



## **Consultation Document on Listing Eligibility and Conservation Actions**

### ***Pteropus conspicillatus* (spectacled flying-fox)**

You are invited to provide your views and supporting reasons related to:

- 1) the eligibility of *Pteropus conspicillatus* (spectacled flying-fox) for inclusion on the EPBC Act threatened species; and
- 2) the necessary conservation actions for the above species.

Evidence provided by experts, stakeholders and the general public are welcome. Responses can be provided by any interested person.

Anyone may nominate a native species, ecological community or threatening process for listing under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or for a transfer of an item already on the list to a new listing category. The Threatened Species Scientific Committee (the Committee) undertakes the assessment of species to determine eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment.

Responses are to be provided in writing either by email to:  
[species.consultation@environment.gov.au](mailto:species.consultation@environment.gov.au)

or by mail to:

The Director  
Marine and Freshwater Species Conservation Section  
Wildlife, Heritage and Marine Division  
Department of the Environment  
PO Box 787  
Canberra ACT 2601

**Responses are required to be submitted by 17 June 2016.**

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## **General background information about listing threatened species**

The Australian Government helps protect species at risk of extinction by listing them as threatened under Part 13 of the EPBC Act. Once listed under the EPBC Act, the species becomes a Matter of National Environmental Significance (MNES) and must be protected from significant impacts through the assessment and approval provisions of the EPBC Act. More information about threatened species is available on the department's website at: <http://www.environment.gov.au/biodiversity/threatened/index.html>.

Public nominations to list threatened species under the EPBC Act are received annually by the department. In order to determine if a species is eligible for listing as threatened under the EPBC Act, the Threatened Species Scientific Committee (the Committee) undertakes a rigorous scientific assessment of its status to determine if the species is eligible for listing against a set of criteria. These criteria are available on the Department's website at: <http://www.environment.gov.au/biodiversity/threatened/pubs/guidelines-species.pdf>.

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species, as well as advice on what conservation actions might be appropriate. Information provided through the consultation process is considered by the Committee in its assessment. The Committee provides its advice on the assessment (together with comments received) to the Minister regarding the eligibility of the species for listing under a particular category and what conservation actions might be appropriate. The Minister decides to add, or not to add, the species to the list of threatened species under the EPBC Act. More detailed information about the listing process is at: <http://www.environment.gov.au/biodiversity/threatened/nominations.html>.

To promote the recovery of listed threatened species and ecological communities, conservation advices and where required, recovery plans are made or adopted in accordance with Part 13 of the EPBC Act. Conservation advices provide guidance at the time of listing on known threats and priority recovery actions that can be undertaken at a local and regional level. Recovery plans describe key threats and identify specific recovery actions that can be undertaken to enable recovery activities to occur within a planned and logical national framework. Information about recovery plans is available on the department's website at: <http://www.environment.gov.au/biodiversity/threatened/recovery.html>.

## **Information about this consultation process**

Responses to this consultation can be provided electronically or in hard copy to the contact addresses provided on Page 1. All responses received will be provided in full to the Committee and then to the Australian Government Minister for the Environment.

In providing comments, please provide references to published data where possible. Should the Committee use the information you provide in formulating its advice, the information will be attributed to you and referenced as a 'personal communication' unless you provide references or otherwise attribute this information (please specify if your organisation requires that this information is attributed to your organisation instead of yourself). The final advice by the Committee will be published on the department's website following the listing decision by the Minister.

Information provided through consultation may be subject to freedom of information legislation and court processes. It is also important to note that under the EPBC Act, the deliberations and recommendations of the Committee are confidential until the Minister has made a final decision on the nomination, unless otherwise determined by the Minister.

# *Pteropus conspicillatus*

spectacled flying-fox

*Note: The information contained in this Conservation Advice was primarily sourced from 'The Action Plan for Australian Mammals 2012' (Woinarski et al., 2014). Any substantive additions obtained during the consultation on the draft will be cited within the advice. Readers may note that Conservation Advices resulting from the Action Plan for Australian Mammals show minor differences in formatting relative to other Conservation Advices. These reflect the desire to efficiently prepare a large number of advices by adopting the presentation approach of the Action Plan for Australian Mammals, and do not reflect any difference in the evidence used to develop the recommendation.*

## **Taxonomy**

Conventionally accepted as *Pteropus conspicillatus* (Gould 1850). Also known as the spectacled fruit bat. Two subspecies are recognised: *P. c. conspicillatus* (Australia and south-eastern New Guinea) and *P. c. chrysauchen* (north-western New Guinea and nearby islands) (Flannery 1995). Within its Australian range, Fox (2011) reported substantial genetic distinction between the Wet Tropics and Iron Range subpopulations; however further analysis in Fox et al. (2012) concluded that there was occasional gene flow between these subpopulations.

## **Species Information**

### **Description**

In Australia, the spectacled flying-fox appears to be the only rainforest specialist among the mainland flying-foxes (Richards et al., 2008). It is mostly black, with distinctive straw-coloured fur surrounding the eyes and upper muzzle, and a prominent yellow neck-ruff (Richards et al., 2008). Eye-rings of some individuals can be indistinct, making them look similar to black flying-foxes (*Pteropus alecto*) (Hall & Richards 2000), and the ruff and head may be silver-blond in some individuals (Richards et al., 2008). The head and body length is 220–240 mm, while the forearm length is 160–189 mm for males and 149–182 mm for females. Weight ranges are 500–1000 g for males and 450–800 g for females (Richards et al., 2008).

### **Distribution**

In Australia, the spectacled flying-fox is restricted to north-eastern Queensland, where it occurs in association with extensive areas of rainforest from Cape York along the eastern coast to as far south as Ingham (Churchill 1998), with outlier records at least as far south as Charters Towers and as far west as Chillagoe (Garnett et al., 1999; Qld DERM 2010; Parson et al., 2010). Within this range, the Wet Tropics region is considered its stronghold (Garnett et al., 1999; Fox 2011; Dennis 2012), with a far smaller population centred on Iron Range, Cape York (Fox 2011). Richards (1990a) described and mapped all then known roosts, and additional roost information is presented in Shilton et al. (2008).

Its extent of occurrence has probably changed little since European settlement, although extensive clearing of lowland vegetation, particularly rainforests, has likely reduced its area of occupancy substantially. Clearing continues at a reduced pace (Garnett et al., 1999). There is some anecdotal information of at least local contraction in range, with fewer reports of the species from the Ingham area (O. Whybird pers. comm., cited in Woinarski et al., 2014). Here, area of occupancy is defined as the area occupied by colonial roosts, albeit noting that these may vary within and between years (Shilton et al., 2008).

Beyond Australia, the species occurs in New Guinea and some surrounding islands (Flannery 1990, 1995), as far west as the Moluccas (Helgen et al., 2008).

## Relevant Biology/Ecology

The spectacled flying-fox is associated mainly with rainforests, with most colonial roosts ('camps') occurring in or near (within 6.5 km) of rainforests (Richards 1990a). However, it forages widely away from such camps across a broad range of vegetation types including mangroves, eucalypt forests, *Melaleuca* forests, gardens and orchards (Parsons et al., 2006; Dennis 2012). Individuals may disperse widely from camps to feed, and may move frequently between camps (Westcott et al., 2001). Following tropical cyclone Larry, which had substantial impacts on vegetation at many camps in the Wet Tropics region, spectacled flying-foxes dispersed widely and occupied many new sites, at least temporarily (Shilton et al., 2008). Although many roost sites have been used for long periods, genetic studies show that there is little genetic isolation between individuals at different camps in the Wet Tropics region, indicating that there is substantial movement of individuals between colonies (Fox 2011; Fox et al., 2012).

Its diet includes fruits of very many tree species, pollen, nectar and leaves (Richards 1990b; Parsons et al., 2006; Richards et al., 2008; Qld DERM 2010). Recent telemetry data suggest that much of the foraging is undertaken in open forests (on mass flowering events) rather than on the dispersed fruit and flower resources in rainforests (Shilton et al., 2008; D. Westcott pers. comm., cited in Woinarski et al., 2014).

Breeding is highly seasonal and synchronised, with births occurring between October and December (Shilton et al., 2008). Females produce one young per year. Longevity in the wild may be up to 13 years, although only a small proportion of individuals live that long (Fox et al., 2008). Some females produce young at two years, but the majority first breed at three years (Fox et al., 2008). Generation length, determined by life table analysis, is five years (Fox et al., 2008); however, this assessment may not be representative as it relates to a colony (and a period) with a high rate of mortality associated with tick infection (S. Fox pers. comm., cited in Woinarski et al., 2014). Generation length is therefore taken here as the midpoint of longevity and age at sexual maturity, i.e. 7–8 years.

Habitat and associated seasonal resources critical to the survival of this species has not been mapped. However, the Mabi Forest (Complex Notophyll Vine Forest 5b), listed as Critically Endangered under the EPBC Act, is considered a key habitat for the spectacled flying-fox (SPRAT).

## Threats

Historic decline was associated particularly with habitat loss and persecution. These impacts have now lessened, in part because of some protection afforded due to its national threatened species listing. However, although much of the species' range occurs within the Wet Tropics World Heritage Area where it is protected from many threats, key foraging resources are found outside the World Heritage Area in agricultural land where clearing and persecution at orchards still occur (Woinarski et al., 2014). Monitoring by Westcott & McKeown (2014) from 2004 to 2014 showed an increasing population shift towards urban areas, which may result in a future increase in human and flying-fox conflicts.

Threats to the spectacled flying-fox are outlined in the table below (Woinarski et al., 2014).

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Habitat loss and fragmentation	Severe	Moderate	Much of its habitat has been cleared and there is some ongoing clearing, particularly of foraging (non-rainforest) habitat. There may be some continuing fragmentation impacts, but probably less so than for more sedentary species.

			Considered a significant threat by Qld DERM (2010).
Persecution at orchards	Severe	Moderate	Considered a significant threat by Qld DERM (2010). Culling was allowed under permit, but this ceased when the species was listed as Vulnerable under Queensland legislation.
Tick paralysis	Moderate	Moderate	Many individuals have been reported to die due to tick paralysis, with this incidence probably increasing, possibly due to recent spread of the weedy shrub <i>Solanum mauritanium</i> (Garnett et al., 1999; Fox 2011; Dennis 2012). Considered a moderate threat by Qld DERM (2010). Analysis indicates fluctuating trends between years associated with rainfall patterning (D. Westcott pers. comm., cited in Woinarski et al., 2014).
Persecution at camps (especially in and near towns)	Minor	Moderate	Persecution at camps is rarely lethal (though disturbance during early gestation can lead to some young falling or being abandoned) with animals moving to other camps. High levels of natural movement between camps by individuals and extreme natural fluctuations in camp size suggest little long-term impact.
Mortality associated with barbed wire, powerlines and netting	Minor	Moderate	Considered a minor threat by Qld DERM (2010).
Birth abnormalities (cleft palate syndrome)	Minor	Minor	There is possibly an increasing incidence of cleft palate syndrome (30–40 cases reported from 1998–2001), with unknown cause. Considered a minor threat by Qld DERM (2010) (Dennis 2012).
Secondary poisoning through chemicals used in agriculture	Minor	Minor	Considered a likely threat by Qld DERM (2010) (Dennis 2012).
Climate change	Minor (unknown)	Entire (future)	Considered a significant threat by Qld DERM (2010). An increased incidence of extreme cyclones and extreme hot days could affect this species (Welbergen et al., 2007).
Habitat	Minor	Large (future)	Spread of Myrtle Rust may affect

degradation (and resource depletion) due to Myrtle rust			recruitment of many of the tree species important in the flying-fox's diet, so this may have an impact in the long term.
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**Assessment of available information in relation to the EPBC Act Criteria and Regulations**

<b>Criterion 1. Population size reduction (reduction in total numbers)</b>			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	<b>Critically Endangered Very severe reduction</b>	<b>Endangered Severe reduction</b>	<b>Vulnerable Substantial reduction</b>
<b>A1</b>	<b>≥ 90%</b>	<b>≥ 70%</b>	<b>≥ 50%</b>
<b>A2, A3, A4</b>	<b>≥ 80%</b>	<b>≥ 50%</b>	<b>≥ 30%</b>
A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.	<i>based on any of the following</i>	(a) direct observation [except A3]	
A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.		(b) an index of abundance appropriate to the taxon	
A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]		(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat	
A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.		(d) actual or potential levels of exploitation	
		(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites	

**Evidence:**

The spectacled flying-fox is undergoing a continuing decline in population size due to a range of threats, with impacts exacerbated due to its low reproductive output. The spectacled flying-fox (and other pteropodids) have a 'slow' life history, and modelling has shown that even relatively small increases in mortality rate may precipitate substantial population decline (McIlwee & Martin 2002; Fox et al., 2008).

Population trends for the species are imprecisely known and difficult to detect due to the large intra-annual fluctuations of animals in and out of the counted population (Westcott et al., 2012). The historical record includes some claims of very large colonies, but these sources are imprecise (Garnett et al., 1999). Dennis (2012) noted that 'the population size and trend is still uncertain ... however a decline is inferred due to considerable habitat loss ... In addition, the bats have faced, and in some cases, still face, a suite of new mortality factors'. Garnett et al. (1999) concluded that there was a general pattern of decline, and presented arguments for and against the rate of decline meeting eligibility thresholds for listing as threatened. Many colonies are known to have been abandoned or destroyed (Garnett et al., 1999; Qld DERM 2010), but this does not represent a clear measure of decline because individuals may have shifted to new sites (Garnett et al., 1999; Shilton et al., 2008; Qld DERM 2010). Large fluctuations in the number of individuals recorded in counted colonies have been associated with cyclonic events and are interpreted as short-term re-locations rather than mortality (Shilton et al. 2008; D. Westcott pers. comm., cited in Woinarski et al., 2014).

Annual monitoring data over the period 1998–2005 for the Wet Tropics, notwithstanding some methodological constraints and inconsistencies, showed no general pattern of decline (Fox 2011). However, monthly monitoring undertaken in the Wet Tropics from 2004 to 2014,

based on daytime counts at roost sites, demonstrated a negative population trend with both the maximum and average size of roosting camps declining over the 10 year period (Westcott & McKeown 2014). The trend was statistically significant and suggested a rate of decline of 4–6 percent per annum (or 34–46 percent over the 10 years). This is despite high inter-annual variability in abundance (maximum yearly population estimates fluctuated between 203 722 and 125 000 over a 9 year period). Although there were significant changes in camp use and 12 new camps were discovered over the study period, the number of camps occupied at any given time remained constant. This suggests that although the movement of individuals away from known camps or to outside the study region may contribute to the observed population trend and variability, it does not explain the full extent of the decline.

Fox et al. (2008) developed life history tables for one colony site (Tolga Scrub on the Atherton Tablelands), derived from a large sample size of individuals killed by paralysis ticks *Ixodes holocyclus*, and reported that this subpopulation declined by 16 percent over the two year study (2001–2002). However they cautioned that this rate of decline may not be representative of other years at this site, or of other sites; in particular lowland sites have far lower tick incidence (S. Fox pers. comm., cited in Woinarski et al., 2014). Furthermore, it is unlikely that this colony represents a closed subpopulation, so the 16 percent decline being due to mortality is at least challengeable (D. Westcott pers. comm., cited in Woinarski et al., 2014).

The data presented above appear to demonstrate that the species is **eligible for listing as Vulnerable (A4(a)(d))** under this criterion. A decline of greater than 30 percent has been observed over 2004–2014 (Westcott & McKeown 2014), and may be projected to continue in the near future as threats to the species are ongoing and not fully understood. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

<b>Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy</b>			
	<b>Critically Endangered Very restricted</b>	<b>Endangered Restricted</b>	<b>Vulnerable Limited</b>
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions indicating distribution is precarious for survival:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

### Evidence:

The extent of occurrence is estimated at 81 562 km<sup>2</sup>, and the area of occupancy estimated at 224 km<sup>2</sup>. These figures are based on the mapping of point records from 1996 to 2016, obtained from state governments, museums and CSIRO. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines 2014 (DotE 2016). Woinarski et al. (2014), which estimated the AOO at 148 km<sup>2</sup>, considered this to be a significant underestimate due to limited sampling across the occupied range, but that the AOO was still likely to be less than 2000 km<sup>2</sup>.

The species occurs at more than 10 locations, and is not severely fragmented. A continuing decline in population size is suspected, but there is no evidence of extreme fluctuations. Large

fluctuations in the number of individuals recorded in counted colonies have been associated with cyclonic events and are interpreted as short-term re-locations rather than mortality (Shilton et al., 2008; D. Westcott pers. comm., cited in Woinarski et al., 2014).

The data presented above appear to demonstrate the species is not eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

<b>Criterion 3. Population size and decline</b>			
	<b>Critically Endangered Very low</b>	<b>Endangered Low</b>	<b>Vulnerable Limited</b>
Estimated number of mature individuals	<b>&lt; 250</b>	<b>&lt; 2,500</b>	<b>&lt; 10,000</b>
AND either (C1) or (C2) is true			
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	<b>Very high rate 25% in 3 years or 1 generation (whichever is longer)</b>	<b>High rate 20% in 5 years or 2 generation (whichever is longer)</b>	<b>Substantial rate 10% in 10 years or 3 generations (whichever is longer)</b>
C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(i) Number of mature individuals in each subpopulation	<b>≤ 50</b>	<b>≤ 250</b>	<b>≤ 1,000</b>
(a) (ii) % of mature individuals in one subpopulation =	<b>90 – 100%</b>	<b>95 – 100%</b>	<b>100%</b>
(b) Extreme fluctuations in the number of mature individuals			

### Evidence:

The population size of the spectacled flying-fox (and other *Pteropus* species) is difficult to estimate because of imprecision in counting large numbers of bats at colonial roosts, and because numbers may vary substantially across time at roosts, and not all roost sites are known (Garnett et al., 1999; Westcott & McKeown 2004; Westcott et al., 2012). Notwithstanding these recognised problems, and based on near-simultaneous counts at all then known roosts in the Wet Tropics, Garnett et al. (1999) estimated the Wet Tropics population size at about 153 000 individuals, and considered that the total (Australian) population 'may reach' 200 000. More or less analogous counts have been conducted annually since (and, from 2004, at monthly intervals) for the Wet Tropics region (Shilcott et al., 2008; Fox 2011; Westcott & McKeown 2014). Monthly monitoring at all known camps (roost sites) from 2004 to 2006 indicated a counted population fluctuating at around 200 000 animals (Westcott et al., 2001; Shilton et al., 2008; D. Westcott pers. comm., cited in Woinarski et al., 2014), with the counted population estimated to be about 80% of the entire population (i.e. around 250 000 individuals) in the Wet Tropics. Monitoring since 2006 indicates relative stability in this estimate (D. Westcott pers. comm., cited in Woinarski et al., 2014).

There have been no such robust estimates for subpopulations on Cape York Peninsula, but Fox (2011) considered the Iron Range colony to be 'very small ... at most comprising several hundred individuals.'



The data presented above appear to demonstrate the species is not eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

<b>Criterion 4. Number of mature individuals</b>			
	<b>Critically Endangered Extremely low</b>	<b>Endangered Very Low</b>	<b>Vulnerable Low</b>
Number of mature individuals	<b>&lt; 50</b>	<b>&lt; 250</b>	<b>&lt; 1,000</b>

**Evidence:**

The number of mature individuals is estimated to be around 250 000 (see Criterion 3).

The data presented above appear to demonstrate the species is not eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

<b>Criterion 5. Quantitative Analysis</b>			
	<b>Critically Endangered Immediate future</b>	<b>Endangered Near future</b>	<b>Vulnerable Medium-term future</b>
Indicating the probability of extinction in the wild to be:	<b>≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)</b>	<b>≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)</b>	<b>≥ 10% in 100 years</b>

**Evidence:**

Population viability analysis appears not to have been undertaken, there are insufficient data to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

**Conservation Actions**

**Recovery Plan**

A recovery plan has been developed by the Queensland government and adopted as a national recovery plan by the Commonwealth (Qld DERM 2010). It includes the following objectives:

- research practicable and cost-effective flying-fox deterrent systems for commercial fruit growers;
- identify and protect native foraging habitat critical to survival;
- accurately assess the short and long term population size and population trends;
- improve the public perception of the spectacled flying-fox and the standard of information available to guide recovery;
- increase knowledge of roosting requirements and protect important camps;
- improve understanding of the incidence of tick paralysis and actions to minimise paralysis mortality;
- implement strategies to reduce incidence of electrocution and entanglement; and

- investigate the causes of birth abnormalities such as cleft palate syndrome.

Some of the actions under these objectives have been implemented, but the extent to which they have contributed to recovery is unclear. The plan has not yet been reviewed.

### Primary Conservation Actions

1. Protect habitat (including important roost and foraging sites) from clearing and fragmentation.
2. Engage with the public to resolve conflicts between humans and flying-foxes in ways which do not harm the species.

### Conservation and Management Priorities

This spectacled flying-fox has been subject to appreciable research, monitoring and management over the last 20 years. It is a high priority species under Queensland's Back on Track program, which outlines management measures to be undertaken for threatened species (Queensland Government 2010a,b). Constraints on some development activities which may affect the species are regulated by a specific EPBC Act policy statement (Qld DEH 2003).

Recommended management actions are outlined in the table below (Woinarski et al., 2014).

Theme	Specific actions	Priority
Active mitigation of threats	Develop and maintain non-destructive protocols for resolving conflicts between humans and flying-foxes	High
	Protect important roost and foraging sites from clearing.	High
Captive breeding	N/a	
Quarantining isolated populations	N/a	
Translocation	N/a	
Establish or enhance monitoring program	Maintain the existing monitoring program, and establish a monitoring program for camps outside the Wet Tropics area.	High
	Enhance monitoring for disease, tick paralysis, and other potential causes of population-level decline.	Medium-high
Community engagement	Develop conservation covenants on lands with high value for this species.	Medium-high
	Develop effective processes for community and industry engagement in the management of flying-fox camps and orchards.	Medium-high
	Involve Indigenous ranger groups in survey, monitoring and management activities.	Medium

### Survey and Monitoring priorities

Theme	Specific actions	Priority
Survey to better define distribution	Undertake a targeted survey of all suitable habitat (roost sites) within the species' range, particularly in Cape York Peninsula.	Medium
	Identify key foraging habitat and its distribution, particularly outside the Wet Tropics World Heritage area, and	Medium

	particularly on Cape York Peninsula.	
Establish or enhance monitoring program	Design an integrated monitoring program across its range.	Low (design already developed)

### Information and Research priorities

Theme	Specific actions	Priority
Assess relative impacts of threats	Enhance life history and population viability modelling to incorporate more evidence about relative causes of mortality.	Medium-high
	Assess pathways for contacts with paralysis ticks, and factors involved in inter-year variation in the incidence of tick paralysis.	Medium
	Identify the incidence and impact of any secondary poisoning from chemicals used in agriculture.	Low-medium
	Assess the likely impact of myrtle rust on key food plants.	Low-medium
	Identify the causes of cleft palate syndrome, and options for reducing its impact.	Low-medium
	Identify 'hotspots' for barbed-wire entanglements.	Low-medium
Assess relative effectiveness of threat mitigation options	Continue to assess the effectiveness of a range of horticultural deterrents that do not kill flying-foxes.	High
	Assess options for replacement of barbed wire.	Medium
Resolve taxonomic uncertainties	N/a	
Assess habitat requirements	Identify factors underlying the species' selection of camp sites, and the extent to which these may be limiting.	Low
Assess diet, life history	N/a	
Undertake research to develop new or enhance existing management mechanisms	Assess options for least-impact management to move camps from sites with unacceptable impacts on people.	Low-medium

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### **Consultation questions**

1. Do you agree with the current taxonomic position of the Australian Faunal Directory for this taxon (as identified in the draft conservation advice)?
2. Can you provide any additional references, information or estimates on longevity, age of maturity, average life span and generation length?
3. Has the survey effort for this taxon been adequate to determine its national distribution and adult population size?
4. Do you accept the estimate provided in the nomination for the current population size of the taxon?
5. For any population with which you are familiar, do you agree with the population estimate provided? If not, are you able to provide a plausible estimate based on your own knowledge? If so, please provide in the form:  
Lower bound (estimated minimum):  
Upper bound (estimated maximum):  
Best Estimate:  
Estimated level of Confidence: %
6. Can you provide any additional data, not contained in the current nomination, on declines in population numbers over the past or next 10 years or 3 generations, whichever is the longer?
7. Is the distribution as described in the nomination valid? Can you provide an estimate of the current geographic distribution (extent of occurrence or area of occupancy in km<sup>2</sup>) of this taxon?
8. Has this geographic distribution declined and if so by how much and over what period of time?

9. Do you agree that the taxon is eligible for inclusion on the threatened species list, in the category listed in the nomination?
10. Do you agree that the threats listed are correct and that their effects on the taxon are significant?
11. To what degree are the identified threats likely to impact on the taxon in the future?
12. Can you provide additional or alternative information on threats, past, current or potential that may adversely affect this taxon at any stage of its life cycle?
13. In seeking to facilitate the recovery of this taxon, can you provide management advice for the following:
  - What individuals or organisations are currently, or need to be, involved in planning to abate threats and any other relevant planning issues?
  - What threats are impacting on different populations, how variable are the threats and what is the relative importance of the different populations?
  - What recovery actions are currently in place, and can you suggest other actions that would help recover the taxon? Please provide evidence and background information.
14. Can you provide additional data or information relevant to this assessment?
15. Can you advise as to whether this species is of cultural significance to Indigenous Australians?