

# THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

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The Minister approved this conservation advice and included this species in the Vulnerable category, effective from 09/07/2020

## Conservation Advice

### *Falco hypoleucos*

Grey Falcon

#### **Taxonomy**

Conventionally accepted as *Falco hypoleucos* Gould, 1841. No infraspecific taxa described. The species consists of a single population and is considered monotypic (Marchant and Higgins 1993).

#### **Summary of assessment**

##### **Conservation status**

Vulnerable: Criterion 4

The highest category for which *Falco hypoleucos* is eligible to be listed is Vulnerable.

*Falco hypoleucos* has been found to be eligible for listing under the following categories:

Criterion 1: Not eligible

Criterion 2: Not eligible

Criterion 3: Not eligible

Criterion 4: Vulnerable

Criterion 5: Not eligible

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see

<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

#### **Reason for conservation assessment by the Threatened Species Scientific Committee**

This advice follows assessment of new information provided to the Committee to list Grey Falcon.

#### **Public consultation**

Notice of the proposed amendment and a consultation document was made available for public comment for 33 business days between 3 July and 16 August 2019. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

#### **Species/sub-species information**

##### **Description**

The Grey Falcon is an elusive species endemic to mainland Australia. It is the rarest of six Australian members of the genus *Falco* (Olsen and Olsen 1986; Marchant and Higgins 1993). The Grey Falcon is a medium-sized raptor (400 – 500g) that exhibits reversed sexual dimorphism in body mass, with females weighing on average about 30 per cent more than males (Schoenjahn 2011). The Grey Falcon is a compact, pale grey falcon with a heavy thick chest, long wings and dark wing tips (Debus 2019; Schoenjahn 2010). The under-body is pale grey and the tail has narrow blackish bars. The chin, throat and cheeks are white in colour; adults are pale grey with fine blackish streaks, and juveniles are white with heavy dark streaks.

The legs and toes, eye-ring, cere and base of the bill are bright orange-yellow and the tip of the bill is black (Marchant and Higgins 1993).

## Distribution

The species occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (Marchant and Higgins 1993). The species is mainly found where annual rainfall is less than 500 mm, except when wet years are followed by drought, when the species might become marginally more widespread, although it is essentially confined to the arid and semi-arid zones at all times (Schoenjahn 2018).

The species appears to be absent from Cape York Peninsula, areas east of the Great Dividing Range in Queensland and New South Wales, south of the Great Dividing Range in Victoria, and south of latitude 26°S in Western Australia (Barrett et al. 2003; Schoenjahn 2018).

## Relevant biology/ecology

The Grey Falcon occurs at low densities across inland Australia (BirdLife International 2019). The ecology of the Grey Falcon was known almost entirely from anecdotal and opportunistic observations, but has been the subject of significant recent research, especially by Schoenjahn (2011, 2013, 2018) but also by Aumann (2001a,b,c), Falkenberg (2011), Sutton (2011), Watson (2011), Janse et al. (2015) and Ley and Tynan (2016).

The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses (Garnett et al. 2011; Watson 2011; Schoenjahn 2013, 2018; Janse et al. 2015; Ley and Tynan 2016). The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (Olsen and Olsen 1986; Schoenjahn 2018).

While breeding Grey Falcons feed almost exclusively on birds (Cupper and Cupper 1980, 1981; Harrison 2000; Aumann 2001c; Falkenberg 2011; Sutton 2011; Schoenjahn 2013; Janse et al. 2015; Ley and Tynan 2016). Prey species include doves, pigeons, small parrots and cockatoos, and finches, but a variety of other bird prey species has been recorded (Marchant and Higgins 1993, Hollands 1984; Debus and Rose 2000; Schoenjahn 2013, Cook 2014, Fisher 2015). Non-avian prey recorded by direct observation include small mammals on three occasions (Schoenjahn 2013, Moore 2016) and a lizard (Czechura 1981).

Breeding occurs from June to November. Clutch size can vary from 1 – 4 eggs (Olsen and Olsen 1986; Garnett et al. 2011; Schoenjahn 2013). Eggs are laid in the old nests of other birds, particularly those of other raptors or corvids. The nests chosen are usually in the tallest trees along watercourses, particularly River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (*E. coolabah*), but falcons also nest in telecommunication towers (Marchant and Higgins 1993; Schoenjahn 2013, 2018; Falkenberg 2010). The incubation period is 34–35 days (Cupper and Cupper 1980; Hollands 1984; Sutton 2011; Ley and Tynan 2016) and the nestling period is variously given as 49–52 days (Cupper and Cupper 1980), 41 days (Hollands 1984), 42–49 days (Hollands 2003) and ‘just under 6 weeks’ (Sutton 2011), suggesting that the lower end may be more realistic and in line with other similar-sized Australian falcons. Typically, young Grey Falcons and their parents will stay together for up to at least 12 months after fledging, even when the parents have a new brood (Schoenjahn 2018).

## Threats

In the absence of focused studies on Grey Falcons, all potential threats to the species that have been published are based on general considerations and extrapolations from better studied species and are, therefore, speculative (Garnett and Crowley 2000, Garnett et al. 2011). Schoenjahn (2018) identified ten plausible threats to the Grey Falcon and ranked them according to severity (Table 1).

**Table 1:** Threats impacting the Grey Falcon in approximate order of severity of risk (see Schoenjahn 2018).

Threat factor	Threat status and priority for action	Evidence base
Invasive species		
Predation by cats	Very High	Schoenjahn (2018) documented that Grey Falcons will roost on the bare open ground and documented Grey Falcon in the gut contents of cats. Chicks may be vulnerable to cat predation at accessible nests.
Climate change		
Increased temperatures in arid and semi-arid Australia	Very High	The breeding distribution now covers areas of the highest annual average temperatures in Australia (Schoenjahn 2013). The predicted increases in severity and frequency of days with very high temperatures, heat waves and droughts may exceed the physiological and behavioural capacities of these birds to thermoregulate adequately (Schoenjahn 2018). Changes in rainfall patterns may affect prey availability and heat stress may affect chick survival. However these impacts are speculative and another analysis of climate change impacts on birds did not predict that Grey Falcons would be affected (Garnett et al. 2013; Garnett and Franklin 2014).
Demographic and genetic stochastic events		
Small population size	High	The estimated number of mature individuals is <1,000 (Schoenjahn 2013, 2018; Garnett et al. 2011; BirdLife International 2019). A small population is more susceptible to demographic and genetic stochastic events, which can impact the long term survival of the population.
Habitat loss and fragmentation		
Grazing by exotic herbivores	Very High	Herbivores such as camels in arid and semi-arid areas are preventing the regeneration of suitable nesting trees (Garnett et al. 2011; Schoenjahn 2018). Habitat degradation by herbivores may also reduce prey abundance.
Nest shortage	High	Land clearing of the semi-arid zone and overgrazing of arid zone rangelands have been identified as possible threats to the availability of nesting trees (Garnett and Crowley 2000; Garnett et al. 2011; Schoenjahn 2013, 2018). The loss of artificial structures (telecommunication towers and repeaters) may also contribute to the reduction of suitable nesting habitat (Schoenjahn 2018).
Disturbance		
Birdwatchers and photographers	Moderate	The Grey Falcon is a highly sought after species by birdwatchers and bird photographers. As a consequence, nest sites may be visited by individuals and commercial birding tour groups during the breeding season hoping to see the species. This may cause disturbance and affect breeding success.
Direct mortality		

Collision with traffic	Moderate	Schoenjahn (2018) documented six cases of Grey Falcons being found injured or dead along roads between 2007 and 2017.
Collision with fences and powerlines	Moderate	Grey Falcons have been reported receiving life-threatening injuries from colliding with fences, and presumably powerlines (Schoenjahn 2011).
Harvesting		
Egg collecting	Low	Egg-collecting was considered a threat until the late 1980s (Cupper and Cupper 1981, Dennis 1986, Hollands 1984, SAOA 1992), but may not be of such importance any longer because collecting and possessing eggs without a permit is now illegal in all Australian states and territories.
Falconry	Low	Falconry is illegal in Australia, however, the international demand from falconry for rare falcon species and colour morphs appears to be strong. Schoenjahn (2018) noted that the threat to the Grey Falcon species as a whole from illegal activities in Australia is, at present, minimal.

### **Threat Prioritisation**

Each of the threats outlined above has been assessed to determine the risk posed to the Grey Falcon population using a risk matrix. This in turn determines the priority for actions outlined below. The threats were considered in the context of the current management regimes. The impact of each threat has been assessed assuming that existing management measures continue to be applied appropriately. If management regimes change then the level of risk associated with threats may also change. The risk matrix considers the likelihood of an incident occurring and the consequences of that incident. Threats may act differently in different parts of the species range and at different times of year, but the precautionary principle dictates that the threat category is determined by the population at highest risk. Population-wide threats are generally considered to present a higher risk.

The risk matrix uses a qualitative assessment drawing on peer reviewed literature and expert opinion. In some cases the consequences of activities are unknown. In these cases, the precautionary principle has been applied. Levels of risk and the associated priority for action are defined as follows:

Very High - immediate mitigation action required

High - mitigation action and an adaptive management plan required, the precautionary principle should be applied

Moderate – obtain additional information and develop mitigation action if required

Low – monitor the threat occurrence and reassess threat level if likelihood or consequences change

**Table 2:** Risk Prioritisation

Likelihood of occurrence	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
Almost certain	Low	Moderate	Very High	Very High	Very High
Likely	Low	Moderate	High	Very High	Very High
Possible	Low	Moderate	High	Very High	Very High
Unlikely	Low	Low	Moderate	High	Very High
Rare or Unknown	Low	Low	Moderate	High	Very High

**Categories for likelihood are defined as follows:**

Almost certain – expected to occur every year

Likely – expected to occur at least once every five years

Possible – might occur at some time

Unlikely – such events are known to have occurred on a worldwide basis but only a few times

Rare or Unknown – may occur only in exceptional circumstances; OR it is currently unknown how often the incident will occur

**Categories for consequences are defined as follows:**

Not significant – no long-term effect on individuals or populations

Minor – individuals are adversely affected but no effect at population level

Moderate – population recovery stalls or reduces

Major – population decreases

Catastrophic – population extinction

**Table 3: Grey Falcon Residual Risk Matrix**

Likelihood of occurrence	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
Almost certain		Birdwatchers and photographers	Predation by cats  Increased temperatures in arid and semi-arid Australia  Grazing by exotic herbivores		
Likely		Collision with traffic			
Possible		Collision with fences and powerlines	Small population size  Nest shortage		
Unlikely					
Rare or Unknown		Egg collecting  Falconry			

**How judged by the Committee 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>
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>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.</p> <p>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]</p> <p>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.</p>	<p><i>based on any of the following:</i></p> <ul style="list-style-type: none"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul>		

**Evidence:****Not eligible**

No population trend data are currently available. The species occurs at low densities across arid and semi-arid Australia. There is uncertainty about historical declines and recent evidence of declines is lacking (Reid and Fleming 1992; Garnett et al 2011). Garnett et al. (2011) considered that past, present or future population declines are unlikely to exceed 20 per cent in any 3-generation period (18.6 years; Garnett et al. 2011).

Following assessment of the data, the Committee has determined that the species is not eligible for listing in any category under this criterion as the past, current or future population declines are thought unlikely to exceed 30 per cent in any 3-generation period.

<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:			
(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:****Not eligible**

The extent of occurrence (EOO) is estimated at 6.1 million km<sup>2</sup>, and the area of occupancy (AOO) estimated at 6,000 km<sup>2</sup> (Garnett et al. 2011). These figures are based on the mapping of point records from post 1997 species observations, obtained from state governments, museums, CSIRO, and Birdlife Australia. 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. Therefore, the species has not met a required element of this criterion.

<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	< 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)	<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:				
(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:**

**Not eligible**

The species consists of a single population (Marchant and Higgins 1993). The total population size is now generally accepted to be <1,000 mature individuals (Schoenjahn 2011, 2018; Garnett et al. 2011; BirdLife International 2019; Schoenjahn et al. *in press*) and considerably scarcer than previously thought (<5,000 individuals, Brouwer and Garnett 1990; Schoenjahn et al. *in press*). No population trend data are available. There is uncertainty about historical declines and recent evidence of decline is lacking (Reid and Fleming 1992; Garnett et al 2011). Garnett et al. (2011) found no evidence to support a continuing population decline or extreme fluctuations. Therefore, the species has not met a required element of this criterion.

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

**Evidence:**

**Eligible under Criterion 4 for listing as Vulnerable**

The species occurs at low densities across arid and semi-arid Australia. The species has been encountered very infrequently during extensive, targeted surveys (Schoenjahn 2011, 2018). The total population size is accepted to be <1,000 mature individuals (Schoenjahn 2011, 2018; Garnett et al. 2011; BirdLife International 2019; Schoenjahn et al. *in press*) and considerably scarcer than previously thought (<5,000 individuals, Brouwer and Garnett 1990; Schoenjahn et al. *in press*). This estimate is based on reported range and densities compared with the Peregrine Falcon (*Falco peregrinus*) (reported over two separate time periods 20 years apart for the Atlas of Australian Birds, Blakers et al. 1984; Barrett et al. 2003), and assuming 3,000 - 5,000 pairs of Peregrine Falcon in Australia (after Olsen and Olsen 1988).

By comparing the range and number of sightings per 1 degree block in the first Atlas of Australian Birds (Blakers et al. 1984), it is estimated that the Grey Falcon occupies about 0.27x the area occupied by the Peregrine Falcon (99 compared to 365 grid blocks) at an average of one-quarter its density. Given an estimated 3,000–5,000 pairs of Peregrines in Australia (Olsen and Olsen 1988, cited in Garnett et al. 2011), this suggests a total of 200 to 350 pairs of Grey Falcon (Schoenjahn 2011). The second Atlas (Barrett et al. 2003) reports sightings in 118 (14%) compared with 384 (47%) of grid blocks, for the Grey Falcon and Peregrine Falcon respectively. At one-third the distribution and a little over half the density, the estimated population is 550–915 pairs. The average of the mid-point of the ranges from the two Atlases is about 500 pairs and is considered appropriately precautionary, especially considering the uncertainty of the data and historical declines (Garnett et al. 2011), thus the population is estimated at 999 mature individuals. More recent work on the genetic variation of the species is consistent with the <1,000 mature individual estimate (S. Garnett pers. comm. J. Schoenjahn pers. comm.)

The Committee considers that the total number of mature individuals is <1,000 which is low. Therefore, the species has met the relevant elements of Criterion 4 to make it eligible for listing as Vulnerable.

<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:**  
**Not eligible**

Population viability analysis has not been undertaken.

### **Conservation actions**

#### **Recovery plan**

A Recovery Plan is not required; an approved Conservation Advice for the species provides sufficient direction to implement priority actions, mitigate against key threats and enable recovery. Management and research activities are being undertaken at state and local levels.

#### **Primary conservation actions**

Support initiatives to improve habitat management, cat and camel control in arid and semi-arid Australia. However, given our understanding of threats is poor, these actions are tentative and may be subject to change in priority.

#### **Conservation and management priorities**

- Habitat loss, disturbance and modifications
  - Support improved fire and grazing management in areas where Grey Falcons are known to occur.
  - Protect known nesting trees and include adequate exclusion buffers with regard to proposed developments and land clearing activities.
  - Support the establishment and survival of replacement nest trees in areas where Grey Falcon in known to breed.
  - Retain artificial structures with known or potential Grey Falcon nests.
- Invasive species
  - Control invasive cats and camels in areas where Grey Falcons are known to occur, especially in known roosting and nesting areas.

#### **Stakeholder Engagement**

- Engage Indigenous Land Councils, communities, pastoral industry, land managers and non-government organisations to support the conservation of Grey Falcons.
- Discourage the disclosure of locations of active nests to the public.

- Promote the conservation, and raise the profile, of Grey Falcons through strategic programs and educational products with land holders and community groups.
- Promote the exchange of conservation priorities between governments, non-government organisations and communities through use of networks, publications and websites.

### **Survey and Monitoring priorities**

- This species is rare, with a very large distribution. Monitoring population trends is particularly challenging, and will probably require collaboration between many stakeholders to implement, once a suitable approach has been designed.
- Annual surveys of breeding events across the arid and semi-arid zone are recommended including at least the Western Simpson Desert, Tanami Desert and Barkly Tablelands.
- Locating active Grey Falcon nests is aided by:
  - Visiting nests used in previous years;
  - Actively searching for new nests in suitable habitat; and
  - Following up records from the general public, including from Indigenous communities, land managers and bird watchers.

### **Information and research priorities**

- Develop methods for assessing population trends in a rare, widely-distributed species. This requires consideration of logistical, sampling and analytical constraints.
- Continues to collect ecological and demographic information.
- Improve knowledge about potential threatening processes including feral cats, climate change and habitat modification.

### **Recommendations**

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Vulnerable category:

*Falco hypoleucos*

- (ii) The Committee recommends that there not be a recovery plan for this species.

Threatened Species Scientific Committee

12/09/2019

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