4 May 2001

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*NOTE: The publication 'Proceedings of a Workshop to Assess the Status of the Grey-headed Flying Fox' is available on the Australasian Bat Society Web Page at the following address: -http://batcall.csu.edu.au/batcall/abs/home.htm

QUESTIONS & ANSWERS

DAN LUNNEY: Thank you Chris.

ROBIN AMOS: You say that the assessment can only be relevant to New South Wales. We all know that flying-foxes fly all over Australia, how can that be relevant?

CHRIS DICKMAN: It is one of the several issues that tied the committee up in knots for some time. We are very aware that flying-foxes do not recognise state boundaries and that much of the habitat that they require occurs over the border, particularly in Queensland. It was one of the factors that we took into account in assessing the resource base for the animals. We had to be concerned only with the New South Wales population, but on the other hand were aware that some of the resources were over the border. It was something that we had to take on board in the assessment process.

CHRIS TIDEMANN (ANU)**:** I realise that the legislation is restricted to New South Wales, I'm wondering whether there should be some thought given to these cross-border migrants being dealt with in a different fashion under some sort of national migrant legislation. I understand the legislation is as it exists now, but should we be resting at that stage, or should we be looking to set up some new class of conservation category?

CHRIS DICKMAN: That's an interesting point. We could perhaps look at increasing the amount of legislative protection for species that move across boundaries. There is one level of protection beyond that offered by the individual states, and that is the recently enacted *Environment Protection and Biodiversity Conservation Act*. That perhaps is, in the first instance at least, a mechanism where species such as Grey-headed flying-foxes could be considered. Whether that is the appropriate venue to look at migratory species, or whether additional legislation needs to be enacted to cover these species, I'm not sure, but that is something that could come up further in discussion.

ED BIEL: Can you tell me why we were not given access to the actual data that was used by the Scientific Committee to determine the decline in population?

CHRIS DICKMAN: Much of the information was published on the Australasian Bat Society web page and a lot of that information came from a one-day seminar at the University of Sydney, as well as additional information that was on that Web page. The other information that the Committee used was that referred to in the preliminary determination. So all of the information that was available should have been available broadly to anybody wishing to make submissions.

DAN LUNNEY: Thank you Chris.