Australian Government
Department of the Environment

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 list in the Endangered category; 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

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 11 November 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

Taxonomy

Conventionally accepted as *Pteropus conspicillatus* (Gould 1850). Known as the spectacled flying-fox, 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

The spectacled flying-fox 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 typically 500–1000 g for males and 450–800 g for females (Richards et al., 2008); however males of up to 1011 g and females up to 851 g have been recorded (Westcott pers. comm., 2016).

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 camps, and additional camp information is presented in Shilton et al. (2008). Camp locations are also mapped and regularly updated as part of the National Flying-Fox Monitoring Program (DotE, n.d).

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. Here, area of occupancy is defined as the area occupied by colonial camps, albeit noting that these may vary within and between years (Shilton et al., 2008). 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 (Whybird pers. comm., cited in Woinarski et al., 2014). However, despite a steady decline in the maximum number of individuals recorded south of -17.6 degrees latitude since 2004, the species still occupies its southern-most camp and it is unclear whether any significant contraction in range has occurred (Westcott pers. comm., 2016).

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).

Cultural Significance

The spectacled flying-fox was an important traditional food source for the Eastern Kuku Yalanji people (Kuku Yalanji elders [various], pers. comm., cited in Pinson pers. comm., 2015). However, no such use is currently known within the Wet Tropics region (Garnett et al., 1999).

Relevant Biology/Ecology

The spectacled flying-fox is associated mainly with rainforests, with most colonial camps occurring in or near (within several kilometres) 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). Individuals are known to fly up to 50 km in a single night to feed, and longer-distance movements are predicted (Fox 2011). 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 differentiation between groups of 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). The spectacled flying-fox will often share camps with other *Pteropus* species, including the little red, and black, flying-foxes (DERM 2010).

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). 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; 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 (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.

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 and 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. A subsequent publication (Tait et al., 2014) showed that there has been an increase in the proportion of urban camps and an increase in the proportion of the population using urban camps over this time period. This increase is not associated with the loss of non-urban camps or habitat.

Table 1 – Threats impacting the spectacled flying-fox in approximate order of severity of risk, based on available evidence

Threat factor	Threat type	Threat status	Evidence base
Climatic factors			
Cyclones	known	current	Analysis of monthly monitoring data from the Wet Tropics over 2004−2014 identified significant declines of the population associated with cyclones (Westcott et al. 2015). Both severe and moderate cyclones were identified as having a significant effect when they result in widespread damage to tree canopies resulting in long term loss of flower and fruit resources (Wescott et al., 2015).
Climate change	potential	future	An increased incidence of extreme cyclones and extreme hot days could affect this species (Welbergen et al., 2007). Considered a significant threat by Qld DERM (2010).
Habitat loss and fragmentation			
Land clearing	known	current	Much of the species' habitat has been cleared and there is ongoing clearing, particularly of foraging (non-rainforest) habitat. Habitat losses are associated with development impacts in coastal areas and plateaus, and agriculture intensification on the dry western margins of the species' range (Queensland Herbarium 2014). There may be some continuing fragmentation impacts. Habitat loss and fragmentation is considered a significant threat by Qld DERM (2010).
Culling and persecution			
Persecution at orchards	known	current	Culling was previously allowed under permit, but this ceased when the species was listed as Vulnerable under Queensland legislation. However, some illegal culling continues (Westcott pers. comm., 2016). Although electrocution grids have been prohibited in Queensland since 2001, they are not required to be dismantled, resulting in continued illegal electrocution (Booth 2006). Persecution by orchardists is considered a significant threat by Qld DERM (2010).
Persecution at camps (especially in and near towns)	known	current	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. However, while individual disturbance events have limited impact, their cumulative effect is significant − e.g. interference at critical periods in the breeding cycle across a number of key camps could result in the loss of many young (Westcott pers. comm., 2016).
Disease and abnormalities			
Tick paralysis	known	current	Many individuals have been reported to die due to tick paralysis, with this incidence probably increasing, possibly due to spread of the introduced shrub wild tobacco (*Solanum mauritanium*) (Garnett et al., 1999; Fox 2011; Dennis 2012; Buettner et al., 2013). Spectacled flying-foxes eat the fruits of this shrub, perhaps due to lower food availability resulting from land clearing or periods of low rainfall, which might expose them to ticks as they forage closer to the ground (Buettner et al., 2013). Analysis indicates fluctuating trends between years associated with rainfall patterning (Buettner et al., 2013). Tick paralysis is considered a moderate threat by Qld DERM (2010).
Birth abnormalities (cleft palate syndrome)	known	current	There is possibly an increasing incidence of cleft palate syndrome (30–40 cases reported from 1998–2001), with unknown cause. Birth defects, including cleft palate, have been reported at high levels at the Cairns Library camp over 2015−2016. There is some level of deformities at this camp in all years and intermittent reports from other camps as well (Westcott pers. comm., 2016). Considered a minor threat by Qld DERM (2010) (Dennis 2012).
Other mortalities			
Mortality associated with barbed wire, powerlines and fruitnetting	known	current	Considered a minor threat by Qld DERM (2010).
Secondary poisoning through chemicals used in agriculture	suspected	current	Considered a likely threat by Qld DERM (2010) (Dennis 2012).
Food availability			
Habitat degradation (and resource depletion) due to myrtle rust	suspected	future	Spread of myrtle rust (*Uredo rangelii*) in the Wet Tropics (Metcalfe et al., 2014) may affect recruitment of many of the tree species important in the flying-fox's diet, which may have an impact in the long term.

Habitat degradation (and resource depletion) due to fire exclusion	suspected	current	Changed fire regimes, predominantly fire exclusion, have resulted in major change to the vegetation composition and structure in the Wet Tropics Bioregion since the 1950s, accelerating since the 1980s (Stanton et al., 2014a, 2014b). 25−79% of sclerophyll woodland and forest are in an irreversible stage of rainforest transition (Stanton et al., 2014a), which may influence food availability for the spectacled flying-fox. Landscape-scale loss of sclerophyll and grassland habitats transitioning to closed forests through rainforest irruption has been documented at Iron Range (Russell-Smith et al., 2004a, 2004b).
Competition with congeners for food resources	suspected	current	Competition from the black flying-fox (*P. alecto*) for nectar, particularly in woodland trees, may be occurring in the southern part of the range of the spectacled flying-fox. The little red flying-fox (*P. scapulatus*) sometimes displaces the spectacled flying-fox from camps at Whiteing Road, Tolga, Cairns Central Swamp and the Daintree (Garnett et al., 1999).

Assessment of available information in relation to the EPBC Act Criteria and Regulations

Criterion 1. Population size reduction (reduction in total numbers)
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	**≥ 90%**	**≥ 70%**	**≥ 50%**
A2, A3, A4	**≥ 80%**	**≥ 50%**	**≥ 30%**

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.

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.

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*]

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.

based on any of the followin

(a) direct observation [*except A3*]

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

(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. It (and other pteropodids)

has a 'slow' life history, and modelling has shown that relatively small increases in mortality rate may precipitate substantial population decline (McIlwee & Martin 2002; Fox et al., 2008).

Population trends for the species have been difficult to detect due to the large intra-annual fluctuations of animals in and out of the counted population (Westcott et al., 2012). A decline has previously been suspected, but not demonstrated, due to threats such as habitat loss and the observance of many abandoned or destroyed colonies (Garnett et al., 1999; Dennis 2012). Large fluctuations in the number of individuals in colonies were previously interpreted as short-term re-locations following cyclonic events (Shilton et al. 2008; Westcott pers. comm., cited in Woinarski et al., 2014). However, more recent data analysis indicates that many bats die in the months following the loss of food resources due to cyclones (Westcott et al., 2015).

Monthly monitoring undertaken in the Wet Tropics from 2005 to 2014, based on daytime counts at roost sites, indicated that the population declined at a rate of 47−62% over the 10 year period. Fitting of Bayesian state-space models to November data (which best estimates the size of the breeding population as most adults are in camps), and excluding data from the November immediately post-Cyclone Larry which caused a very large drop in population size and could be considered an outlier, demonstrated a decline in both the maximum and average size of roosting camps (Westcott et al., 2015). The trend was statistically significant despite high inter-annual variability in abundance (maximum yearly population estimates fluctuated between 203 722 and 125 000 over a 10 year period). Projecting this decline forward suggests that 70−90 percent of the population may be lost over a three generation period from 2005.

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. Analysis of the data revealed that large reductions in population size coincided with (i.e. followed) cyclones, which were the likely cause of much of the population decline (Westcott et al., 2015). However, the decline has also occurred at the same time as the species has shown a shift towards urban areas, increasing conflict with humans (Westcott et al., 2015). 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).

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 (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 may not have been due to mortality alone (Westcott pers. comm., cited in Woinarski et al., 2014).

The data presented above appear to demonstrate that the species is **eligible for listing as Endangered (A4(a)(c)(d))** 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.

Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy			
	Critically Endangered Very restricted	**Endangered Restricted**	**Vulnerable Limited**
B1. Extent of occurrence (EOO)	**< 100 km²**	**< 5,000 km²**	**< 20,000 km²**
B2. Area of occupancy (AOO)	**< 10 km²**	**< 500 km²**	**< 2,000 km²**

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 10 124 km^2, and the area of occupancy estimated at 124 km^2. These figures are based on the mapping of all known roost site locations 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) estimated the AOO at 148 km^2, and considered this to be a significant underestimate due to limited sampling across the occupied range, but thought that the AOO was still likely to be less than 2000 km^2.

The species occurs at more than 10 locations, and is not severely fragmented. There is a continuing decline in population size (see Criterion 1). Despite large fluctuations in the number of individuals between years, these are not considered exteme.

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.

Criterion 3. Population size and decline				
		Critically Endangered Very low	**Endangered Low**	**Vulnerable Limited**
Estimated number of mature individuals		**< 250**	**< 2,500**	**< 10,000**
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)	**Very high rate 25% in 3 years or 1 generation (whichever is longer)**	**High rate 20% in 5 years or 2 generation (whichever is longer)**	**Substantial rate 10% in 10 years or 3 generations (whichever is longer)**
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:			
(a)	(i) Number of mature individuals in each subpopulation	**≤ 50**	**≤ 250**	**≤ 1,000**
	(ii) % of mature individuals in one subpopulation =	**90 – 100%**	**95 – 100%**	**100%**
(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 camps, and because numbers may vary substantially across time at camps, and not all camp sites are

known (Garnett et al., 1999; Westcott & McKeown 2004; Westcott et al., 2012). Approximately 50 roost sites have been identifed in the Wet Tropics, but only 10 are usually occupied at any point in time (Tait et al., 2014). Only small, irregular numbers (less than 1000) and no identififed permanent roosts have been recorded in the Iron and McIllwrath Ranges (Fox 2011).

Notwithstanding these recognised problems, based on near-simultaneous counts at all then known camps 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; 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. However, as of November 2015, the number of mature individuals is estimated at 100 000 (Westcott pers. comm., 2016).

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.

Criterion 4. Number of mature individuals			
	Critically Endangered Extremely low	**Endangered Very Low**	**Vulnerable Low**
Number of mature individuals	**< 50**	**< 250**	**< 1,000**

Evidence:

As of November 2015, the number of mature individuals is estimated to be around 100 000 (Westcott pers. comm., 2016). See also Criterion 3.

The information presented above appears 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.

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

Evidence:

Population viability analysis appears not to have been undertaken, and therefore 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 for the spectacled flying-fox (Qld DERM 2010) was developed by the State of Queensland and adopted as a national recovery plan under the EPBC Act in 2011. The plan is scheduled to expire in 2021 and has not yet been reviewed.

Primary Conservation Actions

1. Protect habitat − including important roost and foraging sites (particularly winter foraging habitat), and native non-rainforest vegetation on the western margins of the species' range − 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.

Further habitat clearing and fragmentation in areas containing important roosting and foraging habitat is likely to have a significant impact on the species.

The species requires a continuous temporal sequence of productive foraging habitats and suitable roosting habitat (Westcott et al., 2001). Habitat and associated seasonal resources critical to the survival of this species have not been mapped.

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).

Habitat loss and fragmentation

- Prevent vegetation clearing at important roost and foraging sites.

Culling and persecution

- Increase compliance efforts to reduce illegal shooting and culling.
- Prevent all electrocution at orchards and camps.
- Develop and maintain non-destructive protocols for resolving conflicts between humans and flying-foxes, including alternatives to dispersal.
- Establish a management zone around camps (which should be defined as an area large enough to accommodate seasonal influxes of individuals), where human habitation is prohibited.

Disease and abnormalities

- Control the incidence and spread of wild tobacco in order to limit exposure to ticks.

Other mortalities

- Replace drape nets on backyard fruit trees with taut nets, in accordance with Queensland Department of Environment and Heritage Protection guidelines, to minimise entanglements.
- Encourage electricity utility companies to increase spacing between electrical cables when replacing crosspieces as part of their continual upgrade program.
- Replace the top strands of barbed wire in fences near roost sites with single-strand wire.

Stakeholder engagement

- Develop conservation covenants on lands with high value for this species.
- Develop effective processes for community and industry engagement in the management of flying-fox camps and orchards.
- Involve Indigenous ranger groups in survey, monitoring and management activities.

Survey and Monitoring priorities

- Maintain the existing monitoring program within the Wet Tropics area, and establish a monitoring program for camps outside the Wet Tropics.
- Enhance monitoring for disease, tick paralysis, and other potential causes of population-level decline.
- Undertake a targeted survey of all suitable habitat for roost sites within the species' range, particularly in Cape York Peninsula, and identify important roost sites.
- Identify important foraging habitat and its distribution, particularly outside the Wet Tropics World Heritage area, and particularly on Cape York Peninsula.
- Monitor the incidence and spread of myrtle rust.

Information and Research priorities

- Continue to assess the effectiveness of a range of horticultural deterrents that do not kill flying-foxes.
- Enhance life history and population viability modelling to incorporate more evidence about relative causes of mortality.
- Assess pathways for contacts with paralysis ticks, and factors involved in inter-year variation in the incidence of tick paralysis.
- Identify the incidence and impact of any secondary poisoning from chemicals used in agriculture.
- Assess the likely impact of myrtle rust on key food plants.
- Identify the causes of cleft palate syndrome, and options for reducing its impact.
- Identify 'hotspots' for barbed-wire entanglements.
- Assess options for least-impact management to move camps from sites with unacceptable impacts on people.
- Identify factors underlying the species' selection of camp sites, and the extent to which these may be limiting.
- Investigate appropriate fire management regimes which will maintain adequate food resources for the species.

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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^2) 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?