Australian Government
Department of the Environment

Consultation Document on Listing Eligibility and Conservation Actions

Rhinolophus robertsi (greater large-eared horseshoe bat)

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

1) the eligibility of *Rhinolophus robertsi* (greater large-eared horseshoe bat) for inclusion on the EPBC Act threatened species list; 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 15 April 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.

Rhinolophus robertsi

Greater large-eared horseshoe bat

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 are 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

Tentatively accepted as *Rhinolophus robertsi* (Tate 1952).

The taxonomy of the *Rhinolophus philippinensis*-group (*sensu* Csorba et al., 2003) in Australia is a curious, complex and long standing issue, that remains unresolved. The treatment here follows advice from K. Armstrong (pers. comm., cited in Woinarski et al., 2014), who is currently engaged in a taxonomic assessment of the complex.

There are two forms in Australia that are readily diagnosable based on external morphology and echolocation calls, and are currently most consistently referred to by their common names: the greater large-eared horseshoe bat (also known as the 'large form') and lesser large-eared horseshoe bat (also known as the 'small form' or the 'intermediate'). They have been named as separate subspecies of *R. philippinensis* in the past (Simmons 2005). For example, Pavey and Kutt (2008) refer to the large form as *R. p. maros*, and the small form as *R. p. achilles*.

Although still not formally resolved, the treatment described in Churchill (2008) is more generally accepted and is followed here. The 'large' form is called *Rhinolophus robertsi*, as (i) it was described (from Mt Amos in Queensland) by Tate (1952) as *R. maros robertsi*, with *maros* now regarded as a junior synonym of *philippinensis*; and (ii) measurements of that holotype match those of the large form (K K. Armstrong pers. comm., cited in Woinarski et al., 2014). Following Churchill (2008), the small form is regarded as a potentially new species (in contrast to the view of Simmons (2005)), given that the two forms are both sympatric and syntopic. Reardon et al. (2010) noted that 'although the taxonomic status … is not yet formally resolved, there is a high likelihood that it will be described as a new species'.

While a comprehensive assessment to place these taxa into the context of forms spread from the Philippines to Australia is in progress (K. Armstrong pers. comm., cited in Woinarski et al., 2014), '*R*. *robertsi*' and *Rhinolophus* sp. are useful classifications in the interim.

Species Information

Description

The greater large-eared horseshoe bat has enormous ears and a large nose-leaf. The fur is long, fine, grey-brown and peppered with white hairs. The fur on the belly is paler in colour. In some individuals, the skin of the nose-leaf, anus and penis or pubic false teats is bright yellow, but the most common colour is greyish. Sexes are similar in appearance and measurements. The fur colour of this species is also very similar to the lesser large-eared horseshoe bat (*Rhinolophus* sp. 'intermediate') and some individuals of the latter form may also have yellow skin (Churchill 1998, 2009).

The forearm length of the greater large-eared horseshoe bat ranges from 51.6 mm to 59.0 mm, ear length 29.0 mm to 33.3 mm and weight 10.0 g to 16.2 g. However, there is a cline in size, with the smallest individuals occurring in the southern part of their range. Where it overlaps in

range with the lesser large-eared horseshoe bat in the northern areas of Cape York, the greater large-eared horseshoe bat is significantly larger and heavier, with the forearm 56.0 mm to 59.0 mm, ear length 32.1 mm to 33.3 mm and weight 11.5 g to 16.2 g. In contrast, in this area of sympatry (overlapping distribution), the lesser large-eared horseshoe bat has a forearm of 50.0 mm to 53.5 mm, ear length 25.2 mm to 27.3 mm and weight 8.3 g to 9.9 g (Churchill 2009; Pavey & Kutt 2008). The greater large-eared horseshoe bat can also be distinguished from the eastern horseshoe bat, *Rhinolophus megaphyllus,* by its much longer forearm length and larger ears (Churchill 1998, 2009).

The echolocation calls of the greater large-eared horseshoe bat are the lowest of any *Rhinolophid* bat, ranging between 28 kHz and 34 kHz (Coles 1993; Fenton 1982; note that call frequency was mixed up between large and small forms in Churchill 1998 and Pavey 2002; but is corrected and updated in Churchill 2009 and Pavey & Kutt 2008). In contrast, the lesser large-eared horseshoe bat emits calls around 40 kHz, and the calls of the eastern horseshoe bat range between 66 kHz to 72 kHz (Coles 1993; Pennay et al., 2004; Reinhold et al., 2001).

Distribution

The greater large-eared horseshoe bat occurs in north-eastern Queensland, from the tip of Cape York Peninsula as far south as Townsville (Kutt 2005; Pavey & Kutt 2008). Most of the distribution is along the eastern coast, but it extends inland where there are suitable cave systems (e.g. Chillagoe, Undara) (Pavey & Kutt 2008).

Duncan et al. (1999) and Thomson et al. (2001) reported the loss (in the 1990s) of some colonies from underground mines, which may have led to reductions in area of occupancy, and possibly in population size.

The distribution of the greater large-eared horseshoe bat is considered to be continuous on a broad scale. However, within this, connectedness among population groups might be low because of land clearing, since the species prefers to forage within relatively dense stands of vegetation (Pavey 2002). The species does forage within woodland, and one radio-tagged individual at Iron Range was observed to fly regularly into the open to feed on insects attracted to a light source (Pavey 2002; Pavey & Kutt 2008). Thus, some propensity for movement among suitable rainforest habitat patches might be possible, but would need to be quantified by a population genetic study.

Relevant Biology/Ecology

The greater large-eared horseshoe bat occurs in rainforests, riparian forests, eucalypt open forests and woodlands. It has a slow fluttery flight, and its diet mostly comprises moths and beetles, but also includes grasshoppers, crickets and lacewings (Pavey 1999; Pavey & Kutt 2008). At night it forages mainly in open forest and wattle-dominated ridges in rainforest (Duncan et al., 1999). In open forest and woodland, it prefers to forage amongst the thicker vegetation in gullies and along creeks, though they have been observed at the edge of grassy clearings in rainforest and road edges (Churchill 2009; Pavey 1999, 2002; Pavey & Kutt 2008). It usually flies within the lower half of the canopy between one and eight metres, using gaps such as tracks within rainforest (Churchill 2009; Pavey 2002), but has also been observed regularly at canopy height (around 25 m; Whybird 1996; O. Whybird pers. comm. in AMBS 2004). While the species has been observed on occasions foraging in rainforest clearings and around a light near a patch of rainforest, it is thought to prefer to remain within canopy (Pavey 1999), and the loss of native vegetation remnants and understorey would likely limit their local distribution.

The species is thought to roost mainly in tree hollows and vegetation, or open habitats such as under creek banks and road culverts, in rockpiles, and relatively shallow caves in drier times (B. Thomson pers. comm., cited in DotE 2013). Like many species of bat it has taken some advantage of disused underground mines, however is not an obligate cave- or mine-dwelling species (DotE 2013).

Females give birth to a single young, probably in October-November (Dennis 2012). Generation length is assumed to be 10 years, derived from a mean age at sexual maturity (estimated at 2−3 years) and longevity (probably c. 20 years) based on information for other *Rhinolophus* species (Jones et al., 2009), but no detailed information is available for this species.

Threats

Threats to the greater large-eared horseshoe bat are outlined in the table below (Woinarski et al., 2014).

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Destruction or reduced accessibility of roost sites	Severe	Minor	Known loss of roost sites associated with closures and destruction due to mining, quarrying or rehabilitiation works (Duncan et al. 1999; Thomson et al. 2001)
Habitat loss and fragmentation	Moderate	Minor	Not demonstrated, but plausible (Dennis 2012)
Disturbance at roost sites (by human visitation and mining)	Moderate	Minor	Not demonstrated, but plausible (Thomson et al. 2001); anecdotal information suggests abandonment of roosts following disturbance (C. Clague pers. comm., cited in Woinarski et. al., 2014)
Too frequent, extensive and intense fire regimes	Minor	Moderate	Not demonstrated, but possible impacts on prey abundance and habitat suitability
Habitat change due to pastoralism	Minor	Moderate	Not demonstrated, but possible impacts on prey abundance
Predation by feral cats	Minor	Moderate	Not demonstrated, but possible that there may be some predation at roost sites and/or their entrances
Disease	Unknown	Unknown	A range of diseases known for congeneric species, with uncertain impacts

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.	*based on any of the followin*	(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:

No information on population trends is available. Reardon et al. (2010) noted that 'it is reasonable to suggest that (this species is) subject to population decline'. Woinarski et al. (2014) suggests that if a decline is occurring, it is 'most unlikely' to be greater than 30 percent over a 30 year (three generation) period.

The data presented above appear to be insufficient 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.

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 49 602 km^2, and the area of occupancy estimated at 32 km^2. These figures are based on the mapping of 12 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 2015). Woinarski et al. (2014) considered that the AOO, which they estimated to be 96 km^2, is a significant under-estimate due to limited sampling across the occupied range, and is likely to be greater than 2000 km^2.

The data presented above appear to demonstrate that 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 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:

There is no robust estimate of population size. Most known roost sites have only solitary individuals or small groups, and there are few known roost sites. The largest colonies have been observed on a single occasion each in just a few old mines (Mt Molloy - 7 to 8 individuals; Phonecian mine at Mt Amos - 18 individuals) (Churchill 2009; B. Thomson pers. comm., cited in DotE 2013). Dennis (2012) noted that 'it appears to be naturally rare'. Reardon et al. (2010) noted that a previous population estimate of less than 2500 individuals was 'likely to be underestimated given that (it is) readily recorded at Iron Range and the McIlwraith Range regions on a single night of survey', and that 'it seems likely that the population exceeds 2500'.

Woinarski et al. (2014) infer that the population size is around 10 000 mature individuals, and infer that the size of the largest subpopulation is less than 1000 mature individuals. There is an inferred decline in population (Reardon et al., 2010).

The data presented above appear to be insufficient 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.

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

Evidence:

There is no robust estimate of population size. However, the number of mature individuals is very likely to be greater than 1000 (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.

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:

A population viability analysis appears not to have been undertaken, and 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.

Consideration for delisting

The greater large-eared horseshoe bat is currently listed as Endangered under the EPBC Act under Criterion 3. The assessment presented in this Consultation Document suggests that the subspecies may no longer be eligible to be listed under the EPBC Act, as it may not satisfy the listing criteria in any category.

However, the population size and population trends of the species are poorly known; it is possible that the species may meet Criterion 3. Given the uncertainty in the assessment and an inferred population decline, there appears to be insufficient evidence to demonstrate that the greater large-eared horseshoe bat is no longer eligible to be listed as Endangered under the EPBC Act.

Inclusion of the greater large-eared horseshoe bat in the Endangered category is likely to be contributing to its survival, as the EPBC Act requires proponents to refer a proposed action for assessment if the action may have a significant impact on a listed species. Where necessary, the Department issues conditions requiring proponents to avoid, minimise or mitigate impacts on the species.

The greater large-eared horseshoe bat is listed as Endangered under the Queensland *Nature Conservation Act (1992)*. If delisted, the species will still be covered under state legislation. However, recovery actions under the *Recovery plan for cave-dwelling bats,* Rhinolophus philippensis, Hipposideros semoni *and* Taphozous troughtoni *2001-2005* (Thomson et al., 2001), which was developed by the State of Queensland and adopted as a national recovery plan under the EPBC Act, may not continue. Actions consistent with the recovery plan have helped to clarify its taxonomy, distribution and status. However, while there has been some management of abandoned mines within the species' range (Thomson 2002), there has been little active management or protection of roost sites in mines. Although it is unclear what impact the recovery plan has had on the survival of the species, without the continuation of research and monitoring activities the species will remain data deficient and may further decline. The recovery plan is currently scheduled to cease in 2017.

Conservation Actions

Recovery Plan

A decision about whether there should be a recovery plan for this species has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

A recovery plan is currently in place. The *Recovery plan for cave-dwelling bats, Rhinolophus philippinensis, Hipposideros semoni and Taphozous troughtoni 2001–2005* (Thompson et al., 2001) includes objectives to:

- establish the status of poorly known species and to identify appropriate species management units within two years of implementation of the plan
- gather the necessary biological data from current records and through new, targeted field work for the effective conservation management of the species
- implement conservation strategies or on-ground conservation works in priority sites where the species occur to mitigate identified threatening processes
- identify trends in the species' abundance at priority sites across their distributional ranges after the instigation of conservation strategies or on-ground conservation works

Previous and current studies, particularly regarding the biology of the species, have contributed towards meeting the objectives of the plan since its adoption (e.g. Reardon et al., 2010; Bonaccorso et al., 2008). However, further research is required to establish population trends, clarify threatening processes and develop appropriate management actions.

Primary Conservation Actions

1. Manage threats to secure or increase overall population size.

Conservation and Management Priorities

There is no specific management targeted at this species. Parts of its range are included in conservation reserves, where some threats are managed. There has been some management of abandoned mines within the species' range (Thomson 2002), but there is little active management or protection of roost sites in mines. As the species does not commonly form large aggregations in mines or caves (B. Thomson pers. comm., cited in DotE 2013), success from efforts to preserve roosting concentrations are limited. A mine important as a regional dispersal centre for part of the species population is the Jack Gordon mine in the Iron Range (Hall et al., 1997). The species is best conserved by preserving natural remnant vegetation with good understorey where it has been identified unambiguously, or is thought to occur (DotE 2013).

There is no monitoring program specifically for the greater large-eared horseshoe bat. However, the increasing use of bat detectors in survey will allow for more broad-scale surveys, and for non-intrusive monitoring of numbers and seasonal patterns of use at known roost sites. This species emits long duration FM-CF-FM echolocation calls with a characteristic frequency around 26 kHz at the second harmonic, which is absolutely diagnostic of the species and distinct from the high frequency of the 'small form' (C. Clague pers. comm., K. Armstrong pers. comm., both cited in Woinarski et al., 2014). Reardon et al. (2010) recommended that this species be sampled with permanent bat recorder stations in strategic locations (including as part of a multi-species monitoring program for Kutini-Payamu (Iron Range) and Kulla Kulla National Parks).

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

Theme	Specific actions	Priority
Active mitigation of threats	Constrain actions that may lead to loss of critical roost sites	High

	If needed, stabilise roost sites; and constrain human visitation	Medium
	Implement fire management that benefits this species	Low-medium
Captive breeding	N/a	
Quarantining isolated populations	N/a	
Translocation	N/a	
Monitoring	Implement integrated monitoring program across its range, and at known roost sites, linked to assessment of management effectiveness	Medium-high
Community engagement	Involve Indigenous ranger groups in survey, monitoring and management	Medium

Survey and Monitoring priorities

Theme	Specific actions	Priority
Survey to define better distribution	Undertake fine-scale sampling to identify and circumscribe important subpopulations (and roost sites), and assess the population size of these	High
Establish or enhance monitoring program	Design an efficient monitoring program, for roost sites and across range	Medium

Information and Research priorities

Theme	Specific actions	Priority
Assess relative impacts of threats	Assess the structural viability and potential threats to all known important roost sites	Medium
	Identify the population-level responses to a range of fire regimes, and model population viability across all fire scenarios	Medium
	Examine population-level responses to clearing and habitat fragmentation	Low
	Assess abundance of feral cats in the range of this species, and the impact of predation on population viability	Low
Assess effectiveness of threat mitigation options	Assess efficacy and impacts of management options to reduce fire incidence, extent and intensity	Medium
	Assess options for gating or other management of roost sites	Low-medium
Resolve taxonomic uncertainties	Clarify relationships of different “forms” (currently in progress: K. Armstrong pers. comm., cited in Woinarski et al., 2014)	Medium-high
	Establish genetic structuring across subpopulations to identify extent of movement of individuals, and to identify populations that may be	Medium

	most genetically distinctive	
	Resolve taxonomic status of Australian vs extralimital populations (currently in progress: K. Armstrong pers. comm., cited in Woinarski et al., 2014)	Medium
Assess habitat requirements	Characterise roost (and maternity) site requirements	Medium
	Investigate seasonal and spatial patterning of foraging habitat use	Low
Assess diet, life history	Investigate key components of diet	Low
	Investigate breeding characteristics and success (Reardon et al. 2010)	Low

References cited in the advice

Australian Museum Business Services (AMBS) (2004). *The Provision of Data for Draft National Fauna Survey Standards: Bats.* Draft Report to the Commonwealth Department of Environment and Heritage. In Churchill, S.K. (1998). *Australian Bats*. Reed New Holland, Sydney.

Churchill, S. K. (2009). *Australian bats.* Second edition. Allen and Unwin, Sydney.

Coles, R.B. (1993). Echolocation and foraging ecology of Australian horseshoe bats (Rhinolophoidea). In *Abstracts of spoken and poster papers, Sixth International Theriological Congress, Sydney, Australia 4-10 July 1993*. Pages 55-56.

Cooper, S. J. B., Reardon, T. B., & Skillins, J. (1998). Molecular systematics of Australian rhinolophid bats (Chiroptera: Rhinolophidae). *Australian Journal of Zoology 46*, 203-220.

Csorba, P., Ujhelyi, P., &Thomas, N. (2003). *Horseshoe bats of the world (Chiroptera: Rhinolophidae)*. Alana Books, Bishop's Castle.

Dennis, A. J. (2012). Large-eared horseshoe bat *Rhinolophus philippinensis* (large form). In *Queensland's threatened animals*. (Eds L. K. Curtis, A. J. Dennis, K. R. McDonald, P. M. Kyne & S. J. S. Debus), pp. 392-393. CSIRO Publishing, Collingwood.

Department of the Environment (DotE) (2013). Greater large-eared horseshoe bat *Rhinolophus robertsi*. Species Profile and Threats Database (SPRAT), Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available on the internet at: http://www.environment.gov.au/sprat.

Department of the Environment (DotE) (2015). *Area of Occupancy and Extent of Occurrence for* Rhinolophus robertsi. Unpublished report, Australian Government Department of the Environment, Canberra.

Duncan, A., Baker, G. B., & Montgomery, N. (1999). *The action plan for Australian bats*. Environment Australia, Canberra.

Fenton, M.B. (1982). Echolocation calls and patterns of hunting and habitat use of bats *(Microchiroptera)* from Chillagoe, North Queensland. *Australian Journal of Zoology*. *30,* 417-425.

Hall, L., G. Richards, N. McKenzie & N. Dunlop (1997). The importance of abandoned mines as habitat for bats. In *Conservation Outside Nature Reserves* (eds P. Hales & D.Lamb), pp. 326-333. Centre for Conservation Biology, The University of Queensland, Brisbane.

Jones, K. E., Bielby, J., Cardillo, M., Fritz, S. A., O'Dell, J., Orme, C. D. L., Safi, K., Sechrest, W., Boakes, E. H., Carbone, C., Connolly, C., Cutts, M. J., Foster, J. K., Grenyer, R., Habib, M., Plaster, C. A., Price, S. A., Rigby, E. A., Rist, J., Teacher, A., Bininda-Emonds, O. R. P., Gittleman, J. L., Mace, G. M., & Purvis, A. (2009). PanTHERIA: a species-level database of life history, ecology and geography of extant and recently extinct mammals. *Ecology 90*, 2648.

Kutt, A. S. (2005). Clarification of the distribution of the long-eared horseshoe bat *Rhinolophus philippinensis* complex in Australia. *Australian Zoologist 32*, 629-631.

Pavey, C. R. (1999). Foraging ecology of the two taxa of large-eared horseshoe bat, *Rhinolophus philippinensis*, on Cape York Peninsula. *Australian Mammalogy 21*, 135-138.

Pavey, C.R. (2002). Large-eared Horseshoe Bat, *Rhinolophus philippinensis*. In *Mammals of Australia: Nature Focus, photographic library at the Australian Museum* (ed. R. Strahan), pp 451-453. Australian Museum, Reed New Holland, Sydney.

Pavey, C. R., & Kutt, A. S. (2008). Large-eared horseshoe bat *Rhinolophus philippinensis*. In *The mammals of Australia*. Third edition. (Eds S. Van Dyck & R. Strahan), pp. 454-456. Reed New Holland, Sydney.

Pennay, M., B. Law & L. Reinhold (2004). *Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats*. Hurstville: NSW Department of Environment and Conservation.

Reardon, T. B., Robson, S. K. A., Parsons, J. G., & Inkster, T. (2010). Review of the threatened status of microchiropteran bat species on Cape York Peninsula. South Australian Museum, Adelaide.

Reinhold, L., B. Law, G. Ford & M. Pennay (2001). *Key to the bat calls of south-east Queensland and north-east New South Wales*. Forest Ecosystem Research and Assessment Technical Paper 2001-07. Queensland: Department of Natural Resources and Mines.

Sedlock, J., Francis, C., Heaney, L., & Suyanto, I. (2008). *Rhinolophus philippinensis*. In 'IUCN red list of threatened species.' Version 2011.2. Viewed 24 May 2012. Available on the internet at: http://www.iucnredlist.org.

Simmons N. B. (2005). Order Chiroptera. In *Mammal species of the world: a taxonomic and geographic reference*. Third edition. (Eds D.E. Wilson & D.M. Reeder), pp. 312–529. Johns Hopkins University Press, Baltimore.

Thomson, B. (2002). *Australian Handbook for the Conservation of Bats in Mines and Artificial Cave-Bat Habitats*. Australian Centre for Mining Environmental Research, Melbourne.

Thomson, B., Pavey, C., & Reardon, T. (2001). National recovery plan for cave-dwelling bats, *Rhinolophus philippensis, Hipposideros semoni* and *Taphozous troughtoni* 2001-2005. Queensland Environmental Protection Agency, Brisbane.

Whybird, O.J. (1996). *An investigation into the vertical stratification of the Chiroptera in tropical Queensland rainforests*. Hons. Thesis. BSc (Hons) thesis University of Queensland, Brisbane (unpublished).

Woinarski, J. C. Z., Burbidge, A. A., & Harrison, P. L. (2014). *The action plan for Australian mammals 2012*. CSIRO Publishing, Collingwood.

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?